ELECTRONIC PATIENT RECORDS AND MEDICAL PRACTICE

Reorganization of Roles, Responsibilities, and Risks

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Contents

Acknowledgements **3**

Introduction **5**

Electronic patient records as levers of change? 5

The location of study 10

The structure of the thesis 12

Theories about technology and organizational change: from variables to a variable ontology **17**

Introduction 17

Technology as a variable: classic and contemporary approaches 20

Technology as an actant: the sociology of translations 41

Political and pragmatic criticisms of actor-network theory 56

Methodology and research practice **61**

Introduction 61

Engaging with the field of study 71

Co-constructing data 78

Writing up data 84

Computerizing physician notes: expanding the circle of authors and readers **95**

Introduction 95

The making of a hospitalization note 100

The EPR as a conjoiner and separator of authors and readers 116

Conclusion 131

Reporting and updating through the screen: nurses' information work across shifts and territories **135**

Introduction 135
The division of nursing work 136
Reporting routines 144
Updating routines 166
Conclusion 188
Stabilizing medicine prescriptions? Implosion and ramification in the trajectory of medication 191
Introduction 191
The interweaving trajectories of medication before the EPR 193
The altered trajectory of medication 211
Conclusion 237
Adding computers to the infrastructure of test distribution: reshuffling work loads and temporalities 243
Introduction 243
A changed chain of test result distribution 244
Workloads and dilemmas 248
Discussion: temporality and risks 257
Conclusion 262
Nodes of ordering in medical practice 265
Introduction 265
Written interaction 268
More coordination of less 285
Roles and responsibilities: rationalizing healthcare practice 293
Redistribution of errors 309
Conclusion 319
References 327
Resume af afhandlingen 343

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1

Introduction

Electronic patient records as levers of change?

This thesis is about electronic patient records and medical practice. Electronic patient records (EPRs) are patient records stored electronically and accessible through computers. Although there are many types of EPR-systems, they all differ from paper-based records in that it is possible to read the same patient record simultaneously from different computers and data can be entered from many sites at a time.

During the last five years, there has been an upsurge of interest in EPRs. From being minimalist information-systems, which were basically DOS-based word-processing programs, EPRs have developed into many kinds of typically Windows-based advanced systems capable of handling many kinds of information: texts, pictures, and even animations. Still more hospitals have introduced or are about to introduce the new EPR-systems in wards, outpatient-clinics, and emergency departments. In 1996 the Ministry of Health launched a National Action Program for EPRs placing EPRs as the single most crucial element in the development of hospitals of the future (Ministry of Health 1999).

There are, of course, many reasons for this intensified interest. One of the major reasons is that electronic patient records are seen as solutions to different kinds of problems troubling hospital managers, politicians, and professional organizations. Hospitals, and health care in general, have been and still are hot topics in the Danish public discourse. There are long waiting lists for a wide range of surgical operations; budgets are tight compared to an ever-growing demand; the efficiency of hospitals are questioned; complaints about mistreatment and low quality

are growing in numbers; and there is shortage of both physicians and nurses. In the attempt to meet these and other challenges, the hospital field is in a permanent state of restructuring (Bentsen et al. 1999). Hospitals that traditionally have been performing a wide range of functions are being restructured into centers that work as "function bearing units" (Borum 2000); departments are reorganized to decentralize the admission of patients (Vinge 2002); and the treatment of patients is being redefined and standardized in "clinical pathways" (Scheuer 2001). Yet there is also a growing feeling of something more or something different being necessary to change the status quo. In this context the EPR has been singled out as a promising lever for changing the basic dynamics of hospitals.

In general, EPRs are thought of as having the capacity to speed up and improve the flow of work, and hence, the handling of patient cases across occupations, units, and hospitals. One of the main rationales being that replacing paper-based records with EPRs will radically enhance the way information is gathered, stored, distributed, and used. And since information processing is crucial to the treatment and care of patient, better and faster information is a tool for improving quality and efficiency. Furthermore, EPRs are assumed also to lead to more cooperation among the staff around the patient, and ultimately bring the patient more into focus. Let me quote from a few articles and project presentations to illustrate the kind of things expected from introducing the EPR:

> "Further substantial gains in service and efficiency can be achieved through *electronic patient case files*, which can gather information across wards at each hospital, and with which information can be interchanged between hospitals and with GPs. Thus patients might avoid double examinations, diagnoses may be given more securely and free of mistakes, and the duration of treatments can be shortened. Furthermore there are substantial rationalization gains to be made on hospitals internally" (Ministry of Research 1994, chapter five).

> "Looking further ahead, the vision is the 'virtual record', where the electronic patient record acts as the user interface to a distributed world of information. From this world, relevant information will be gathered in the concrete situation, where intelligent tools will provide

> optimal overview and utilization of already existing information from many different sources" (Ministry of Health 1999, 16, my translation).
>
> "Introduction of electronic documentation opens up new possibilities of creating coherence and introducing securing and ongoing development of quality in treatment and care"(Asp et al. 2002, my translation).
>
> "It is expected that the [electronic patient record] project will establish new possibilities for communication, which will support the patient's course of hospitalization, make work flows more flexible, raise quality, and ultimately lead to an optimization of the operation of [the hospitals]" (Sygehus Fyn 1999: 1, my translation).

More precisely, the expected effects of EPRs can be subsumed under three categories. First, patient data are currently recorded in many different places and are often copied manually from one document to another giving rise to mistakes and errors. With the EPR a lot of data will only have to be registered once – *at the source* – and can be pasted into many different documents without running the risk of being misread or forgotten: data will be the same everywhere and errors will diminish, the argument goes. Second, in most hospital wards patient records are often hard to procure either because they have been misplaced or because others are using them. In contrast EPRs are easily accessible, and therefore they are expected to improve the *intraorganizational* communication and division of labor, and thus ultimately the efficiency and quality of healthcare. Third, at present patient records are stored in the individual hospitals. However, patients are often hospitalized in many different hospitals and their records from earlier hospitalizations will be hard and sometimes even impossible to get a hold of. Therefore, patients are often treated as "new cases" every time they are hospitalized. The vision is that when EPRs have been introduced into all hospitals, patient records can easily be exchanged and thus improve *interorganizational* efficiency and quality of healthcare.

In this atmosphere of optimism and trust in the power of information technology, huge amounts of resources are being spent or are going to be spent on introducing EPR-systems in hospitals (approximately between one and two billion DKK, or 150-250 million dollar (Nielsen

2001)). This investment has encountered some criticism. It has, for instance, been argued that local investments in EPR-systems run the risk of proving futile, because the various systems are based on different standards making it difficult to communicate when coupled together across institutions and county-boundaries (Bonnerup & Frelle-Petersen 2001). Acknowledging this hazard, the National Board of Health has worked intensively to launch a basic model for the structure of EPRs (Sundhedsstyrelsen 2001). However, it is recognized that the exchange of patient data among hospitals requires the development of a much more elaborate set of national classifications and semantic standards – a project that may not be accomplished in the immediate future (Vingtoft et al. 2000, Andersen 2001).

It is striking that the debate mainly centers on the technical aspects of EPRs. Admittedly there is some mentioning of the introduction of EPRs as also being a question of organization development and of the necessity of dealing with "organizational aspects" such as training staff and overcoming "resistance to change" in order to secure full utilized of EPRs. One example is that "one does not introduce digital support to the flow of work without a fundamentally reorganization of this work. It is 80% process, which includes much information, appreciation from the personal, and a strong commitment from the management" (Andersen 2000, p. 5969 my translation). But there is practically no questioning of the basic expectations of EPRs: that they will improve quality and efficiency if the organization is properly adjusted. On the other hand, it has been argued that hospitals should not defer the introduction of EPR-systems and wait for the national standards, because even a local system will improve quality radically by, for instance, reducing medication errors and save patients' lives (Henriksen 2001).

But the implications of introducing EPRs have been subject to little research. Recently a few articles have been published on time savings in relation to selected work routines (Lisby et. al. 2002); on experienced advantages and disadvantages of having cross-disciplinary EPRs (Biering-Sørensen et. al. 2001); and on errors in record texts (Rasmussen 1999). An evaluation report has been made (Fyns Amt 2001) describing specific effects of EPRs on selected clinical and organizational dimensions such as data information, documentation, communication, and management and planning. A progress report from the National EPR-

Observatory sums up experiences and expected outcomes from local EPR-projects on a number of general variables such as organizational, integration-related, and security-related aspect. But the report concludes that "there are several challenges related to the evaluation of cost-benefits of EPRs across the different projects, because… they are in constant development…they are very different…it is difficult to identify the areas, which are relevant to evaluate/measure…it has not been possible to make before and after analyses under controlled conditions" (Vingtoft 2000: 22). In sum, the effects of introducing EPRs are largely unsubstantiated.

Yet it seems reasonable to think that a societal investment of this proportion should not only consider technical and implementation issues, but also be accompanied by some sort of critical inquiry into the wider implications of introducing EPRs: to what degree are the expectations fulfilled? What kind of unexpected consequences have emerged? What kind of new problems have emerged? Such basic questions paramount not only in relation to local experiments with various EPR-systems, but also for a more balanced public debate about how to spend money, and how to organize hospitals so that they become places of balanced and careful treatment, good working conditions, and sensible utilization of resources. However, the questions of EPRs, of change of workflow, and of organizational processes at hospitals are also of general interest. As computers become more and more salient features of human life, we need to develop a rich and balanced knowledge about their dynamic interplay in order to avoid simplistic notions about consequences or solutions. Moreover, studies of information technology "at work" might very well challenge our understanding of ourselves, of our organizations, and of our society. In this respect, electronic patient records can be considered an invitation to restudy the hospital: How is it organized with computers, how are tasks defined and carried out, and how are people relating to one another? Such explorative questions might be considered a virtue at a point when there are very few investigations of the consequences of EPRs and when it is still possible to shape the design and introduction of information technology in the healthcare sector.

In this thesis, I have taken up the invitation to explore how EPRs actually work in the medical practice. My aim is to understand what

kinds of effects the introduction of the EPS create in a hospital, or more precisely: *how medical practice is performed through the use of EPRs, and what kind of implications it has for whom*. However, my ambition is not to give a general and comprehensive answer, but to dig into selected areas of this practice in order to raise the level of specificity. General studies or studies of general aspects can render much significant knowledge. Yet in a situation where we hope for so much, but know so little about the effects of EPR in hospitals, I find it crucial to describe and analyze organizational practices in depth rather than in broad outline. Besides it is also a methodological point that in focusing on and analyzing a few mundane practices we often come to understand the basic mechanisms of our society better than by correlating abstract variables across a large population. I will focus on two of the three dimensions regarding the expectations from the EPR: the significance of EPRs for the *registration of data* "at the source" and the expected reduction of errors, and the significance of EPRs for *intraorganizational roles and relations* and for the quality of medical practice.

The location of study

The empirical focus of the thesis is two medical wards on Svendborg Hospital in which the EPR-system "MediCare" has been operating since October 1999. I will soon go into greater details about my theoretical and methodological focus, but first it is necessary to present some background information about the site of study and of MediCare. This is of importance, because the analyses and conclusions of this thesis are not generally applicable to all hospitals and all kinds of EPR systems but are closely related to the particular location. However, I will only give a brief overview of the hospital wards and the specific EPR-system, since both aspects are further described in relation to the specific analyses.

The Medical Wards at Svendborg Hospital

Svendborg Hospital is located in the Southern part of Funen and organizationally it is coupled to two smaller hospitals in Rudkøbing and Ærøskøbing. Svendborg Hospital is a medium-sized hospital (at least in the Danish context) with 189 beds distributed on a surgical, a psychiatric, and a medical department. The medical department has recently been restructured into a "Admission Ward", where new patients are placed for the first 24 hours after which time they are referred to one of five special wards: "Apoplexy Ward", "Gastro-intestinal Ward", "Pulmonary Ward", "Endocrinology Ward", and "Geriatric Ward". Each special ward holds from between ten and twenty patients. Physically, the Admission Ward is placed in the middle of a long hallway, with two special wards on each side. All wards consist of an office, a kitchen, toilets, a flushing room, a depot, and a number of bedrooms.

In October 1999 EPRs were introduced in all medical wards. From day one, new patient records were no longer drawn up on paper but only electronically. If a patient was rehospitalized, his or her old paper-based record was fetched from the central archive and read, but continued as an electronic one. Prior to this day, all staff had taken lessons in the new system and in the use of computers. Computers and printers were placed in all ward offices (typically 5-6 computers in each office), in management offices, and at the physicians' offices. All in all 175 workstations were set up, and 419 people defined as users, i.e. assigned a password (physicians, nurses, aides, secretaries, physiotherapists, ward managers, and system operators). The empirical observation study underlying this thesis began approximately one year after the introduction of EPRs in the wards.

The EPR-system MediCare

The EPR-system is a shared record-system, which means that nurses, physicians, aides, physiotherapists, and ergotherapists have access to all patient data. Basically, the system holds all records of patients being hospitalized since the introduction of EPRs, and it holds updated lists over the patients being hospitalized for the present. An electronic patient record consists of a front page (which lists basic patient data such as name, address, date of hospitalization, etc.) and a number of folders (nursing notes, physician notes, physiotherapist notes, medicine scheme,

laboratory figures, prescription sheet, diagnosis scheme). Besides, there are, as mentioned earlier, also general folders listing the patients hospitalized at each ward, the patients undergoing different cross-organizational programs such as physiotherapist, and the latest results from tests and examinations (which are also sent directly into the specific patient records). Since not all types of patient data can be stored electronically, a plastic folder is drawn up for all patients too in which these data can be kept during the hospitalization. When a patient is discharged, this plastic folder is maculated.
The EPR-system has been developed on the basis of an older system operating in the neighbor hospital in Rudkøbing since 1994. Nurses, secretaries, and physicians from both Rudkøbing and Svendborg Hospitals have participated in the development process, and the system is still undergoing further developed. New versions of the system are currently installed, and during the observation period the system was updated with a few additional functions.

The structure of the thesis

How is medical practice carried out with EPRs, and what are the implications for whom? This question is the governing idea of the thesis, though I will sometimes treat it as a more general question of how to understand technology and organizational change, and at other times zoom in on rather specific topics such as the way drugs are prescribed.

In *chapter two* I discuss how organization theories traditionally approach the question of technology and organizational change. I argue that there is a widespread tendency to conceptualize technology as a variable that has a certain impact on organizational dimensions, or makes it necessary for them to adjust. In this perspective technology is viewed as exogenous to the social organization of humans. However, this basic assumption frames change as a matter of competition between two worlds – the technical and the social – which ultimately blinds us to the way in which the technical and the social are intricately enmeshed, change each other, and produce unexpected effects. I present, therefore, a radically alternative approach – the actor-network – that explicitly makes a virtue of not defining things in advance of the study, but pro-

poses a methodology for exploring the co-construction of the social and the technical. Discussing some criticisms of the approach (e.g. that it does not say much about organizations), I suggest adopting a pragmatic stance when trying out this methodology without turning it into a dogma.

In *chapter three*, I present this research strategy in greater detail. I define the overall framework of the study as constructionist, which implies that all phenomena arise as outcomes of multiple network relations between entities, and that my own research practice is also part of this co-creation. In this light, science is not a means to represent universal Truths, but to generate descriptions of local network-activities, of partial practices, which can be juxtaposed with other descriptions. I argue that the criteria of "valid" and "reliable" data, which belong to a representational view of science, should be replaced by two other criteria, namely of making "meaningful" and "useful" stories, and I describe how I have attempted this throughout the processes of engaging with the field of study, co-constructing data, and writing up analyzes of data.

Chapter four is the first of four empirical chapters and deals with the practices of writing and reading physician notes. I describe how the network of human and non-human actors participating in the "authoring" and reading of these notes expand and are rearranged by the introduction of EPRs, and that the results seem to be new roles and relations between physicians and nurses. However, the overall effect of this extended network around the patient-as-a-case leads to the strengthening of the scientific-medical paradigm.

Chapter five is about the updating and reporting routines of nurses. It describes the way EPRs participate in these. On broad, I argue that the EPRs occasion a move toward more written interaction among nurses at the expense of face-to-face interaction. However, the EPRs also contribute to enhancing a dilemma between documenting nursing activities and coordinating across shifts and occupational territories. Yet in the altered network of the ward, nursing seems to be enacted as a scientific-medical allied rather than a "holistic" profession.

Chapter six looks into the medication process, i.e. the line of work from the production of the patient as a medical problem, via the prescription of a drug to alleviate this problem, to the moment when the patient swallows the pill. I show that the introduction of EPRs continues

well-known “sources of error” and gives rise to whole new medication errors. Furthermore, I argue that neither physicians and nurses nor patients change their position radically. The physician is enacted as the protagonist in the medication process, although he or she is more confined in the formulation of a prescription. The nurse as the one doing the invisible work of producing a unifying principle in the trajectory of medication; and the patient as an even more passive recipient of diagnoses and drugs. Moreover, the overall scientific-medical rationale is coupled strongly to the market of medicinal products.

In *chapter seven*, I deal with the way test results are distributed after the introduction of EPRs. Results are communicated both electronically and in paper, giving rise to a reshuffling of roles and responsibilities among physicians, nurses, and secretaries. Paradoxically, the relations between the three groups end up being enacted in a manner very close to the traditional organizational hierarchy. And yet, new work temporalities seem to emerge and the traditional ordering principle for the physicians’ workday is challenged. Also the new temporalities make it more difficult for the occupational groups to align their work. This introduces new risks of mistakes.

In *chapter eight,* I compare the four analyses and discuss their common features and interconnections. I introduce the concept of “nodes of ordering”, which refers to the way some human or non-human actors suddenly become temporary centers of organizing, and I discuss how EPRs participate in replacing old nodes of ordering with new ones. These new nodes emerge as interaction among the staff is increasingly happening through writing, and they give rise to a stronger coordination of activities in the ward, albeit around a more narrow view of the patient, namely as a bureaucratic and scientific-medical case. I discuss what roles physician, nurses, secretaries, and patients come to perform in this new organizational arrangement and put these roles into perspective by pointing to debates related to the future of physician and nursing professions. Finally, I discuss the risk of “errors” in the new versus the old organizational arrangement, and argue that EPRs cannot ensure a “fail-proof organization” – an errorless medical practice. There are conflicting concerns and in-built dilemmas regarding the handling of patient data and regarding the division and coordination of work across duties.

Finally, in *chapter nine*, I recapitulate the introductory questions of the thesis and discuss what has been accomplished through the research process. I argue that my study of the medical wards in Svendborg throws new light on the range of expectations from EPRs. Rather than confirming or disconfirming the expectations, the study specifies in what ways, to what extent the expectations might be fulfilled, and how this may be at the expenses of other aspects of the healthcare. In consequence, the study raises doubts about the usefulness of evaluation models that invite to the measuring of specific parameters or variables before and after the introduction of information technology in order to demonstrate the resulting effects. When a new technology is introduced into an organization, technology, humans, programs, criteria, etc., are subtly but radically transformed, and the comparison of selected parameters may at best be imprecise and at worst misleading because the parameters themselves change. Instead, effects should be mapped by following the new practices and discuss what consequences these practices have for the definition of tasks, for the definition of roles and relationship, and for the distribution of rights and duties. In this connection, weight should be put on methodology in the unraveling of effects rather than on theoretical preconceptions. The study suggest that the actor-network-theoretical approach is a fruitful way to study the organizational effects of new technologies, but that the concept of nodes of ordering is necessary in order to understand how general effects emerge from multiple local activities. Finally, I discuss what kind of implications this study has for the national policy regarding EPRs and healthcare.

2

Theories about technology and organizational change: from variables to a variable ontology

Introduction

What is the relationship of technology and organizational change? Although the headings and the occasions have varied, this question has occupied organizational theorists for long, and it has been a topic ever since the birth of assembly line technology and the rise of scientific management with its focus on streamlining the organization to utilize the potential of technology. As new kinds of technologies or production systems emerged, the question of organization became progressively more important. From late 1950s to late 1960s a wealth of theoretical and empirical studies – many under the headline of "contingency theory" – came to mark a "first" peak in the academic interest in relations between technology and organizational issues. These studies were predominantly occupied with the question of how organizations should and could be organized to fit the demands of technology. Recently, a second peak has cropped up, as computers have been progressively more salient in organizational life. In this second peak, there have been two major trends of the literature. One continuing the focus of contingency theory on the relation between new information technology and the need for new forms of organizing (cf. the literature on virtual organizations). And another more micro-sociological approach focusing on the emergence of new social phenomena and competencies and the way users adapt technology (Zuboff 1988, Tyre & Orlikowski 1994, Orlikowski 1996, Star

1992 & 1995). All in all, a large body of knowledge has been developed on the issue.

Despite this accumulation of theories, models, and empirical findings, we seem to have only made initial moves towards a deeper understanding of how technology takes part in organizational life. One of the symptoms is a pronounced disagreement within the academic field on the role of technology. On the one hand, technology is viewed as extremely powerful, both in the dystopian sense of "molding" human life (cf. Habermas 1981, Braverman 1974), and in the more optimistic sense of undermining power structures and creating new emancipative possibilities as stressed in quite diverse literature ranging from theories of organizational development (Davenport & Short 1990, Hammer & Champy 1993), via theories of organizational learning (Pentland 1995, Robey et al 2000, Brøndsted & Elkjær 2001), to theories of cyborg-identities (Haraway 1991, Turkle 1996) and postmodernism (Lyotard 1979). On the other hand, technology is seen as weak and dependent on the motivation of humans (a common claim in the literature on implementation under the heading "resistance to change" and in the literature on computer supported cooperative work, which predominantly discusses the way technology must be adapted to fit human skills and cognition).

In this chapter, I will argue that these opposite viewpoints are not simply different perspectives on the topic. Rather they are rooted in a widespread tendency – regardless of theoretical affiliations – to view "technology" as a delimited and unequivocal variable vis-à-vis the "organizational" as an equally delimited and unequivocal variable. When this assumption is thriving, "change" becomes a matter of power balance between the two variables, where the strongest will set the agenda and the other will have to adjust or mold itself according to this given agenda. Furthermore, the term "variable" indicates that, in principle, you can replace one technology with another, one organization with another, and still be able to explain their relationship. However, these ideas of change are much too simple. Neither technology, nor humans or the organization exist separated from each other, but are fundamentally enmeshed with each other. A technology becomes only a real technology when linked to other materials, locales, humans, and discourses; and likewise, the organization emerges as it ties together a network of materials, locales, humans, procedures, and discourses. Accordingly, it invol-

ves a great deal of simplification and deletion of details to settle what is technological and what is organizational. And the problem is that by doing this, you easily come to cut away exactly the interrelations that are important for understanding how the specific characteristics of the organization in question have emerged and are changing. When a new technology is introduced into an organizational network it does not simply start a battle between fixed agendas. Rather it is an occasion for a subtle or radical reconfiguration of the relations of a multitude of elements including the technology itself, and often entirely new phenomena emerge. In this light, the paradoxical statements about the effects of technology are perhaps not the problem: depending on the specific configuration of machines, humans, raw materials, buildings, cultures etc. widely different effects will arise. The problem is, however, that these effects are sought explained by fixed uniform variables – either a strong or weak technology, or strong or weak organizational characteristics. By adopting this explanatory strategy, the knowledge produced is at best a simplification of the change processes. At worst we becomes blind to exactly the processes in which technology or humans are produced as strong or weak actors – and by explaining change in terms of the interplay of stable categories, their intricate relationships remain a black-box.

In the following, I shall show how the distinction between technology and organization constitute the basic feature of three classic and contemporary theories on the subject of technology and organizational change. More specifically, I shall demonstrate how all three approaches share the assumption that technology is endogenous to the organizational, and I shall argue that in effect of this assumption interaction between the two variables is split up in temporally separated moments of unidirectional impact. Then I shall introduce a radically alternative way of understanding the simultaneous co-constructing of the technological and the social (and organizational), namely the actor-network theory. Rather than seeing technology as a distinct variable that impact the social or vice versa, both technology and say the organization are considered “actants”, which become defined through their relations to other actants in a network. By understanding every phenomenon as a network effect, actor-network theory offers a way of transgressing conventional dichotomies within social and organization theory. Dichotomies that contribute to cement the notion of variables (e.g. “social context” versus

"technical content", "micro" versus "macro", and "real" versus "unreal") and the notion of fit or impact (e.g. "stability" versus "instability" and "form" versus "content".

However, while this approach introduces a new vocabulary and methodology for unraveling the co-constitution of seemingly stable entities – the recurring construction of a variable ontology – the approach does also have certain limitations, in particular regarding the understanding of traditional organizational topics such as forms of organizing and organizational processes, but also regarding the understanding of human rationales of action. I will conclude the chapter by addressing these criticisms and present my research strategy that employs the vocabulary and methodology from actor-network theory not as dogmas but as heuristics. In this way I hope to throw light on the consequences for medical practice of introducing EPRs in a hospital ward without foreclosing any possibilities – to dodge the notions of variables and map the complicated production of consequences.

Technology as a variable: classic and contemporary approaches

In the introduction, I stated that a majority of theories on the subject of technology and organizational change rest on the notion of technology as a variable distinguishable from social variables. I shall substantiate this statement by examining two classic schools of thought that are still very much alive in contemporary ways of thinking about technology: contingency theory and sociotechnical systems theory. Both schools operate with more or less clearly defined variables; and a third more recent work-oriented approach, which attempts to overcome certain limitations of the two classic traditions. I shall argue that despite attempts to renew the conceptual framework for understanding technologies at work in organizations even the latter approach bases its core concepts and principles on the idea of separate variables.

Contingency theory

Fundamentally, contingency theories share the basic assumption of open systems theory that an organization exists in relation to the environment, and if the organization is to survive it must adjust to changes in this environment by self-organization, that is, by reconfiguring the relations of its elements. This idea was adopted from Bertalanffy's general systems theory based on two anti-reductionist hypotheses: a) it is necessary to view a phenomenon of a certain complexity as a whole that cannot be decomposed into elements if one wants to be able to describe this whole; b) descriptions of systems are cross-disciplinary and in principle independent of the concrete systems (Køppe 1990)). Early contingency theorists, such as Burns & Stalker (1961), asserted that specific organizational structures are appropriate to different conditions of complexity and stability in the environment, and in general, contingency theories are centered on the notion that context and structure must somehow fit each other if the organization is to perform well (Drazin & Van de Ven 1985).

A study conducted by Joan Woodward of the relations between types of technologies, structures, and overall performance was central for spawning this view. She was interested in distinguishing the organizational arrangements that produced the highest level of performance. The relation between technology and structure was pivotal for this problem, she stated. More specifically, she distinguished three types of core technology (small batch and unit production technologies, large batch and mass production technologies, and continuous process production) and proposed the view that the highest level of performance was found when organizational attributes such as span of control, centralization of authority, and the formalization of rules and procedures were fitting the core technology (Woodward 1958). Thus, technology was viewed as a context variable, which required a restructuring of the organization in order to remain viable. This basic theory was later revised and elaborated by for instance Perrow (1967) and Thompson (1967).

Technology as a contingency factor

In his book "The Structuring of Organizations" from 1979, Henry Mintzberg proposes a synthesis of the studies within the frame of contin-

gency theory and distinguishes four situational or contingency factors that determine the way an organization must be structured in order to remain effective. These are the age and size of the organization, its technical system, the environment, and its power relationships. The organization must design its structure so as to fits the requirements of these four factors. This can be done by combining nine design parameters (job specialization, behavior formalization, training and indoctrination, unit grouping, unit size, planning and control systems, liaison devices, and vertical and horizontal decentralization) in various ways. The basic hypothesis, called the "extended configuration hypothesis" is that "effective structuring requires a consistency among the design parameters and contingency factors" (Mintzberg 1979: 220). This configuration hypothesis rests on a "congruence hypothesis", namely that there is evidence of the relationships between the contingency factors and design parameters. Let me focus on the relationship between technical system and design parameters, for this is central to the topic in this chapter.

Mintzberg starts the synthesis of his findings on technology as a factor, which determines the best structural design, by acknowledging that there has been no consensus in the academic field on how to define "technology". He chooses to use the definition offered by Hunt, which focuses exclusively on the technical system of the organization, i.e. the "collective instruments used by the operators to do their work" (ibid.: 250). According to Mintzberg, this definition leaves much of the definitional confusion aside. On the basis of Hunt's study, Mintzberg then sorts out two core dimensions of any technical system that are central to the way the organizational structure must be designed. The first dimension is *regulation*, which refers to the influence of the technical system on the work of the operators: "the extent to which the operators' work is controlled, or regulated, by their instruments". The second dimension is *sophistication*, which refers to the complexity or intricateness of the technical system: "how difficult it is to understand" (ibid.: 251). Reviewing a range of studies on the relationship between technical system dimensions and organizational design, Mintzberg proposes three hypotheses regarding the regulation and sophistication dimensions of the technical system. The first sounds:

> "The more regulating the technical system, the more formalized the operating work and the more bureaucratic the structure of the operating core" (ibid.: 261).

Mintzberg argues for this causal relationship in the following way:

> "As the technical system becomes more regulating, the operating work becomes more routine and predictable; as a result, it can more easily be specialized and formalized. Control becomes more impersonal, eventually mechanical as staff analysts who design the work flow increasingly take power over it away from the workers who operate it and the managers who supervise them" (ibid.)

The two other hypotheses go:

> "The more sophisticated the technical system, the more elaborate the administrative structure, specifically the larger and more professional the support staff, the greater the selective decentralization (to that staff), and the greater the use of liaison devices (to coordinate the work of that staff) (ibid.: 262).

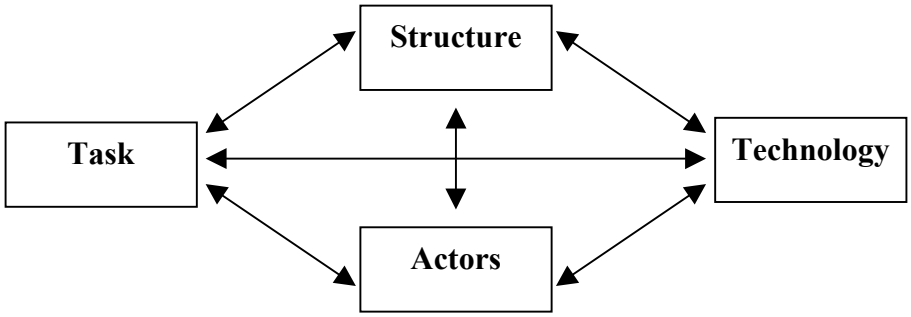
> "The automation of the operating core transforms a bureaucratic administrative structure into an organic one" (ibid.: 264).

The premises of these hypotheses are, of course, that the system has to stay fit. Mintzberg acknowledges, however, that other situational factors may be of importance too, and the most effective structural design is therefore not straightforward. As an example of such "multiple contingencies" Mintzberg mentions that although the technical system may call for a bureaucratic structure, the age of the organization may call for an organic one, and hence, the most effective structure is a blend – a configuration – of basic organizing principles. However, in principle this complexity does not challenge the basic theorems, but calls for a more fine-grained conceptual framework for understanding "what goes on in structures" and what kind of organizational structure that is the better under the given circumstances (ibid.: 225).

Technology as a change parameter

The basic principle of understanding the organization as a system, which organizes itself in order to stay effective under given contingency factors, has also found its way into the literature that addresses the topic of organizational change directly. A very viable model in terms of circulation in both academic and practice-oriented communities[1] is the four-variable model proposed by Harold Leavitt. The model does not explicitly look into the relationship between the organization and its environment and has a somewhat different way of grouping the elements of the organizational system. Yet it seems implicitly to build upon the notion that changes in some elements of the system cause changes in others. On closer examination, this causality seems closely linked to the imperative of staying alive in a changing environment.

Leavitt argues that four variables seem particularly important in the organizational system: 1) task, which refers to "the organization's *raison d'être*", which is its production of goods and services and the related subtasks; 2) structure, which refers to the systems of communication, authority, and work flow; 3) technology, which refers to both machines and programs; and 4) actors, which refer chiefly to humans (Leavitt 1970: 1144). The four variables are highly interdependent as the following classic figure suggests:



Whenever an organization is to be changed, Leavitt asserts that it is one or more of these variables that have to be changed. Sometimes the aim

[1] Leavitt's model is used by, for example, Funen County's evaluation of MediCare (Fyns Amt 2001). Another variant of this model can be found in the evaluation-program of Danish Centre for Evaluation and Health Technology Assessment (MTV-instituttet). Here, all projects are categorized according to which of four variables – technology, the patient, the organization, and the economy.

might be just to change one of these variables, other times the change can be directed towards one of these with the aim of influencing a change in another. Usually, but not always, Leavitt says, the aim of change is ultimately to influence the task variable (ibid.: 1145), but changes in one variable in order to influence change in another may cause changes – consciously intended or unforeseen – in the other variables too:

> "…the introduction of new technological tools – computers, for example – may cause changes in structure (e.g. in the communication system or decision map of the organization), changes in actors (their numbers, skills, attitudes, and activities), and changes in performance or even definition of tasks, since some tasks may now become feasible of accomplishment for the first time, and others may become unnecessary" (ibid)..

Leavitt points to three basic approaches to organizational change: structural approaches, technological approaches[2], and human approaches, which each directs attention towards different variables. He stresses that, eventually, all of the approaches will have to deal with the three other variables as they are affected by the change. Accordingly, the three approaches differ not in the exclusion of the other variables, but rather in the points of entry into the organization, their relative weightings of

[2] Leavitt mentions two dominant traditions within this approach. The first is "scientific management", which focuses on the operating core of the organization. Taking a stance outside the task, it studied the way the basic operations of the worker could be designed most rationally and effectively. By the aid of time-study men, method engineers, work standards etc. scientific management became a disputed albeit widely used approach when changing organizations. But as it primarily was applicable to eye-hand and muscle jobs, it receded into the background in the late thirties and forties (Leavitt 1970: 1149). After World War II and the development of computers a second tradition emerged: the "operations-research". It had many similarities with the principle of scientific management although it was somewhat more sophisticated as regards the techniques it employed and as it applied to a larger range of tasks. However, it aimed also at finding the best way to solve a problem (e.g. how to design the production schedule). Moreover, both traditions shared "a faith in the ultimate victory of their version of *better* (cheaper, more rational, and more elegant) problem solutions over *worse* ones" (ibid.: 1150).

variables, and in their underlying values, for instance as regards the definition of what counts as "improved performance" (ibid.: 1146).

Leavitt reviews central traditions within each of the three approaches as regards organizational change. In short, he concludes that structural and technological approaches are differed from people approaches by their narrower focus on problem-solving interventions, "sliding past the internal operations of the organization, and the processes by which new problem-solving means are generated and adopted into the organization" (ibid.: 1151). In contrast, the people approaches have focused on "the micro-process of change itself". Here, the "power-equalization models" are particularly useful in relation to "task areas in organizations in which the criteria of creativity, flexibility, and capacity to deal with novel unprogrammed problems [are] critically important" (ibid.: 1166). Leavitt stresses, however, the contingent nature of organizational change: neither structural, nor technological, nor people approaches to change should be considered as universal change strategies, but will be appropriate in different organizational areas and under different organizational circumstances. However, while he seems somewhat inclined towards people-oriented change strategies, he nevertheless quotes technology-oriented approaches for the argument that in the long run, changes of technology towards "better solutions" will prove to be most effective, because competitive forces in the economy press them upon the individual organization anyhow.

In sum, Leavitt takes a somewhat different approach to the question of technology and organizations, but his basic conclusion is close to Mintzberg's configuration hypothesis and to the central tenets of contingency theory, namely that in order to remain effective the organizational system will adjusts itself to changes in the environment, but this readjustment is not simply a change in single elements but implies adjustment of other elements of the organization, too.

Discussion

The basic conception of the organization as a system is appealing and underlies many organizational theories. At first sight, it is an obvious metaphor, stressing that although organizations share the basic characteristics of being demarcated from the environment and comprising a set of variables, they cannot be lumped together in a universal way. Rather,

they have changing conditions of existence, which necessitates different inner structures. Furthermore, it invites an increasingly detailed mapping of the relationships between environmental characteristics and internal structure at the same time as it rejects simple explanations. Finally, it provides an ultimate yardstick for the feasibility of a change strategy, namely the concept of survival, which works as the basic source of explanation too: changes in the relationships between elements of the system happen because they help the organization stay fit. I will, however, point out some problems with the assumption that an organization is adequately understood as a system made up of relations between variables.

First, the system metaphor implies the *distinction between system and environment*. This distinction seems to rest on the assumption that an organization can be compared to a biological organism, whose basic goal is to survive. However, the concept of survival as well as the distinction between inside and outside of the organization can be questioned. Regarding the concept of survival, contingency theory frames this as a matter of fit, or congruency, between contingency factors and organizational parameters. This can be obtained in various ways, but some kind of fit is necessary for the organization to work in an efficient way that will not, ultimately, undermine its existence. Accordingly, the functions of the organizational parameters are to adapt the system to the contingencies of the situation. Yet this idea of functionalism has been extremely criticized from many angles. It has, for example, been argued that functionalism cannot explain the emergence of conflicts and revolutions and eventually the question of change (Hassard 1993). It has also been stated that referring to the functional outcomes of something does not explain how it came into existence in the first place (Giddens 1984). Regarding the distinction between inside and outside the organization, contingency theory places the contingency factors outside the organizational parameters. The organization is thereby demarcated from its environment and has to respond to changes in the latter. But as Weick has demonstrated, organizations do not simply respond to external stimuli, they create part of the environment they face (Weick 1995). Although boundaries are made between inside and outside the organization, it seems problematic to draw the boundaries in advance of a concrete case. Also technology is placed outside the organization. An organization can

choose its technology, but when chosen it becomes a contingency factor to which the organization must adapt its internal structure. In consequence, technology is viewed as exogenous[3] to the social parameters of the organization, i.e. the various ways humans can be trained and their work can be divided and coordinated (although Leavitt explicitly places technology on equal footing with other variables inside the organization, a similar distinction is at work in his model).

Second, the above distinction participates to enact the idea that *technology can be isolated as an independent variable*, or rather; that at some points it is a dependent variable and at others it becomes an independent variable. Both Mintzberg and Leavitt state that technology is also influenced by the organization. Thus, they accept that the technological variable is influenced by social variables since, for instance, it can be replaced by other technologies. However, in daily use, the organization has to adapt its structure to the chosen technology by adjusting the different parameters – when implemented technology stops changing and the organizational parameters become dependent variables (again it is a little harder to argue this about Leavitt's general model, which puts arrows in both directions between the variables, but when he refers to the long-term effects of technology, he seems to share this idea too). However, the idea that technology can be viewed as an independent variable, and that it is possible to single out the technical logic of the technology and deduce from this the demands on human actors, does not correspond with studies of technology in use. These studies show how technologies are sometimes not used at all, or are modified in order to work (Akrich 1992, Tyre & Orlikowski 1994), become subjects of negotiation or even conflict (Tryggestad 1995), and are sometimes used in

[3] The term "exogenous" is taken from Tryggestad & Borum (2001) who argue that the Center for Evaluation and Health Technology Assessment under Danish National Board of Health bases their evaluation models of technology on the assumption that technology can be separated from the "organizational". This critique is very much in line with my own critique of contingency theorists, however I find the term "exogenous" somewhat confusing, since the problem is not that technology is viewed as outside the organization, but that it is viewed as separable from the "social elements" of the organization. Therefore, I will not use their term but stick to the critique of a distinction between the technical and the social.

ways different from originally intended (Leontjev 1975/1983, Zuboff 1988, Suchman 1987).

Third, the above problems of distinguishing between moments of influencing and moments of being influenced in the question of technology and organization seem tied to the notion of *technology as a delimited variable*. Both Mintzberg and Leavitt seem to fully accept the idea that technology can be treated as a variable once it is settled what is exactly meant by "technology". Hereby, it is implicitly assumed that technology is relatively stable and clearly separated from other variables such as "the human" or "the structure". Yet this assumption has been criticized by for instance Giddens (1984) (regarding the separation of actors and structure), and by Latour (cf. 1993) and other scholars within the actor-network theoretical tradition (regarding the separation of the social and the technical).

In sum, contingency theory deals with the question of technology and organizational change in two parts: it is accepted that organizations can choose among various technologies, but having made their choice the organizational structure should somehow fit the characteristics of this technology. Thus, although the technology variable and the organizational variables (and, of course, other contingency factors too) are interdependent, this interdependency is separated in time. Consequently, organizational change in relation to introduction of new technology becomes primarily a matter of restructuring the known parameters to fit this technology. Whether the technology itself changes during this process is not sufficiently clarified, neither is it clear how new qualities might arise that do not fit one of the known parameters.

Socio-technical systems theory

Although contingency gradually softened the idea that one type of technology corresponded with one best way of organizing (e.g. as Woodward's study asserted, a different school of thought, the socio-technical systems theory, further questioned the idea of fit between technology and social structure.

Socio-technical systems theory emerged from the work of researchers at the Tavistock Institute of Human Relations. They were occupied

with the influence of technology on people, and based on a study of coal mining this was theorized in an organizational work context. Each production unit was considered a socio-technical system comprising a technological system "expressive of the prevailing outlook of mass-production engineering" and a social system "consisting of occupational roles that have been institutionalized in its use" (Trist et al. 1963). The technological system and the social structure were thought of as interactive patterns or forces, which had psychological effects in the life-space of the worker. Conversely, the worker's "own contribution to the field of determinants arises from the nature and quality of the attitudes and relationships he develops in performing … tasks and taking … roles" (ibid.: 5). The coal-mining study showed that it was possible – and fruitful for the psychosocial well being of the workers – to combine a mechanized method of winning coal with the small group form of work organization that had been associated with the hand got methods. The Tavistock Research Team began studying and experimenting with ways of joint optimization of the technical system and the social system; considering the "the performance of the enterprise's primary task while at the same time catering for the emotional needs of those who worked for it" (Mumford 1985: 6).

Better technology and workplace democracy

The ethical focus came to mark the socio-technical approach based on the assumption that the technological system is interactive with but separated from the social system. Technology determines the nature of the work task (e.g. the cycle of work and the potentiality of conflicts among work shifts), and the social structure determines the way this work is divided and coordinated among the workers: the quality of work roles, the nature of task groups, the prevailing work culture, the climate of intergroup relations and the character of the managing system (ibid.: 5). This opened up the prospects of experimenting with forms of organization that could mitigate harmful effects of technology on the workers' life and increase job satisfaction. Mumford cites, for exampl,e the aim of a "Participation Project" carried out in Norwegian industry: " under what conditions can more rights and responsibilities be achieved for the individual in the workplace" (ibid.: 9).

In Scandinavia, the prevalence of computers, or EDP-systems, occasioned the emergence of a strong research tradition in participatory systems-design and workplace democracy governed by two assumptions: a) that involvement of users in the design of computer systems is a means to make better systems, because the users' expectations of the system will be adjusted and reduce the risk of "resistance to change", and because user participation will provide specific knowledge about the context of use and, hence, specify the premises on which the system is build (Bjørn-Andersen & Hedberg 1977); and b) that democracy is a goal in itself, the workers should participate in decisions that are likely to affect them (Borum & Bjørn-Andersen 1977).

In order to increase workplace democracy as a long-term goal, however, authors within the tradition argue that it does not suffice to simply let the users participate in the design process. Rather, referring to Leavitt's model Borum and Bjørn-Andersen argue for the necessity of considering user-participation as a matter of organizational change and acknowledge that a change program has better chances of succeeding when more organizational variables are changed simultaneously. "…a democratic system can be described as an interplay between democratic structures, persons with democratic attitudes and skills, and democratic [system design] processes" Borum & Bjørn-Andersen 1977: 150, my translation). To ensure that changes in organizational structure and work content are made subject to open discussion and are considered just as important as technical and economical concerns, the consequences of an EDP-system must be evaluated also in terms of sociological/organizational, psychological, political/societal, and moral/ethical consequences (Bjørn-Andersen & Rasmussen 1977), and in connection to the specific job in terms of task variation, control- and feedback processes, work pressure, management relation, autonomy, knowledge and training, and social contact (Borum & Bjørn-Andersen 1977).

Discussion

Socio-technical systems theory made two core contributions to the understanding of technology and organization. First, it softened the idea of fit between the technical system and the organizational design parameters arguing that there is not one best way of organizing in relation to a specific technology but several possibilities. Second, this discovery led

to a broader notion of organizational survival from being predominantly a question of economical efficiency to include also the question of social sustainability. With that expansion the human actor shifted status from being simply an operator of the technical system and, hence, a resource in the economical machinery, to being a subject with a life-world and legitimate access to participate in the definition of work roles and the distribution of rights and duties – a subsystem parallel to the technical. Moreover, it introduced the notion of dilemmas between different concerns to replace the simplistic assumption in contingency theory that the success of an organization can be assessed in an unambiguous manner.

Basically, however, the system-theoretical assumptions of contingency theory continue in socio-technical systems theory and its offspring, the Scandinavian participatory systems design tradition. They all claim that the organization is a bounded system comprising certain subsystems and variables that can be separately defined. These system elements are treated as variables that influence each other in specific, albeit complex, ways and eventually change the overall characteristics of the system. Since the overall system characteristic can be normatively evaluated on the basis of a number of different concerns, the variables of the organization and their interrelations come to represent possibilities of intervening in the system in order to reconfigure it in a more appropriate way. Thereby, socio-technical systems theory invites some of the same questions that I raised against contingency theory and some additional ones.

First, the system metaphor still conveys the problematic notion of a separation between inside and outside the organization and environment and the functionalist assumptions, even though the criterion for survival is not restricted to economical efficiency. Technology is also viewed as separated from social variables. *Second*, the idea of fit between technology and organizational structure is softened and the two are seen as coexisting and equivalent subsystems. They are not influencing each other. But just as in contingency theory the interconnections are split up in sequences separated in time: a) the technical system determines the "basic" dimensions of the work; b) the social system determines the way this work is carried out; and finally c) the technical system can be designed in order to produce normatively better basic dimensions. Accordingly, neither socio-technical systems theory leaves any possibility that

a technology is modified in use, and hence that tasks might change as technology and human work together. Nor does it operate with the possibility that technology influences social values and thereby the process of its (re)design. *Third*, because the distinction between the technical and the social system forms the core of the theoretical approach, it becomes even harder to discuss phenomena, which do not easily fit one or the other box. Consider for example professional specialties. Do they belong to the technical box or the social? (E.g. many medical specialties are defined by the technology they use, other specialties are defined around certain diseases, and others again around certain parts of the human body). Do these phenomena belong to the "technical system" or the "social system", or "in between"? And what about "tasks": not all tasks can be directly inferred from the technological "demands" or from social "needs". When sharply separated from each other the relations between "the technical" and "the social system" are narrowed down to a question of whether they support or hinder each other – and ultimately support or hinder efficiency and democracy. Thereby, one precludes the possibility that whole new effects emerge from the interplay between technology and humans, and that the two worlds are dynamic and intertwined rather than static and separate. Berg (1999) mentions, for example, that the idea of support versus obstruction has dominated the academic field of participatory design and computer supported cooperative work in discussions of the impact of technology on human capabilities and work. This dichotomy has stood in the way of the basic discovery that "human capabilities" and "work situation" are themselves transformed through their interlocking with technology.

Work sociology and role theory

The broad variables of both contingency theory and socio-technical systems theory have been criticized by Stephen Barley, who has been advancing a micro-sociological approach to the question of technology and organization throughout the last two decades. Whereas he shares the interest of contingency theory and socio-technical theory in understanding the impact of technology on organizational structure, he regrets the tendency in both approaches to abandon the focus on specific jobs and

technologies in favor of looking at larger technological systems. Moreover he raises critique of the tendency in organization theory to look at either macro-social forces influencing the design of organizations and technologies, or at the way technology exerts unintended as well as intended pressures on the social organization of work. Rather, Barley suggests, "a comprehensive theory of the relation between technology and organizational structure should address micro-social and macro-social forces simultaneously" (Barley 1990: 64). In this respect, Barley's goal is to draw up a theoretical framework of levels that accounts for the interplay between macro- and micro-social forces regarding the question of technology in organizations. Based on the problems hampering previous theory on the subject, he lists the following demands to one such framework: a) the term "technology" should be confined to specific tools, machines and techniques that admit the possibility of ostensive definition, and the term "structure" should be called different names in relation to the various levels of aggregation; b) close examinations of technologies in use must be made before making comparative classifications in order to get information about variations in technologies; c) the relations between everyday interaction and overarching patterns of social organization must be defined to replace inferential leaps between levels of analysis; and d) concepts such as "structure" and "tasks and skills" must be seen as embedded in social relations, instead of treating them as "nonsocial concepts" (Barley 1990: 64-66).

These demands can be fulfilled by "bringing work back in" in organizational theory. Ever since the studies of bureaucracy and the associated patterns of work in the first half of the twentieth century, "work has slipped increasingly into the background as organizational theory converged on the study of strategies, structures, and environments as its central and defining interests" (Barley & Kunda 2001: 76). However, work in the industrial society has changed since the time when basic concepts of organization theory were developed and we need, therefore, to develop images of organizations that are congruent with the realities of work in a new economic order and with new kinds of technologies, especially computers.

Basically, Barley and Kunda propose a return to systematic studies of concrete work activities and the way in which they constitute routines of organizing and in turn broader organizational structures. Classic mi-

cro-sociological approaches such as negotiated order theory, behavioral role theory, and social network theory are all apt for such studies, Barley states (Barley 1990).

Negotiated-order theory advanced by Strauss and Maines asserts that one of the principal ways that things get accomplished in organizations is through people negotiating with one another. "It takes the theoretical position that both individual action and organizational constraint can be comprehended by understanding the nature and context of those negotiations" (Maines and Charleton 1985: 272). Social orders are thus understood as more or less stable patterns of action, interaction, and interpretation, and hence, as emergent phenomena. Role theory (advanced by Anselm Strauss among others) is closely related to this perspective but go even closer to the micro-sociological aspect of work, occupation, and organizational routines. Regarding the question of technology, Barley singles out a distinction proposed by Nadel between "non-relational" and "relational roles". A relational role is a role that cannot be played without a specific other (person), who fills a complementary position (e.g. a child implies a mother). In contrast, a non-relational role is the instrumental task that is a socially accepted characteristic of a role (e.g. a baker's role is characterized by kneading dough, baking bread etc.) In practice, however, roles are combinations or bundles of relational as well as non-relational aspects that can be separated only analytically.

> "Nadel's distinction provides a useful framework for conceptualizing how a technology's effects might ramify across levels of analysis…. Because non-relational elements of a role include skills and tasks, it is here that technologies are likely to have their most immediate impact…. Since few tasks are truly independent… technically induced change in the non-relational aspects of a role is prone to alter the role's relational elements. Altered tasks may narrow or expand the range of one's role set, shift the nature of one's dependencies, or affect the frequency and content of typical interactions. In fact, since non-relational roles largely comprise solitary actions, one cannot properly speak of technically induced change until a technology has begun to affect relationships. Therefore, if a technology is to occasion social change, modifications in non-relational elements of a role must spill over into the role's relational aspect" (Barley 1990: 69).

This theory of how technology affects social relations is combined with social network theory, which claims that social structures are configurations inscribed by routine interactions among role incumbents. In other words, modifications of social structure are grounded in changes in dyadic interactions. Barley concludes:

> "Taken together, the foregoing notions offer investigators a lens for viewing technically occasioned social change as a series of reverberations that spread across levels of analysis much like ripples on the surface of a pond. When introduced into a work setting, new technologies initially modify tasks, skills and other non-relational aspects of roles. These modifications, in turn, shape role relations. Altered role relations either transform or buttress the social networks that constitute occupational and organizational structures. Ultimately, shifting networks should either sustain or modify institutions, since the latter represent blueprints for ongoing actions" (ibid.: 70).

From this, Barley sums up that technology and organizational change should be studied by: 1) showing how technology influences non-relational aspects of work roles; 2) indicating how these changes influence relations among different role incumbents; and 3) examining the organization's social network to see if shifting role relations affect the configuration of the network.

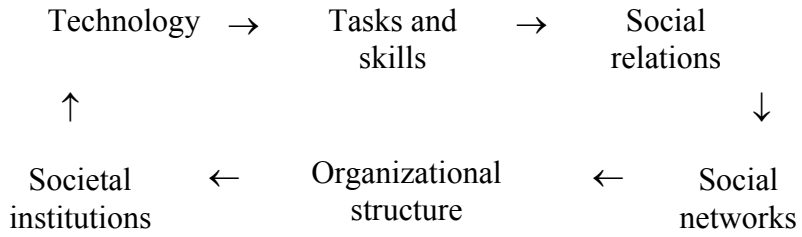
Discussion

Barley leaves the system metaphor underlying the two previous approaches and replaces it with a notion of ontological levels (e.g. the level of organizational structure is connected to lower and higher levels of reality). He defines the concrete work practices as a basic constitutive level for the emergence of higher levels such as organizational structures and societal institutions[4]. Although technology imposes conditions on work and human action, technology itself is altered through the demands of society. In this respect, the question of technology and organizational change becomes a question of how technology structures work practices that in turn may alter the characteristics of organizational structure and

[4] This assumption offers a parallel to Giddens' theory of structuration, which also places human action in a central position for the structuring of society (Giddens 1984)

societal institutions, which then again feed back on the supply and design of technologies. Rather than simply asserting that there are relations between variables in a system, Barley places them on different ontological levels and confronts the issue of how these variables emerge. Thereby he takes a step towards overcoming a problem, which characterized the two other approaches, namely that the relations between variables in the social system were asserted in a general manner rather explained specifically. By Barley's specification of relations between organizational levels, the organization appears as a more dynamic entity than it does in contingency theory and socio-technical systems theory: changes on one level will ramify across other levels and potentially alter their characteristics. Thus, the organization's particular characteristics are not simply expressing equilibrium between different variables or forces but are emergent phenomena.

Despite these advantages, Barley's approach has shortcomings that hamper the understanding of technology and organizational change. First, although Barley replaces the system metaphor with the idea of levels, his account of the relationship between these levels – the "ripple-on-a-pond" metaphor – does still bear much resemblance to the *sequential interdependency* between the technical system and the organizational (i.e. social) variables in contingency theory and socio-technical systems theory. Barley pictures the chain of relationships in the following way:



As the arrows suggest this circular relationship is unidirectional. Thus, although Barley asserts a circular relationship between technology and social levels, the one-way arrows preclude that things may work the other way around. Consider, for instance, the relationship between technology and tasks and skills. According to Barley's model, tasks and skills cannot exert direct influence on technology, but as previously ar-

gued this is not what studies of people and technology tell. In general, the understanding of change as a unidirectional circular process has the consequence that change at one level is always explained by something stable at another. This assumption does not seem viable.

Second, Barley continues the problematic assumption of the two other approaches; namely that from the moment *technology* has entered the organization and daily working life it can be treated *as a given and stable entity* that affects the conditions of human action. Nadel's distinction between non-relational and relational roles does not add anything new to this basic problem; although it specifies how technology influences the human, it does not address how the human may come to use technology in ways different from the those the design prescribes. Thus the complicated, co-instantaneous co-configuring of technology and human actors is narrowed down to a matter of how new social phenomena emerge from the inner logic of the technology. Reaction on this inner logic of the technology is displaced to a point in the future, where social norms and institutions influence the development of new or modified technology. The split between the social and the technical inherent in the micro-social perspectives is continued and further shored up by distinguishing between non-relational and relation roles.

Conclusion

My point of departure was two questions: how come, despite a rich body of literature on the relationship between technology and organizational change, we are still surprised that technology seldom fulfills our expectations? And how can it be that the theoretical literature seems divided on the power of technology? I suggested that a contributory cause to this bewilderment might be that basic assumptions about the nature of organizations and technology prevent us from forming more reasonable expectations from the technology and more balanced theoretical conceptions of its power.

Having now reviewed three weighty theoretical approaches to the question of technology and organizational change, it has become clear what these widespread assumptions are and what they do to the question of technology and organizational change. Despite different basic metaphors for the organization (a system versus an ontological level) the

three approaches share the basic assumption that technology is a variable separated from the humans, the human relations, and as such from the organization even though it is thought of as inside the organization's boundaries. Since none of the three approaches are technologically determinists, they acknowledge that the social also shapes technology. However, this influence is thought of as happening in the design process or, for example, in the strategic decisions to buy new technology. At the moment technology is "at work" it is treated as a stable and unequivocal entity to which the social organization must adapt, or which determines basic aspects of human roles that again change social relations, etc. – the mutual interdependence between technology and social organizational variables is temporally divided. In effect, the relationship between technology and organizational change becomes framed as a matter of regulation rather than of co-configuration.

As already said, framing of technology as a separate variable makes it hard to understand how technology is shaped during its use, and, hence, to understand how organizational change is not only a question of the effects of technology on the social but of reciprocal shaping. But the very distinction between the technical and the social is problematic. It presupposes that technical objects and social subjects are easy to identify. But in practice their distinctiveness is often extremely hard to uphold: "technology" cannot work without "social" support such as technicians, system operators, written manuals, etc; and conversely social categories such as "the operator" or "group relations" would break down or change radically if their material or technological assistants were removed. The "technological" and the "social"(or "organizational") are only possible to treat as separate variables by carefully deleting their interlacement. What is more, in relation to the question of technology and organizational change this careful separation of variables invites thinking in terms of relative strengths and impacts rather than in terms of co-configuring and emergence. In this respect it is not surprising that empirical studies of technology and organizational change yield paradoxical results, or that the belief that technology can be employed to produce certain organizational effects is often disappointed.

Thinking in terms of separation is a widespread phenomenon

The three approaches do not deal explicitly with computers, which makes it natural to ask whether the treatment of technology as a separate variable is less widespread in literature explicitly addressing the role of information technology in organizational change. Having looked through a pile of such literature, I find that this is not the case. Even in sophisticated and empirically grounded literature, the assumptions that technology is clearly distinguished from the social organization is the rule rather than the exception, and accordingly the technical and the social are treated as two separate spheres. Let me illustrate this by a few examples.

In his classic book "In the Age of the Smart Machine", Zuboff argues that technological change depends on the interplay between effects of new information technology on the contours of reality – its capacity to automate and informate – and the way in which these new possibilities are engaged by the often-conflicting demands of social, political, and economic interests in order to produce a 'choice' (Zuboff 1988). Thus, a distinction between (technical) essence and choice are at work in Zuboff's text. In consonance with Barley, another organization theorist, Debra Gash (1991), accentuates knowledge and cognition as loci of change with the introduction of new information technology, thereby continuing the separation between the social (cognition and knowledge) and the technical. Orlikowski focuses on micro-social practices and stresses the importance of sense-making and improvisation processes of organizational members (Orlikowski 1996). Whereas she accepts that people has to experiment and get used to the technology she nevertheless places technology outside these cognitive processes of the human. The notion of social forces driving or opposing social change by the introduction of information technology can be found in Robey & Boudreau (1999). And the notion of bridging micro- and macro-social structures appears in DeSanctis and Poole (1994), who advance the assumption that organizational change occurs as an interplay between social structures embodied in the technology and social structures in action. In sum, despite the empirical focus of these articles, they share, with contingency theory, socio-technical systems theory and micro-sociological role

theory the assumptions that in the moment of use, technology can be treated as a stable and uniform variable separated from the social.

I will argue that as long as these basic conceptualizations are at work, we will not be able to radically overcome the practical and theoretical confusion regarding the question of technology and organizational change. We must find a way to study technologies in organizations without having to squeeze the observed phenomena into pre-established categories such as "technical system" or "social structures": a way in which we can treat technology as an endogenous aspect of the organization. Otherwise we will simply reproduce the basic figures of thought that I have shown to be inadequate.

In the following section, I will introduce a way to study technology and organization, which too places action centrally, but which excludes having to choose in advance between the technical and the social, the micro and the macro, or to import essentialist definitions of one of these dimensions to explain effects in the other.

Technology as an actant: the sociology of translations

For long it has been an established idea that the purpose of science is to map the objective relationships of the world. By meticulously following stringent epistemological procedures it was possible to produce facts about the world that were not contaminated by the researcher's own prejudices or political interests. However, such stringency was easier to obtain in some scientific disciplines than others. Accordingly, disciplines, such as physics and chemistry, ranked above disciplines that could not demonstrate equally stringent and objective research procedures. In the late 1970s, however, sociologist began studying the work processes of researchers in "hard sciences". And what they found were not processes through which the laws of "nature" were uncovered, but processes through which the complexities of the phenomena of interest were simplified – gray zones turned into white and black zones –through

many steps, which produced "the natural" through deleting or silencing "social elements". Thus, the laws of nature were constructed rather than revealed; the very notions of Nature and Society were constructions rather than essences (Latour & Woolgar 1979). These empirical findings did not only question the assumption that science is something extraordinary and lofty, but more important, questioned the very division of reality into domains that could be analyzed separately.

The science studies came to fuel growing interest in studying phenomena, which conventionally belonged to "Nature" such as engineering and systems design (Law 2002, Akrich 1992, Bowers 1992), economic markets (Callon 1999), medicine (Berg 1999, Cussins 1998), or belonged to "Society" such as identity (Michael 1996) and social work (Elgaard Jensen 2001). The focus of interest has not been to define the objects of study as belonging to either society or nature, but to see how they are produced and what consequences they produce.

In connection to these empirical studies there has emerged a theoretical community called actor-network theory (although these three words, "actor", "network", and "theory" has been problematized by the community members themselves in the book "ANT and after" (Law & Hassard 1999). One of the central ideas was to develop a vocabulary and methodology that allowed studying phenomena without operating with reality as separated into distinct spheres.

Bruno Latour has been one of the prominent and most radical scholars within the community. In "We Have Never Been Modern" he proposes the view that the historical establishment of the sciences from the Enlightenment to the Modern Settlement and the view that reality can be carved up and defined essentially went hand in hand (Latour 1993). Moreover, he argues that the above-mentioned dual movement has made it increasingly hard to understand basic phenomena of our time. This is because "the modern" designates two entirely different practices, which must be kept apart if they are to be effective, but have begun to be confused. The first set of practices, by *translation*, creates mixtures or hybrids of nature and culture. The second, by *purification*, creates two entirely distinct zones of "the human" and "the non-human" (ibid: 10). Although these two sets of practices have each other as necessary prerequisites, the irony is that as long as they are kept apart, new hybrids will proliferate while the sciences will have less and less understanding

of them. Latour suggests, therefore, a radical break with this separation and the development of a stance in which processes of translation and of purification can be addressed simultaneously.

In order to do this, it is necessary to dissolve the basic distinction between humans and non-humans. And here we can learn from the way anthropologists have studied cultures, Latour says. They have never been bothered by categorical and disciplinary boundaries when addressing exotic cultural phenomena. In one analysis, they draw together material, social, and mythical elements to describe the universe of a specific culture. Latour suggests that we bring anthropology "back from the tropics" to start analyzing phenomena of the Western World with similar openness and symmetry[5].

Problems with social theory: "social" and "theory"

While non-humans have been assigned an independent position in the natural sciences, they have been largely discriminated in social theory. Yet, for Latour, any strict differentiation between humans and non-humans is forced. If we wish to understand classic sociological preoccupations such as 'interaction', 'social structure', and 'social change' we must acknowledge that acting humans as well as acting non-humans take part in the construction and reconstruction of the phenomena and events that together make up 'social reality'. Rather than discussing whether something belongs to this or that category (e.g. Nature or Society) Latour suggests that all entities are considered "quasi-objects" – a concept taken from the French philosopher Michel Serres (Latour 1993: 51). Quasi-objects, or quasi-subjects, are simultaneously social, non-human, fabricated, objective, narrated, real, and collective. This is the starting point from which we can make social theory – and organization theory – studying how humans and non-humans co-construct each other and the world.

[5] Originally, British sociologist David Bloor offered the concept of a symmetrical approach to empirical facts. He argued that truth and error should not be explained differently, for example by operating with a priori assumptions about truth. However, Latour extends this principle to humans and non-humans: we should not grant them essential quality or special abilities, but look at their actions (Latour 1993, p. 103).

For long, social theory has been occupied with defining power structures and relations. However, it has never successfully explained how dominance is achieved. To do this, says Latour, it is not sufficient to focus on social relations. Rather, social entities form part of a fabric, into which non-human actants[6] are woven too. In fact, non-humans are deeply involved in keeping society together as a stable unity and in constituting power. The distinction between a material infrastructure and a symbolic superstructure has been justified to the extent it has worked to remind social science about the importance of non-humans. And yet, the dichotomy gives an imprecise picture of how non-humans are mobilized and take part in social relations (Latour 1991, p. 103). In a classic[7] example Latour exemplify how mobilization processes happen.

Hotel managers and ill-mannered visitors

In European hotels, the room keys often have a big unhandy object attached. These objects have to remind the visitors to leave their keys in the reception when they go out. Apparently, the inscription on a sign: "Please, leave your room key at the front desk before you go out" is not enough to make the visitors behave as the hotel manager wants. Visitors have other concerns and keys keep vanishing into thin air. However, if an innovator displaces the inscription on the sign with a large, heavy piece of metal, the hotel manager no longer needs to rely on the visitors' moral obligations. Now, the visitors willingly leave the troublesome object in the reception. Where the inscription, the imperative, the discipline and the moral obligation failed, the hotel manager, the innovator and the metal weight succeeded. But the point is, Latour writes, that in order to achieve this behavior, the hotel manager must enter into an alliance with

[6] Presumably, Latour uses the term 'actant' to remind us that both humans and non-humans act (which is the basic principle of Greimas' "actant-model" for a narrative plot. Traditionally, the term "actor" refers to a human, but this definition is too narrow, Latour argues. However, Latour uses "actant" and "actors" synonymously and this inconsistency can also be found in my presentation of Latour's points. But the basic point remains, namely, that technology, animals, humans, words etc. all act.

[7] Some might say that the example is not only classic but also hackneyed. I will, however, present it again, because it demonstrates the semiotically inspired methodology of ANT, and at the same time affords ground for questioning its basic assumptions about the motives of actors – an objection I will elaborate on in the end of the chapter.

the innovator, and the innovator into alliance with different metal weights and their production process.

This example points to fundamental principles in the study of social relations and technology: the force with which the enunciator makes a statement[8] is not enough to predict the further course of the statement – "the fate of a statement is in the hands of others", Latour says (Latour 1991, p. 106). If, for example, a visitor forgets the message or does not understand the language, the statement is reduced to paint on a sign. However, if the visitor obeys the order, he has consented to the statement and "gained some reality" (ibid.: 108). Thus, the force of the statement depends on what is inscribed into the sign and what successive listeners do with the inscription. To predict how the statement will be treated, the hotel manager can either make all visitors equal by ensuring that they understand the language or that they know that in European hotels you have a private room but leave the key in the reception. Or he can *load* his statement in such a way that visitors behave in the same manner, regardless of their mother tongue or their hotel experiences. The choice lies between incorporation and excorporation (Latour 1991: 105).

The imperative statement: "leave your room key!" is the first loading, or displacement; the inscription on the sign loading number two; the adding of the polite "please" to the imperative in order to gain the visitors' favor the third loading; and the lump of metal a fourth one. The number of loadings necessary to add to a statement depends on the resistance of the visitors: e.g. how forgetful are they? How refractory are they? Moreover, it depends on how much the hotel manager wants to control them and how smart the visitors are; the more complicated the program of the enunciator becomes, the more complex are the recipients' anti-programs. But the program that they finally comply with is no longer the same as the original one: by its displacements it has been *translated* – not transmitted. The visitors no longer leave their keys; they get rid of an unhandy object. They can hardly act in any another way and they do not give it much thought. Latour concludes: the statement is no

[8] According to Latour, the word "statement" refers to "anything that is thrown, sent or delegated by an enunciator". Thus, a statement does not refer to linguistics, but to the gradients that "carries us from words to things and from things to words" (Latour 1991, p. 106).

longer the same, the visitors are no longer the same, the keys are no longer the same – even the hotel is no longer quite the same (ibid.).

To study how non-humans participate in social relations, one should consider both the succession of hands that transport a statement and the succession of the transformations the statement undergoes. Thus, it is not a question of following a statement through a context, but one of following the simultaneous production of "text" and "context" in chains of humans and non-humans. Studies of innovations, Latour says, show us that we do not work in a world of actants with fixed contours. On the contrary, actants undergo constant transformations initiated by other actants, which alter their previous connection to programs, their competencies, and even their definitions. These transformations are crucial, says Latour, because they reveal that an apparently well-defined actant is in fact an association of elements that can be redistributed. When studying change, the difficult part is to open and close the "black boxes[9]".

We are never confronted with either objects or social relations, but with chains or associations of humans (H) and non-humans (NH). Nobody has ever seen a social relation in itself. Rather, we are presented with chains of the following formula: H-NH-NH-NH-H-H-NH. A chain of H-H-H can appear as a social relation. Likewise, a chain of NH-NH-NH

[9] French sociologist Madeleine Akrich has offered an elaborate vocabulary to open up the black boxes of technical objects and more specifically the co-constitutive relations between humans and non-humans. She views the process of designing technology as one of inscribing certain visions in the technical object. This entails ascribing certain values, competencies, aspirations, and prejudices to the users and designing the technology in accordance with this to make sure that the users actually behave in the desired way. Thus, technical objects embodies and produces a "geography of responsibilities, or more generally, of causes" (Akrich 1992: 207). Or as Akrich also puts it: technology may generate both forms of knowledge and moral judgments. However, the relation between representations of the users, the technical solutions, and the actual use of the technology is not always successful. The script has to negotiate its role in a heterogeneous network, and often it appears that the prescriptions delegated to the technology do not hold. Thus, technical objects define the actors and their relations, but have to stabilize and channel these in order to function. When the designers' scripts are actually complied with, one can say that an integrated network of technical objects and actors has become stabilized. As it can be difficult to study these elementary mechanisms of adjustment, Akrich suggests that one should look for the situations, in which the demarcation line between inside and outside the technical object is blurred – where disagreement, negotiation and breakdown take place.

can look like a mechanism or a machine. And yet, chains like these are always part of longer chains. What is interesting is chains in their entirety and their transformations – not the single parts of the chains. For instance it does not make much sense to discuss what is the most important part of a phenomenon, as it is the specific connection – or organization – of elements that together produce the phenomenon: "Boing 747s do not fly, the airlines do!" (Latour 1998). Instead of asking "has society influenced technology" or "does technology affect society" we should be asking: Has this actant been replaced by another? Has this actant's competency been modified? Has the chain of association been extended or modified?

> "Power is not a property of any one of those elements but of a chain" (ibid.: 110).

Discarding social scientific dichotomies

The example of the hotel keys demonstrates the kind of analysis of relations between humans and non-humans that Latour contemplates. But such analyses are rare in social theory, because there is no applicable terminology or narrativity, Latour says. We can easily describe human relations and mechanical relations, but we are not good at describing how these two worlds are enmeshed with each other. This makes it difficult to comprehend that when a social relation appears stable it is the introduction of non-humans that secure the relative stability. Lack of vocabulary is, however, not the only thing hindering this insight. Social science has been characterized by a host of dichotomies (such as static/dynamic, formal/informal, fit/nonfit) that have contributed to mystify the relations between humans and non-humans. Let me briefly address some common dichotomies – some of which were at work in the three approaches to technology and organizational change:

Micro versus macro

In sociology a disagreement has developed between those who assert the substantial existence of "society" (or social structures) and those who assert the primacy of interactions. However, to Latour this distinction neg-

lects the fact that neither social structure nor human interaction exists in a vacuum, but are heavily bound up to and made possible by the involvement of non-human actants/objects.

Looking at baboon societies it becomes clear that they manage their intense social lives without the use of other resources than their bodies alone. This leads to extreme complexity in their social skills, as they cannot transform weak bonds into stronger ones except by using more social skills. The baboons constantly have to redefine their society, which is why it never achieves a stable structure (Latour 1986: 275). The point is that very little human interaction compares to this naked kind, but is mediated or backed up by a multiplicity of other elements such as clothes, architecture, technology, documents, etc. This is exactly what produces the stability of our society and, hence, the emergence of larger structures. Individual action and structure are themselves effects; they arise from the work of globalization and of localization. Attempts to start social theory from one of these categories will, therefore, not lead to anything, and neither do we make progress if we try to design ways of addressing both elements simultaneously by construing some third artifact (Latour 1996: 6).

Stability versus instability

Distinguishing between stable structures and transitory interactions has also been widespread. But these adjectives are themselves effects. When an actor seeks to obtain a specific program, it must be thought of as a strategic maneuver of translation, in which a number of actants must be enrolled, combined, or replaced. But this translation process is always risky, says Latour, and there is no guarantee that the original end goal will be attained – maybe it will be modified or opposed. On the contrary, the elements that are connected and produced through the translation process can disperse like a flock of birds; it takes continual work to keep all actants aligned. Moreover, translation implies the gradual transformation of the original program itself; this is the price to pay for enrolling more actants. Whenever an actor succeeds and obtain durability or stability, it cannot be explained by his power, but only by convergence between what he expects from others and what the others expect from him.

Form versus content

Social science (as well as other sciences) has also cultivated another dichotomy, namely the distinction between form and 'real' content. This dichotomy has had the effect that 'external' details such as color and style has been considered important aspects of a product. Latour settles with what he calls "the diffusionist's bad habit" (1991: 115) of considering that an innovation builds on a single, brilliant idea. An innovation is a chain of associations that involves precisely as many humans and non-humans as it takes to counter anti-programs. Thus, the only essence in a project (or a scientific statement) is its total existence. One cannot determine in advance what is necessary and what is not, without studying it empirically.

Social context versus technical contents

Another widespread dichotomy is the separation of an innovation's social context and its technical content. Often, interests of social groups are used to explain the prevalence of a specific technology. This explanation implies a notion of innovations as objects that cut through various social contexts. However, this notion is problematic, because it presupposes that interests exist prior to the innovation, which is seldom the case. True, social groups choose among different innovations, but pari passu this selection they are themselves transformed and so are their interests. We should, therefore, neither fix social groups nor technical innovations to explain the other's course of development. This is also to say that it is incorrect to distinguish between the thing that changes and the context in which the change happens (Latour 1991: 117).

Real versus unreal

The distinction between the real and the unreal is a deep-seated principle in much social theory. For instance it underlies the idea that the final stage of an innovation is the incarnation of an originally crazy idea. But also this distinction between unreal and real should be reconsidered and treated symmetrically. The difference between idea and result is just a difference between different versions of association chains, which involves multiple translations. The real is not different from the possible, the unreal, the desirable, the utopian, the absurd, or the sensible, Latour says (1991: 117). These adjectives are just ways to describe a succession

of stages in a narrative. When one chain of associations is more real than another one, it is because it is longer seen from the position of the program being articulated. However, gaining real existence is a short respite. The status as real must be maintained through continuous prolongation of the chain of association. Nothing ever becomes so real that it can do without a network in which its existence can be maintained. The only way to gain more reality is to reduce the margin of negotiation, or to transform the most faithful of the allied into black boxes[10]:

> "Domination is never a capital that can be stored in a bank. It has to be deployed, black box(ed), repaired, maintained" (ibid.: 118).

A minimal ontology: networks and actors

Actor-network theory offers a new vocabulary for studying the interlacing of society and nature. At the same time, it questions the dichotomies and scales that have hampered the epistemological work. And yet it is not completely clear what kind of alternative ontological assumptions, Latour advances. Let me focus on this.

Networks

One core thesis is that there is nothing but networks: there is nothing between and nothing beyond networks. One consequence of this is that question of distance and proximity may be reframed. Two elements that seem close to each other can be very distant in terms of their network relations. A person talking in a public phone box can, for instance, be less than one meter from the person in the next phone box and still be

[10] The term "black box" originates from studying the production of scientific facts. Latour acted as naïve observant in a large, chemistry laboratory and observed how the scientific practice ran through stages of uncertainty, hesitation, failure, and dispute and suddenly produces scientific facts that appear certain, irrefutable and closed. He used the black box as a synonym for scientific facts as they appear in textbooks and scientific journals. At the moment a scientific fact has been established, says Latour, as if by magic it becomes detached from its genesis. All adaptations and doubts concerning the functioning of the technical apparatus and uncertainty of the researcher's competencies disappear. All the work behind the discovery vanishes behind the fact (Latour & Woolgar 1979).

closer related to the interlocutor thousand of kilometers away. Whether something is close or far away has nothing to do with 'real' space, but with associations in networks (Latour 1997: 3).

The concept of network aims also at clarifying the relationship between micro/macro – one of the popular distinctions in social theory, as already hinted. Yet, instead of using concepts of size or scale, the network-thesis suggests using a concept of connections. Thus, the macro-structure of society is made of the same material as the micro-structure – just as the electrical network simultaneously consists of local micro-circuits and forms a global structure. No network is bigger than another one, but simply longer or more closely connected. This does not exclude the possibility of hierarchies or scales, but these cannot be determined in advance. Hierarchies and scales arise as a result of the connections being established and they loose their significance when connections are lost, Latour says (ibid.).

Moreover, the network-metaphor undermines the question of inside/outside. Whereas a system has an inside and an outside separated by a boundary, a network is a boundary with no inner and no outer side. The only question that matters is whether or not a connection has been established between two elements. Taking this approach one is no longer obliged to fill out the empty space between relations – a topic that has caused much scientific trouble. The network is a positive concept that does not need to be negatively defined; it has no shadow, Latour writes, and it is not a thing but the recorded movement of a thing (ibid.: 9). Accordingly, the network concept makes it possible to reconsider the spatial metaphors that have hampered studies of society-nature. Though, the point is not that "macro-structures" or "nature" does not exist, but that we must investigate how such effects come into being:

> "In order to obtain the effects of distance, proximity, hierarchies, connectedness, outsiderness and surfaces, an enormous supplementary work has to be done" (ibid.: 4).

And yet, the concept of networks does not suffice in explaining how this work happens – it is necessary to add a concept of actors.

Actors

How to understand the actants that take part in, for example, the development of innovations? From where come the actants that figure in an innovation and radically contribute to its different versions and its transformations? Latour states that the concept of an actant is defined semiotically[11], which is to say that it cannot be defined outside from what semoticians call 'the text': an actant is something that acts in relation to other actants or something that others ascribe action to (ibid.). Thus, an actant is defined by what it does, but Latour stresses that we should refrain from defining the essence of an actant once and for all. Rather, we should define an actant by the innovations or relations it appears in. An actant is a list of answers to many trials – a list that when stabilized can be attached to the name of a thing or a substance.

Elsewhere, Latour argues that we have to shift from an ostensive to a performative definition of society (Latour 1986: 272). This applies to all actants: although an actant cannot be defined in principle it can be defined in practice by locating and listing the multiplicity of relations it enters or are ascribed. Consequently, the hotel manager 'is' the frustrated speaker, who reminds the visitors to leave their keys, but he is more than that. He is also the one who makes out bills, orders clean sheets, advertises in papers, celebrates his jubilee, etc. The key cannot be defined solely on basis of the above innovation story, but by the list of all the actions and innovations in which it partakes. Furthermore, lists like these define the actant's history.

The longer a list it is possible to enumerate, the more active is the actant. Oppositely, the shorter a list, the less important is the actant. The large the number of different actants is to which it is connected, the more polymorphous it is. And the harder it is to open its black box, the more coherent and stable is the actant. Thus, an actant can be so cohe-

[11] In general, many actor-network theoretical points are reformulations of basis principles in semiotics. Latour says that actor-network theory acknowledges the semiotic methodology, but rejects its ontological consequences (e.g. the dichotomy between structure and actor. While semiotics, according to Latour, easily could study myths, religion, fashion, and politic, it had trouble studying science itself – the hard facts. Latour wants to put scientific facts into the "empty, semiotic space" and make it possible to follow all assemblages of heterogeneous elements by the same methodological principles (Latour, 1997, s. 6).

rent that it almost becomes predictable and possible to describe as a norm. What is crucial, however, is to keep in mind that each definition or norm signifies the attempt of a specific actor to render the actions of others more predictable. Accordingly, "power" and "dominance" are words given to such stabilizations and not an account of their origin (Latour 1991: 123).

In a universe where innovations can solely be defined by associations and substitutions of actants, and actants can only be defined by the multiplicity of innovations in which they participate, translation becomes the fundamental compositorial principle – the principle that connects, recruits, and enrolls. This implies that there is no external vantage point from where one can determine the degree of reality or success of an innovation. This is only possible by triangulating the viewpoints of many actants. It is, therefore, crucial to shift from one observer to another (ibid.: 124).

To understand what status an innovation or a statement has, there exists no criterion of evaluation *outside* the network. The degrees of truth and meaningfulness are functions of how other actants treat the statement. Accordingly, the question is not how to judge something as true or not. All statements have real existence and this realness can be evaluated most precisely by constantly comparing what one actant says about another actant with what this other actant says about itself:

> "This point is not relativist: all statements are not equal. It is relationist: showing the relationships between the points of view held by mobilized and mobilizing actors give judgments as fine a degree of precision as one could wish for" (ibid).

Technology in organizations

With these concluding definitions of network and actants, we are back at the starting point of this chapter, namely the understanding of technology and organizational change. Organization theory has been characterized by attempts to study the characteristics of organizations by drawing hard-and-fast lines between the 'technical' and the 'social', between 'outside' and 'inside', between 'macro' and 'micro', as held true by the

three approaches above too. In sharp contrast to this strategy Latour – together with scholars from science and technology studies – takes the stance that these distinctions are epistemological constructs that have the unfortunate side effect of making it difficult to understand how phenomena emerge in daily life. Instead, we should adopt a minimal ontological definition of an organization and investigate empirically what makes it distinct.

In his short text ""Kan vetenskapssociologi lära organisationsteori någonting?"(Latour 1998) Latour suggests one such minimal definition[12] of an organization. A spontaneous definition would be that it is a network of interactions between humans and non-humans, but this definition is too broad, says Latour, as an organization need boundaries – a limitation of the network. However, the notion of network alone will not help us understand boundaries. And we could easily loose track if we studied normal, large organizations, because they involve vast networks of human, tools, and artifacts. Instead Latour presents a very simple case of an organization. Latour asks a friend "to meet in the main hall after the EGOS-conference", a linguistic proposition. This simple proposition refers to many non-humans (the clock, the conference program, maps over the school, etc.), but that is not what makes it an organization. Rather it is the fact that as soon as Latour has enunciated the proposition, he has created a script with interesting qualities. When breaking up, the two actors are delegated roles in this script, and more importantly, they are delegated tasks. As time passes after the formation of the script, the script develops, and if the two meet in the hall the requirements of the linguistic act are considered fulfilled. This special act of delegating responsibility to a script, Latour calls "transmitter", and he asserts that this is the core around which an organization is build by "instrumentalizing" it. Latour concludes:

[12] Latour is not familiar with organization theory he says, which is why he simply just offers to consider the question of organizations from "the vantage point of science studies". The chain of arguments leading to his definition does not seem perfectly unfolded either. Nevertheless, I will present the definition of organizations in order to indicate the type of minimal propositions and concepts that are characteristic of work within the ANT-tradition.

> "An organization…is a local interaction, plus a transmitter, and, through the mediation of instruments and artifacts, a network of relations that modifies its scale – without changing level" (ibid. p. 284, my translation).

The point is also that we do not need concepts of levels to understand how complicated entities such as organizations arise and work. And rather than carefully selecting among dichotomies and definitions, actor-network theory – or the sociology of translation as Latour prefers to call it – suggests a totally different strategy. This strategy is one of precaution, rather than one of affirmation, since it focuses on how not to prevent us from learning from empirical phenomena for the sake of scientific purity. It asserts, therefore, the following basic principles:

a) All phenomena must be treated *symmetrically* – i.e. the same principles must be used to explain truths and errors – essentialist accounts cannot be employed to explain truth only; and the production of humans and non-humans must be studied simultaneously.
b) All phenomena should be conceived of in terms of *relationality* – i.e. nothing exists "in itself", but gains reality (and definition) in connection to other entities.
c) Nothing exists forever but only as long as it is *recursively* enacted – i.e. an entity is better understood as a process than as a thing (Law 1994, p. 14).
d) New phenomena arise through processes of *translations*, in which neither actors nor their attributes remain unchanged.

As for the issue of technology and organizational change, these principles suggest four important things that counter organization theoretical "common-sense". *First*, while for organization theory the question of technology and organizational roles is one of understanding the breadth and the scope of their mutual influences, sociology of translation suggests that the nouns on both sides of the "and" – 'technology' and 'organizational roles' – are not seen as fixed, stable entities but as outcomes of actions in networks, which amounts to saying that the origin and

maintenance of both have to be explained. *Second*, in organization theory the study of organizational role changes often, and becomes a question of determining in advance "on which side" change is activated and then studying the repercussions on the other side. The sociology of translation stresses that the 'and' is not a demarcation line, but a plus sign; technology is an endogenous, co-constituent element in an organization and vice versa, not a separate variable that influences the social organization "other things being equal". *Third*, the very distinction in organization theory between technical and social entities makes it hard to notice anything but the rise or decline of fixed elements. In contrast, sociology of translation suggests that the concept of "organization" should be understood as comprising both humans and non-humans – we cannot a priori determine which actants will act in what kind of roles.

Fourth, in organization theory the relationship between technical and social entities becomes one of success or failure for the overall system. This implies that something leading to a failure is an "error" and research becomes focused upon finding the instigator of error on either the technical side or the social side. The sociology of translation suggests, however, that "the culprit of an error" is not to be found on either sides, but emerges as a distributed and contested phenomenon in a complicated network.

Political and pragmatic criticisms of actor-network theory

Having presented a radically different approach to the issue of technology and organizational change, time has come to recapitulate the problems with mainstream organization theory and discuss how much further actor-network theory has taken us concerning the question of technology and organizational change.

One of the central concerns of actor-network theory, and one of the main reasons for introducing it in this chapter, was the wish to transgress the social/technical division, which I argued was an inherent assumption

in the theories about technology and organizational change. Actor-network theory makes a virtue of having an almost empty ontology: if we are to study the on-going emergence and decline of phenomena, we must bracket our modernist assumptions about the world and follow the recurring linkages of humans and non-humans. As such, we can build new knowledge about technology and organizational changes by studying actor-networks via new methodologies, not via careful fine-tuning of the theoretical framework.

To a large extent, I am very inspired by this turn from theory towards methodology: it seems much more fruitful to conduct an empirical study of a concrete case from this point than from any of the three previous approaches. However, I am not completely sure that we can content ourselves with the minimal methodology of actor-network theory. Let me address some of the objections that others have raised and some additional troubles I have myself.

First of all, actor-network theory has been criticized for what has been called "managerialism". This term refers to the tendency in actor-network theory to center on technological innovation projects and, hence, the program of entrepreneurs or managers, and thus adopting the assumption that the world and its dynamics can be adequately understood in terms of the entrepreneurial metaphor. The example with the hotel-keys illustrates this tendency: the hotelkeeper appears as the calculating and crafty agent, who enrolls actants and mobilizes networks to carry out his vision. However, it seems not satisfactory to assume such capabilities in advance and ascribe them to a person – especially not when one of the core points of actor-network theory is to treat non-humans and human symmetrically. Moreover, it presupposes that humans are intentional and that intentions govern our actions – i.e., assumes that all actions are teleological, an assumption that has been criticized by for example Hans Joas (1986). Besides, the world is immensely more complicated than a network of calculating, intentional actants. In close connection to this critique, it has also been argued that the entrepreneur-metaphor makes us blind to weaker actors and the significance of invisible work.

Second, it has been argued that the network-metaphor is problematic, because it assumes that everything is connected to each other, that the world is "flat" and coherent. However, practices are not exclusively

part of a network but seem to involve multiple spaces (Mol & Law 1994, Elgaard Jensen 2001). Rather than replacing the ontological metaphor of regions with the metaphor of networks, we should operate with the possibility of multiple spatial metaphors for reality such as "fluid space" and "fire space" (Mol & Law 1994). However, I will not go into details with this attempt to revise the ontological premises of science and technology studies, as I fear that the application of such categories on the present topic of technology and organizational change in advance of the empirical investigation will simply lead to more a priori categorization and hence premature closure of the inquiry into real life practices. While I appreciate the attempt to remind us of our basic assumptions and the way they frame our inquiry into a matter, I find that the potentiality of the network-metaphor is far from exhausted.

Third, although I feel more comfortable with the network metaphor than with the systems metaphor and the metaphor of levels, I must concede that the minimal ontology it implies involves a danger of what has been termed "interactionism" (Køppe 1990). At first sight, interactionism may be considered a virtue, as it invites a dogged investigation of seemingly fixed and stable entities in order to understand how they have come into being and what keeps them stable and fixed. Ultimately, however, this decomposition of entities into interactions among elements never stops: you can always dig deeper and ask what interactions underlying these smaller elements – an infinite regress. But perhaps this problem is too philosophical. In practice, one could argue, the research process does stop, namely at the elements that are pragmatically defined in the concrete case. But of course, this solution introduces a new discussion, namely: who decides when to stop?

Fourth, this critique opens up for another objection. What to use the knowledge about heterogeneous ordering and co-construction of entities for? It can be argued that actor-network theory runs the risk of "quietism", i.e. not saying anything practically or politically useful, because it puts all actors and actants on equal footing. But we should not refrain from taking a moral stance as Fujimura (1991) and Star have argued (cf. Bowker & Star 1999). We should use the knowledge about network-effects, not only to show how everything – including power – is an outcome, but also to discuss the consequences these outcomes have for humans, and especially for humans that are in danger of becoming invisi-

ble, because they are not part of an extended network, or because their actions are too small to count in the big picture.

Finally, turning back to the topic of this thesis – technology and organizational change – it appears that actor-network theory is a good door-opener, but that it is much too vague when it comes to discussing organizing as a special kind of action. On the one side, it offers a metaphor of entrepreneurs (humans and non-humans), who act according to programs or scripts. On the other, it offers a metaphor of the collective, which enrolls humans and non-humans in order to expand in scale. But how are small and large networks linked? How can something be simultaneously linked and separated? These questions point directly to the concept of organization as kinds of partial networks. Based on a single, simple case, Latour offers one attempt at defining how such a partial network comes into being. However, he admits that most organizations are far more complicated than this example suggests. I will argue that his definition of an organization is also much too simple. Not because it lacks substantial definitions – I do not think this is the solution as argued several times – but because it says too little about how mediators – the tools and artifacts – work in relation to interactions and scripts among humans. Perhaps it is too coarse an evaluation to make on the basis of a short pedagogical example, but by taking humans as the point of departure for his definition of organizations, Latour delegates tools and artifacts the role of mere *mediators* of programs and agreements, and humans as the *protagonists* of agreements, the "*inscripteurs"*. Of course the mediating role is not to be seen as a neutral one – programs have to change a bit every time they enroll actants. However, it appears to me that we should dig deeper into these inscribing and mediating roles and refrain from casting only humans and non-humans respectively. How are local interactions between human and non-humans actors connected to agreements, and how do other humans and non-humans mediate them? How are humans and non-humans organized? And how do such organizations change?

A pragmatic stance towards dogmas

How to move on from these five criticisms? On the one hand, actor-network theory provides a promising point of departure for an investigation of technology and organizational change. On the other hand, there are many indications that this methodology – if taken as a dogma – brings along other kinds of practical and political dilemmas. In consequence, I have decided to employ the vocabulary and basic methodological principles of actor-network theory as heuristics rather than doctrines in relation to my study of EPRs and organizational practice in a medical ward. Thus, I have attempted not to impose a priori narrow definitions of and distinctions between the "technological" and the "social and organizational" on the empirical case, but I have not refrained from focusing on topics or actors I find of special interest or politically important. Moreover, I have tried to address the organization as an outcome, but also employed "findings" about organizations, occupations, etc., from other research traditions whenever I found they could bring the case at hand into perspective. Finally, I have not sought and will not argue for a general "Truth" about the practices I follow, but neither have I stayed content with the minimal set of concepts for the emergence and modification of organizations, or refrained from taking a moral stance on the state-of-affairs.

In sum, the review of theoretical approaches to the question of technology and organizational change has served to line up some precautions in my empirical study. However, I have taken up a pragmatic stance towards the dogmas of actor-network theory and only adopted them to the extent they seemed to push the research process ahead. But of course, this statement does not suffice as a description of how the research was carried out. This is the topic of next chapter.

3

Methodology and research practice

Introduction

In the chapters to come, I will lay out the substance and results of my research work. Before that, however, I need to clarify two things, namely what I mean by "results", and what kind of work and considerations that underlie these results. In that respect this chapter is about methodology, i.e. about the connections between my research question, my theoretical framework, and the concrete practices – or methods – I have carried out in order to answer the research question. I prefer to think of these three elements – research question, theory, and methods – as elements of a network rather than of a chain, as, in the course of research, they feed into, inspire, question, and transform one another. Thus, although I have chosen to answer the two above-mentioned questions by structuring the chapter after the chronological phases of my project: meeting the people in the hospital, and the medical ward and its "inhabitants"; constructing different sorts of data; and working these data up – a chronology that is in itself a simplification, which deletes the interconnectedness and back-and-forth-movement between the phases (as pointed out by Andersen et al. 1995) – I will continually point to this process of mutual modification. First, however, I wish to address the meta-theoretical background on which the whole study is based, and against which it must be evaluated.

As argued in the previous chapter, I take the minimal ontological stance that: a) nothing exists in itself, but does only so in and through multiple relations to other entities; and b) practices of representing are actively involved in the very constitution of the entities and relations being represented. With that, I enter the realm of 'constructionism'.

Over the last three decades this term has grown in popularity and quite different theoretical traditions have categorized themselves under this headline. However, it is a common denominator for most discourses connecting to the concept of constructionism that they leave behind the definition of research as fact-finding.

What does this mean for the process of formulating an answer to my research question? For me – inspired by many texts on the subject – it has meant at least four things: that meaningfulness and usefulness enter as central epistemological concerns in the production of scientific knowledge; that science is inherently political; that there is no privileged epistemological point of departure; and that it becomes important to locate the subjects and objects of the research process. Let me elaborate these statements.

Meaningful and useful narratives

I have taken the object of study – the electronic patient record at the medical ward – as an *occasion* for constructing scientifically and practically useful and meaningful narratives, rather than as a thing in itself to be objectively grasped and explained. I use the adjectives "meaningful" and "useful" instead of the traditional criteria of "valid" and "reliable", since these terms invoke an objectivity that ignores how representational practices are deeply involved in building the object of study. Thus, rather than trying to seek the "Truth" about the topic, it has been a basic pragmatic principle in my study of the EPR and practices at the medical ward to produce knowledge, which is meaningful – i.e. makes sense – for a heterogeneous audience, and which is evaluated as useful for the reflection over and work with practical tasks and problems. As I shall later discuss in greater detail, I find these alternative criteria of scientific knowledge production no less strict than the conventional ones. However, the practices of building meaningfulness and usefulness are different from the practices of building validity and reliability as they place the locus of justification or evaluation outside "Science" rather than inside.

A central methodological awareness concerns the fact that the researcher should not monopolize the definition of meaning and useful-

ness. The process of formulating answers is inevitably a process of viewing and sorting through certain lenses that frames and eventually come to enact something that was not there before the scientific story. The question is how this framing happens, and what consequences it has for whom. From the very beginning of this project, I have taken choices that narrow and frame my study, and more than once I have had to re-define and revise the whole study, or parts of it, as it was criticized by others, or as I found parts awkward and preconceived. I have already argued for the choice of a minimal ontology regarding the understanding of technology and organizational change. Naturally, this argument goes for all other phenomena as well. However, it has been an ongoing struggle trying to move from a language of axioms or assumptions (which is ready at hand not least due to a long school-life) to a language of inquiry. Yet I have found great help in the writings of for example Howard Becker (1970, 1998), Leigh Star (cf. Star & Ruhleder 1996, Bowker & Star 1999), and Bruno Latour (cf. 1997) who are all exemplary when it comes to posing simple questions that produce much and interesting knowledge[13]. Often, I became aware of my own presuppositions about the EPR, the hospital, or the way in which the staff acted in discussions with fellow students and supervisors. These events were of the kind where, in a sense, the rug was pulled out from under me (and the readers of this thesis will most likely find other kinds of framings, which I would probably agree are too narrow or crude).

Politics

There have also been framings that I deliberately and advisedly made, especially concerning the focus of the study (e.g. the choice to follow physicians, secretaries, and nurses, but not patients). The reasons for this are political and practical. The meta-theoretical framework of this thesis

[13] Becker asks, for example, "or else what?" to statements that imply some kind of necessity. Asking this simple question often elucidates that many sources of necessity (not least in social scientific concepts) are never as obvious or impervious to questioning as those statements assume (Becker 1998: 161). Many of Star's texts circle around another question "qui bono?" – a question that is often analytically powerful to study the distribution of rights and duties, visibility and marginality.

is, for example, a political choice, which may imply that my work seems strange to some part of the public such as the communities for whom only extensive, quantitative surveys count. Such framings are unavoidable and, I shall argue, necessary. It is a necessary part of the research practice to single out specific areas of attention, no matter if these areas are not in fashion or politically correct. I shall illustrate this by an issue that has cropped up repeatedly.

I focus on four kinds of organizational practices in my project: the reading and authoring of physician notes, the coordination routines of nurses, the medication process, and the distribution of test results. Yet, people in the department and at academic conferences have criticized these foci for not taking the patient sufficiently into account and following his or her practices. I think, however, I have arguments for retaining the focus. I agree that the patient's perspective is of crucial importance, both because he or she is the crux of the matter for the businesses in a hospital, and because in too many cases the meeting between patient and hospital is painful, unpleasant, and even violent. The actual interaction between patient and staff is an important relation to investigate, and a wealth of literature deals with this topic in great detail[14]. But there are many other aspects of hospital life that are of great importance to the way patients are approached and dealt with. One of these aspects is the way the staff talks and writes about the patient. Since the introduction of EPRs has direct consequences for the writing and reading about the patient and since this topic is far less discussed, I decided to focus explicitly on the "backstage routines" at the medical ward – i.e. the line of organizational work in which the patient-as-a-case is also drawn up, delineated, and distributed. This is not to forget the patient; rather it is to focus on organizational processes, which are often invisible to the patient, but nevertheless lies at the very heart of the way in which he or she is framed and, hence, handled in the organization.

[14] Medical encounters are the object of study in a good deal of sociological analyses. Atkinson points to the fact that, interestingly, medical encounters have consistently been narrowed down to 'doctor-patient interaction´ and more specifically the consultation. He suggests different explanations of this "bias", for example that the medical consultation is essentially asymmetric and thus appealing to a study of microsocial play of power (Atkinson 1995: 31).

But even such an argument should not be an excuse for not reflecting upon the consequences of foreground/background-decisions for my scientific story: every time one leaves out an issue or skate over it, there is the risk that the knowledge produced will be either meaningless, useless, or even harmful to someone[15]. The first step toward such awareness, however, is to point to the various decisions and analytical cuts made during the research process. However, this example points to the fact that scientific endeavor is also political and implies a moral stance. Let me describe how these issues have been part of my research practice.

The hospital is a complicated topic. It is a place of hope and despair for the sick or needy person; it is a work place for thousands; it is a marketplace for the sale and consumption of drugs, high-tech equipment and technologies of efficiency; and it is a giant institution for medicine as a scientific and clinical discipline. The stakes are multiple and there is an ongoing battle among interest groups over the definition of its core activities, its target groups, it regulation mechanisms, its geographical placing, etc. How to enter this high-tension field in a way that makes a difference and does good? It seems obvious to me that the patient is in many respects the weak party. Although there has been a growth in patient organizations and these are progressively more active in the public agenda of the hospitals, there are still many kinds of patients whose perspectives are downplayed or neglected, and who have very few opportunities for changing the state of affairs. This is paradoxical as the patient can be seen as the very *raison d'être* of the hospital. Therefore, I decided that this study should somehow focus on the interest of the patients – although I acknowledge that it is deeply problematic to talk about this in the singular. However, I felt that it would be interesting for many patients (and here I decided to rely on my own experiences as a patient) to know about the "backstage processes" where they are central albeit ab-

[15] Joan Fujimura has, for example, questioned the program of actor-network theory that views non-humans and humans as equally important for the understanding of social phenomena. She argues, that even though nonhumans are analytically important, they are not as important as humans when it comes to evaluating consequences: "a …difference between Latour's agenda and mine is that he wants to collapse dichotomies, while I want to construct concepts and theories to help some people win over others" (Fujimura 1991: 223). Accordingly, a symmetrical study of a phenomenon must not be an excuse for not taking a moral and political stance.

sent objects. To know about the way they as patients are treated, framed, negotiated and, of course, often helped, could be of interest in order to know more about the inner workings of the machinery on which their lives and well-being are very dependent. What is more, I reasoned that this kind of knowledge is crucial in order to assess the political programs of the EPR that promised to "improve health care", "raise quality", etc. However, I have been very aware that the sympathy for certain groups should not be an excuse for treating other groups proportionally disrespectful, or legitimizing crude generalizations on their behalf. First of all, I do not believe in simple explanations such as "capitalism is the root of all evil", "technology debases human life", or "physicians are unable of being empathic"; modern life is far more complicated, ambiguous, and multiple than such allegations suggest. Power is not a cause but an effect, and it is central to any empirical study to trace those mechanisms that build power rather than taking power or the powerful for granted. Secondly, the principle of symmetry should also be understood ethically: even though the aim of the study is to unravel the mechanisms that produce inequality, marginality, and oppression, both weak and strong actors should be treated in a way that can be ethically defended.

Epistemological flexibility

Since the product of science is not "Truth" but meaningful and useful stories, and since any scientific activity implies politics there can be no privileged epistemological point of departure; rather there are multiple ways in which statements can be generated about the object of study, and multiple ways in which these statements can be juxtaposed and linked (Rorty 1982, Becker 1996 and 1998; Fujimura 1991, Czarniawska 1999, Latour forthcoming).

The basic research strategy of my project – closely coupled with my research question and the theoretical take-off – has been to look at the EPR as it participates in concrete work practices in a medical ward. In that respect it is deeply inspired by the movement in research milieus towards the local; towards exploring concrete interactions, contingencies and trade-offs involved in carrying out different jobs (Orr 1996, Fujimura 1987, Hutchins 1993, and Barley 1996 just to mention a few). This

movement – and also the kindred movement in science and technology studies – has taken inspiration from anthropology and the way it has studied cultures. Particularly, two of anthropology's methodological principles has been central for the recent movement: the principle of bracketing the cultural expectations of the researcher (e.g. what is 'natural' or 'proper') and observe events in the field of study with an open mind; and the symmetrical principle of including all entities as relevant data irrespective of their "character" (thus, daily tasks, the climate, conversations between people, artifacts, rites and rules of the collective etc. are all relevant for understanding the inner workings and universe of the signification of the culture).

However, I have not followed all dogmas of the anthropological tradition[16]. One practical reason is that it was not possible for me to do comprehensive, longitudinal participant observation; I had to make do with a shorter, more focused period of observation. Therefore, I decided to make a virtue out of necessity and narrow the focus of the further data construction: interviewing about quite specific issues rather than broad and general themes; and getting documents, artifacts, and pictures related to the specific issues. Later it became clear that this also gave me the opportunity to go into detail with and focus upon the nitty-gritty and often unheeded aspects of practice – often the non-humans usually left out when the purpose is to address general patterns.

Another just as significant reason is that my project is not a study of culture but of specific work practices. In that respect it is an organizational change analysis – an analysis of the way elements are being redistributed and reconnected in a network – and not a study of cultural meaning systems and narratives. This is also where I departed from studies of situated work practices or technologies: my aim to tell about not just single jobs, but about the organizational arrangement into which technology is introduced. Accordingly, the task was one of understanding situated practices, the ways such situated practices connect and conflict, *and* the ways these interconnected practices change over time. Because of the change focus, the narrow focus of study seemed even more

[16]One core dogma in anthropology is the insistence on a long period of observation, often a year or more, in order to let the researcher experience all four seasons and thereby the cycle of cultivation in the culture.

appropriate in order to raise the level of specificity. Also it seemed appropriate to adopt a strategy combined of observations, interviews, and collection of artifacts and literature.

The latter activity – the collection of literature – is perhaps odd to mention in a chapter on methodology, as it may be seen as a natural, inherent dimension of a scientific work process – a matter of course. However, I found myself in a dilemma regarding how to position the reading of literature on the subject, i.e. literature that posit explicit statements about hospitals, EPRs, nurses, etc. On the one hand, I wanted to take seriously the principle of bracketing assumptions, to follow the actors in the field symmetrically without preconceptions. The section about constructing data tells how this went on. On the other, I found that in the moment of analysis – as far as it is possible to delimit this activity – my juxtaposition and comparisons of observations, interviews, and artifacts did sometimes reach an impasse: a point where the analysis seemed self-evident or even tame, and where I did not know how to push the story further ahead. In these moments, it was quite helpful to search the literature to look for heuristic concepts and "facts", which could shed new light on my own data in different ways: a) in the sense of hinting at other analytical cuts to make inside the data, where "facts" were not seen as essences to be found at Svendborg Hospital, but as propositions about something that might happen to happen there; and b) in the sense of providing categories that my data could question or reject. The section about writing up data takes up this issue in greater length.

Locating the study

The considerations about the role of literature in my study point to a more general issue regarding the claims of a minimal ontology and the principle of bracketing. I find both ideas most appropriate and necessary in order to produce scientific stories without simply affirming what is already scientifically and politically accepted (and just one partial truth among multiple truths – as feminist scholars have perseveringly demonstrated). Yet it is practically impossible and politically problematic to refrain from framing the world to some degree. In this way, bracketing

and framing are to be seen as each other's prerequisites – or as Siamese twins.

However, these Siamese twins call for making reflexivity an integral part of any scientific endeavor. Actually, this is an important argument for having a chapter on methodology, which reflects on the way in which the research practice enacts certain versions of the topic to be studied at the expense of other versions, and what kind of consequences this has for whom. Yet I will enact a type of reflexivity that can be distinguished from two other types of reflexivity. The first is what Sandra Harding calls "epistemological internalism" (i.e. the assumption in older theory of scientific knowledge "that the success of modern science is insured by its internal features" as for example scientific methods and standards for maximizing objectivity and rationality, Harding 1998: 2), which implies that the researcher reflects on how he has complied with these privileged methods and standards. The other kind of reflexivity, which I have not pursued, is what Donna Haraway (1997) calls "self-vision" (i.e. where ongoing self-reflection is seen as the only possible way to construct knowledge). I agree with Harding's and Haraway's political argument that we should not accept a production of scientific knowledge, in which the representing subject is concealed or invisible, and the Fact, therefore, appears as a God's eye view. However, nor should we fly to the opposite viewpoint – that nothing is factual but only extensions or extrapolations of idiosyncrasies – because it is wrong and because it erodes the possibilities of speaking weighty about anything. In Haraway (1997), Harding argues for what she calls "strong objectivity":

> "A stronger, more adequate notion of objectivity would require methods for systematically examining all of the social values shaping a particular research process, not just those that happen to differ between members of a scientific community. Social communities, not either individuals, or 'no one at all', should be conceptualized as the 'knowers' of scientific knowledge claims. Culture wide beliefs that are not critically examined within scientific processes end up functioning as evidence for or against hypotheses" (Harding quoted in Haraway 1997: 36).

Haraway elaborates this argument by adding that:

> "Strong objectivity requires that both the objects and the subjects of knowledge-making practices must be located. Location is not the concrete to the abstract of decontextualization. Location is the always partial, always finite, always fraught play of foreground and background, text and context that constitutes critical inquiry. Above all, location is not self-evident or transparent" (ibid.: 37).

I have tried to situate my own research practice between these two extremes of science as a God's eye and science as fiction or self-vision. Rather than enacting credibility or robustness of data by referring to the observance of scientific rules for producing Facts, or to my own phenomenological world, I will try to enact these adjectives by locating my object of study and myself as a subject of the research practice.

It is fundamental to this study and its account of reality that I address a topic, which is historically situated and socio-technical-geographically located. I do not speak about EPRs in general, but about a highly specific one that is in the process of continuous modification. Neither do I speak about medical practices in general, but about concrete activities and relations at the medical wards in Svendborg Hospital that I have seen or the staff has told me about. This localization of the object of study means that I cannot and do not attempt to generalize about the effects of introducing EPRs in Denmark. Undoubtedly, hospitals are different in terms of work culture, economic situation, architecture, etc. And their recording procedures and particular information technological infrastructures are just as contingent. The introduction of EPRs may mean different things in different organizational arrangements.

What is more, the localization of my study has meant that I have had to negotiate its finding with the people and artifacts I studied. In the beginning of the project, I had a very premature plot for the scientific story, which – in all innocence – cast the EPR in the role of the great emancipator of medical practice. Yet, as I saw what was going on, listened to the staff, and chewed on the field notes, this story could not be told: I could not make the statements fit this narrative. Thus, I moved from one location to another as an effect of the work process, because the voices of the field, the data, acted back on me – "gave friction" as Sami Boutaiba, a fellow student, calls it. With this, perhaps common-

place remark, I wish to stress that I have seen this research project as neither a call for free speculation, nor as a call for persevering self-reflection, but as a call for finding multiple voices on the businesses of a medical ward in which EPRs have been introduced, and for discussing what kinds of patterns that seem to arise from these voices. In that sense, the stories are not constructed but co-constructed as Harding also argues (Harding 1998) and can therefore be considered negotiated orders (Fujimura 1991). Thus, the descriptions and analytical discussions in this thesis are neither universal knowledge claims nor mere speculations, but located stories and statements, empirically grounded in observed and local practices, which are part of the world. I hope they will count as such. But in the same breath I will encourage others to supplement or challenge the conclusions of this thesis by producing additional or alternative stories about located practices.

Engaging with the field of study

Getting access as an ongoing task

In this section, I will address the process of engaging with the field of study. At first, I gave this section the headline "getting access", since the conduct of an empirical study to a large degree depends on access to the organization, subculture, or sites where the phenomena of interest happen. The character of the study varies according to the degree to which the researcher has access to the practices or phenomena of interest or access to people who can tell about these practices. Usually, access depends on some kind of preliminary negotiation with the people involved or, for example, with their employers, and there are numerous examples in the literature of how hard it can be to gain this access (cf. Buchanan et al. 1989, Finken 2001). My own research project is partly financed by the Hospitals of Southern Funen, that, for different reasons, wanted an investigation of their EPR-system, and hence had committed themselves to giving me access to the places where the EPR was at work. However, this commitment was vicarious because it was stated by hospital mana-

gement and administration[17] and not by the artifacts and the people, whom I really wanted to study: the nurses, secretaries, physicians, patients, and various artifacts at the medical ward. In consequence, I had to meet more people and engage in many and ongoing negotiations of access. Although the ward nurses and the head doctors accepted me, I still had to negotiate with the individual nurse I wanted to follow, with the patient I wanted to observe practices around, and with the EPR that I wanted to look into (having no password you can only access it by looking over the shoulder of others and signing an oath of secrecy). During all these negotiations, the research project – its questions, its method, and its assumptions – is subject of negotiation too. In this way, it is not just a question of access to the field of study, but of mutual interaction between the field and the study. When something or someone raised objections against the study's framing, I tried as the researcher to persuade and assure, but often I had to change the focus slightly. In this way it was not just a question of access, but of ongoing encounters with actors and actants of the field in which the research project, my researcher identity, and the identity of the researched were continuously modified. Thus, I came to see the question of access as a sustained or constant aspect of the research process – a constant meeting between researcher and the researched rather than a preparatory, one-off task. Let me describe the process of meeting the field in greater detail.

Meeting a field in transition

The PhD-scholarship was co-financed by the Hospitals of Southern Funen, Rambøll, Copenhagen Business School, and the Danish Research Academy. The scholarship was advertised inviting applications that somehow dealt with the introduction of EPRs in Southern Funen. I received the scholarship after having submitted a project description centered on the idea to study the organizational learning processes around the

[17] Eventually, the question of access becomes also a question of the different views of the members of the organization has of the researcher (especially people asked about my educational background and heard that I was a psychologist and interested in organizations), and how the decision to let a researcher into the organization becomes involved in organizational power struggles.

EPRs. However, I soon moved away from this theoretical angle, as I felt progressively uncomfortable with the normative assumptions about developmental progress inherent in much literature on learning. Thus, although I presented the learning angle to the project members of the EPR-team in Southern Funen at a meeting, I decided afterwards to change the focus to a less theoretically loaded study of the EPR and medical practice. I wanted to look at both the design process of the EPR and the introduction of EPR in the medical ward. The institutional arrangement was so that I had to negotiate the change of angle with my supervisor and not with the EPR project-team. However, whilst my supervisor okayed the revision, it felt much harder to communicate the change to the project team, who was in a phase of organizational unrest (e.g. the time schedule for the project was delayed, local politicians were eager to see results, and the physician group at Svendborg Hospital, where the EPR would soon be introduced, was skeptical about the whole project). Due to this situation, the project team hoped that my project would point out the benefits of EPRs. It felt kind of impolite to insist on following the introduction process – from the birth of the EPR-project to the "implemented" EPRs in the medical ward – without presuppositions about its advantages. Actually, the project team was never reluctant to the idea of following practices, but in our conversations about the research plan, I found it hard to be attentive to and appreciative of their stories about the project and their suggestions of places to look or people to talk with, *and* continuously making sure that I did not end up looking at the EPR-project in places where things ran extraordinarily smooth. I think I was very lucky that the project-team after all was not very demanding and came to fully accept the idea of an "impartial researcher". However, the anecdote stresses the fact that meeting the field entails a balancing of contradictory considerations: building a viable relationship to people you do not know, getting to know about the field, and keeping in mind that the world is more than this depiction and that other people might disagree.

I divided my work into two phases. The first should focus on the "design process of the EPR" and the second on the "EPRs in the medical ward". I began interviewing people – project managers and project members – about the first issue hoping that I could meet enough relevant people before I went on maternity leave. However, it was quite difficult

to make agreements with people, as, it should appear, the engineering company that had developed the first version of the EPR was pulling out and negotiations with a new company were going on. After three months, I went on maternity leave.

When I returned, much had changed or was about to change. The hospital manager had left, and a new arrived. The entire hospital structure was under reorganization (one of the hospitals was to be shut down). A new company had taken over the EPR-development and the time-schedule was heavily delayed. The project-team at the hospital was to be downsized; and EPRs had been introduced in the medical wards at Svendborg Hospital at the same time as the medical wards had been reorganized as a medical center with shared reception of patients and four special units. Also, I had come to be more interested in studying the EPR real-time "at work" rather than unraveling the history of its formation. I decided, therefore, to narrow the focus of my project to the medical ward and use the data from interviewing project-members and managers as historical background of the EPR-system.

Meeting the medical ward and negotiating with its inhabitants

Getting access to the medical ward implied that I had to obtain consent from first the leading head doctor and the leading head nurse, and then the head doctor and the chief nurse of special units H and A, where I decided to conduct the study (after having discussed with the EPR-project team where the EPR was fully "implemented" and where I would get a good sense of the multiform character of medical practices where the EPR was to work). In these meetings, where I explained the purpose of the study and tried to learn about the possibilities of following humans and artifacts, focus shifted gradually from being on the EPR as a "figure" and medical practice as background to the reverse order: nurses and physicians accepted that I was interested in the EPR, but they stressed that this "project" was just one of many that made work difficult and people quarrel in the ward. It felt like my project and the EPR were suddenly looked at form the other end of the telescope: it was just a tiny element of a complicated, hectic, dramatic, and contested work. To-

gether with the head doctor and nurse, I reasoned that one way to know more about this complexity was to follow persons at different duties.

In fact, this decision was a sliding of the original plan, where I had decided to follow EPRs by sitting next to the computers and following when, how, and why patient records were "called to life" on the computer screen: a sliding towards following humans rather than non-humans. However, I reasoned that following humans would not prevent me from observing non-humans, although I would have to be sensitive in a different way than originally planned. What is more, I became interested in the worlds of physicians, nurses, and secretaries. I realized that my prejudices about these groups were perhaps even more pronounced than my prejudices about the information technology, and that it would probably be a good strategy to start the study by following these actors "with an open mind". Besides, it would entail radically more negotiating work to follow the EPR as it passed through multiple hands of staff, patients, relatives, people from other organizations, etc., than simply following selected persons and their interactions with other staff, patients and artifacts.

With this agreement, I began the work of finding the persons to be followed. I made an agreement with the head doctor and nurse that I would send them the dates and the different duties to be observed, and they would then find the people who was on duty at these dates and did not mind being observed. Consequently, the actual selection of staff was not in my hands, which introduced the question whether the people I was to follow had been chosen for strategic reasons (e.g. because they were particularly good at using the EPR, or particularly annoyed with it). I do not know the answer to this question. However, during my stay at the medical ward I decided to be attentive to how the staff talked about or referred to these persons. Now, looking back on the selection of staff, I am inclined to thinking that the staff was selected after quite casual criteria (or at least after some idea of broad sampling[18]). The physicians

[18] I do not mention these considerations in order to argue that my findings are representative or typical. This dissertation is not a study of Truth but of located practices. Yet it was important for me to reflect on whether the people I followed had some special politics and practices in relation to the EPR.

and nurses I came to follow expressed quite diverse attitudes toward the EPR and toward their jobs and they applied different work methods. Also I came both to observe people having worked in the ward for many years, and people of only a few months experience with the ward.

Although the agreements with the people to be followed were formally in place, all of the actual meetings with these persons implied small negotiations with him or her about the nature and relevance of my presence. Usually, I opened the "meeting" by presenting myself as a researcher interested in medical practice and the EPR, and that this implied that I would like to follow them on their whole duty, except in moments where they found it inappropriate for ethical or personal reasons, and take field notes to remember the details. The majority accepted this explanation. However, I often noticed the staff's puzzlement when I took field notes in all kinds of mundane situations (e.g. when they talked to others, walked into another room, and navigated the EPR-system). Even though I explained why I found these "boring" aspects interesting, I sometimes felt that my identity as a serious researcher was at risk. Sometimes, the person I followed began sorting for me what would be of interest and what would not such as stating: "I'll just go and check the patient, you can stay here and wait for me", or "Oh, hi X! I am sure Signe wants to know how many times in last week the system was down?" Thus, it was quite a work to simply follow the persons, since I often had to argue for access to parts of their practice and decline offers of access to other parts.

Another aspect of accessing real-time practices was that it was often hard to follow the practices in a way that allowed me to take usable field notes; often I had to ask the person what was going on, because I just saw movements and facial expressions. Naturally, I had to defer from asking until the moment when I would not disturb too much, which meant that sometimes I forgot to ask or the person could not remember all the details. But there were also persons who were simply reluctant to explain things to me. One told me several times that I probably would not understand it even though he told me about it "because it is very technical!" Another person kept on answering my questions by playing down the importance of what was happening "well, I just do the usual stuff" or by disregarding the question. In both cases, I reasoned that these problems of access had something to do with my assumed identity as a "re-

searcher": in the first instance as a humanistic-researcher-with-no-sense-of-hard-science and in the second as a snob-researcher-who-did-just-write-instead-of-helping-about-with-things. I tried, therefore, to actively challenge these framings and, for instance, put down my notebook and help lifting patients and wheeling beds. Luckily, in both cases it actually seemed to change my relationships with the persons, who began telling me much more about their work.

The above examples point to a very important aspect of field studies, namely that getting access is not simply a question of formalities but of interpersonal relations. But perhaps more surprising, the issue is not only true of relations with humans. Also, I had to work on the relations to the non-humans of medical practice – the various instruments, paper forms, drugs, numbers, etc. As non-humans are mute, I could not ask why they acted as they did. Instead, I had to read about them or ask a human, who knew them. Knowing how this or that artifact typically acts or is supposed to act, one is better equipped to notice how it actually act. Most of the time, though, I had to postpone my questions till later. No doubt, this dilemma was sharpened because of the relatively short observation period: if I could have stayed on the medical ward for a longer period, I would probably have become more familiar with the artifacts there and, hence, knowledgeable about the events going on. On the other hand, being a stranger to the object of study can also be seen as a possibility for noticing aspects of life that appear as natural or evident for the experienced and become invisible to the researcher who has "gone native" – a classic dilemma in anthropology. However, this problem of immediate access made it necessary to supplement observations with focused investigation of artifacts, which appeared in the ward (e.g. by reading about a specific diseases and the role of a drug in this connection or talking to people in the EPR-group about the functionalities of the EPR-system). In the following section, I shall elaborate on how these tasks of getting access and meeting the field was connected to the task of producing data for illuminating the research question. Yet, as I hope to have illustrated, the research question was not fixed or stable, but was negotiated, modified, and narrowed in exactly these successive meetings.

Co-constructing data

Once more, I will begin a section by reflecting on the headline. In a research project like mine, the meeting with the field is not simply a courtesy visit but a central activity in the formulation of an answer to the research question. Conventionally, this activity is named "data collection". However, this figure of speech has problematic connotations when one is inclined to a constructionist view of the world and the research practice: data do not exist as pre-packed lumps of evidence or signification, which can be collected like shells on a beach, but has to be actively produced through highly specific interventions by the researcher. On the other hand, data is not simply extrapolations of the researcher but artifacts that emerge from the relationship between researcher and the researched network – they are co-constructed as Harding phrased it above (Harding 1998). In this section, I shall describe the interventions that I carried out in order to produce data and the type of data that were co-produced in these events.

Observing

Svendborg Hospital is located some 300 kilometers from my home, and for practical reason I had to economize with the time devoted to following staff on duty. I decided, therefore, to settle with a solution, which would not give me a comprehensive picture of the activities and relations on the ward, but nevertheless seemed to cover parts of the work division among staff. This minimum-solution focused on physicians, nurses, and secretaries as these occupational groups were constantly mentioned by the people in the EPR-project-group as central for the design and evaluation of EPRs. Also, these three groups seemed to differ from each other in terms of core-responsibilities in the ward[19] and,

[19] Naturally, one can object that this choice was a radical framing of the whole study based on a preconceived idea of importance or difference – how could I be sure that nurse aides, physiotherapists, or hospital orderlies were not just as important? This

hence, three types of practices in which the EPR was regularly used. Moreover, I chose to focus on the Acute Reception Ward and on one of the four specialized wards, the Apoplexy Ward, as I reasoned it would be important to study both the place where patients were received and that to which they were later referred and subsequently discharged from. Later on, I decided to follow a couple of persons in the outpatient clinic too in order to get a sense of the way patients could be connected to the hospital after being discharged. The table below lists the different types of duties that exist and the ones that I followed:

Physicians	*Secretaries*	*Nurses*
"Forvagt [20]"	Day duty, ACR (not observed)	Day duty, ACR
"Bagvagt [21]"	Day duty, specialized wards.	Day duty, Apoplexy ward
Head doctor on duty, mainly doing ward rounds on specialized wards.	Evening duty, ACR	Evening duty, ACR (not observed)
Outpatient's clinic duty.	Out-patient's clinic	Evening duty, Apoplexy ward
	Common secretariat (not observed)	Night duty, ACR (not observed)
		Night duty, Apoplexy ward

objection is appropriate and important. My response is, however, that the choice of the three occupational groups is a pragmatic rather than an essential choice: though I have arguments for following exactly these three groups, this is not to say that other actors are not relevant or central. The information system technicians and the internal mail carrier play important roles too. Also, importantly, the purpose was not to stay with these groups, but to use them as vehicles for exploring networks of medical practice, networks where patients, cells, beds, records, cleaning ladies, and managers etc. all are part of the enactment of medical practice.

[20] Literally "front duty". Refers to the type of physician duty primarily at the ACR. Takes care of the initial phase of the patient trajectory, which includes thoroughly examination of the body, querying about the circumstances of hospitalizations, ordination of basic tests and the reporting of all this in the record. Mainly manned with younger residents on training.

[21] Literally "backhand duty". Refers to the type of physician watch, which is responsible for all medical decisions in the ACR, and at night in the specialized wards, as well. Manned with older, experienced physicians.

The various duties contain both similar and very distinctive work tasks (e.g. although all physicians perform diagnostic work, the "*forvagt*" performs the initial exploration of the patient). And as the table shows I skipped some of the duties, when it appeared that they contained more or less the same as another duty (e.g. the night nurses do the same kind of work no matter which wards they are in).

I followed each of the persons on his or her entire duty, from the moment he or she met on duty till the end of that day's work. During the observation, I continuously wrote down in a notebook as much as I could about the person's activities. As can be imagined I had to use cue words, since often things happened very fast, and I wanted to keep up with the actions going on. Consequently, my notes were typically of the following form:

13:25 /Office
Ask nurse "Has X-ray pics. arrived?"
n. nods, points at light board with pics.
Goes to the computer, sits down.
Logs in. Opens rec. of Mrs. Holm/X-ray description.
Reads shortly.
Goes to l-board, looks pics.: "Yes, gray spot!"

At first sight, the notes came to resemble notes of a classic scientific management time study: what kind of subtasks does the person perform, for how long and with what outcome. And yet, there were substantial differences as my aim was not to map out operations in order to make suggestions for improving efficiency, but to understand what kind of tasks and relations a duty consists of and how it connects to the work of others. Thus, my focus was not restricted to the person and his or her movements, but also included the artifacts (e.g. the particularities of the EPRs working and of the specific EPR-pages being worked with) and the patient cases the person was handling in his or her work (e.g. the specific details of the patient's disease). Accordingly, my notes contained many references to artifacts and patient cases, enabling me to study these later in greater detail.

Within a period of 4 months I followed 4 physicians, 4 nurses, and 3 secretaries on their duty – that is 11 workdays of 6-10 hours each, approximately 90 hours all in all. After each observation, I transcribed the

field-notes and added details I could remember, but did not have the time to scribble down on the spot, and I looked up information about the artifacts and specific patient-cases such as information about diabetes, lung cancer, and aphasia. In addition, I began mini-analyses of the field-notes, because I wanted later to conduct interviews with each of the 11 persons based on my observations. The mini-analyses were made in two ways, both of which have much in common with the basic steps of grounded theory (Strauss 1987). *First*, I read the transcribed and elaborated field notes and divided the content into first small then bigger chunks of *activity* that were named after common features of the elements (e.g. "meeting on duty", "updating on the patients", "meeting the patients" etc.). As I did this to more and more field notes, it appeared that some types of activities were common to several persons, which, for example, made me reason that "updating" would be an important activity to interview the nurses about. *Second*, I divided the field notes after patient names, so that I could sort all the activities in a duty related to a specific patient in order to construct small "patient trajectories" (e.g. the way Mrs. Holm is dealt with during a work day). Based on this sorting I chose two-three patients from each observation and wrote small "patient-stories" about the observed person's interaction with these patients. The following is an example of one such story (including a question that was puzzling me when I wrote it):

> (11.45 p.m.) The evening nurse is informing the night nurse, Gitte, about the different patients. Now she tells about the patient Mrs. Hansen: "Her wound is infected with staphylococcus. When was her dressing changed?" she asks Gitte. "Well, I didn't make it yesterday", Gitte tells. The evening nurse continues: "She was CT-scanned yesterday…has a large internal hemorrhage!" Gitte clicks to see the patient's X-ray report on the screen. She skims it. "By the way, will you check if there is *Magnyl*-pills in her dosage box, and can you give her *Clyx* – her digestion is not working …she has started on *Cipramil*", she says to Gitte, who opens the medicine scheme and reads about the medicine.
>
> (02.13 a.m.) Gitte opens Mrs. Hansen's record, and clicks to see the physician notes. She reads shortly: "I have to measure her blood sugar", she says and writes a note on a scrap of paper to remind herself and puts it in front of her at the keyboard. Then she opens the nursing notes and scrolls

back. Reads a little. Opens the medicine scheme and then the nursing notes (what is she looking for?).

(03.35 a.m.) Gitte comes into the office, where a nurse from the Pulmonary Ward sits and enters diet orders. ”Oh no, I hope her shoulder has not been dislocated…it is the paretic side!” Gitte logs into MediCare, opens the nursing notes on Mrs. Hansen and a folder having the headline “disoriented”. She reads, but says: “There is nothing about whether she has pains in that side!” Then she writes a note: “When turned, Mrs. Hansen complains about pains in right shoulder. NB at the morning ward tomorrow!” and goes back to the patient.

(04.25 a.m.) Blood sugar was measured at 3 a.m. Now the figure has to be entered. Gitte opens the record of Mrs. Hansen, finds the nursing-folder “diabetes” and writes a note here: “Blood sugar 03.00: 8,5”. She scrolls back in the folders, but then switches to another patient.

(04.49 a.m.) Gitte sits still in front of the computer and is going through the patients to remember if something has to be written about them. She comes to Mrs. Hansen and opens the nursing folder headed “unilateral paresis”. Looks shortly at the notes here and closes the folder without writing anything.

The criteria for choosing among the possible patient stories were that they should contain “typical” activities of the observed person, making it possible to interview the person about these activities in a way that included as many as possible the particular circumstances of the activity.

The purpose of writing these stories was dual: a) to ask the person to check the specific data and tell me if I had misunderstood anything, and whether the stories were typical of their usual work or were exotic, special cases; and b) to ask the person to reflect upon how a similar case would have been handled before the introduction of EPRs. Thus, the phase of observing persons on different duties was followed by interviews.

Interviewing

As described, the focus of the project was twofold: to study medical practice as an organizational outcome, and to study the way in which the EPR takes part in and potentially modifies this. While the observations were aimed at understanding the particularities of medical practice after the introduction of EPRs, the interviews were (besides checking my field-notes) aimed at understanding the way medical practice was accomplished before EPRs. However, I did not want to ask in general: "how were things before the EPR?" or the like, as I feared this would be general questions that would elicit broad opinions rather than the specific, concrete descriptions of humans and materialities I was after. Instead, I took the patient stories as "centers of rotation" for the interviews. Accordingly in advance of each interview, I sent two-three stories like the above to the person in question – stories that were made on basis of the observation of that person. Each interview began asking about the person's reaction to the stories: were they fair, could the person help clearing up questions, had I misunderstood something? Having settled the status of each story, the interview then took the form of a travel through each story, focusing on how a similar task would have been carried out before the EPRs (e.g. "what would you have done in this situation before the EPRs?" "What would happen?" etc.) Also, I asked about the activities of other staff members that appeared in the story (e.g. "is this a typical routine of the nurses?" "How would the physician have acted earlier on?") Only after having gone through all the detailed micro-tasks and situations of the patient-stories, I would move on to the more general level and ask questions that invited more broad and normative comparisons of practice before and after the introduction of EPRs (e.g. "what do you think has been the biggest advantage/drawback of having EPR in relation to preparing the ward round?", "does the EPR aggravate/diminish the problem of getting an overview of the patient's medicine?", "do you talk more or less with each other about the patients after having EPRs?).

The above procedure was intended to ensure data about historical non-humans too. Being directed towards micro-aspects, sub tasks, and particular patient cases, the interviewees told in details about past activities and relations in a way that made explicit what had changed and with

what consequences. Thus, the interviews were predominantly focused on the level of concrete interactions before and now between staff, patients, and artifacts, and focused on wider perspectives of the micro-changes only at the end. The interviews were taped, and I promised the interviewees anonymity.

Collecting artifacts

The problem of following humans in a study that specifically aims at analyzing organizational practices symmetrically is, of course, that non-humans tend to be downplayed. As mentioned I was quite aware of this problem, and before, during, and after the observations of and interviews with staff in the ward, I tried, therefore, to collect or describe artifacts that took part in the activities. The methods were multiple. I took photographs of the locales of the activities and of particular physical work-arrangements such as the computer table and its "inhabitants" such as pencils, letter trays, Post It notes. I made sketches of the physical layout of the office furniture, and of the locales of the ward. I copied or got copies of standard forms, laboratory figures, record excerpts (made anonymous); and I collected artifacts such as record-folders, patient labels, medicine cards. As I shall elaborate in the following section, these materials acted not only as means to illustrate complicated practices, but also served to physically remind me about the role of artifacts as very important participants in medical practice.

Writing up data

It is, of course, a simplification to divide this chapter into sections of engaging with the field, co-constructing data, and writing up data as mentioned above. Throughout the project, I have continually written introductions, presentations, and summaries of my study to be presented in various connections: to my supervisor, at conferences and workshops, in newsletters, for evaluation committees, etc. This pile of preceding texts

have interacted with the way I met the field and the way data emerged, and naturally also informed the final process of writing the thesis. In this respect, the texts have worked as temporary closures of the research question; as encirclements of the field of interests; as experiments with and approaches to moods of presenting data; and as tentative conclusions to be later revised or concretized.

The interwoven character of the research process – the intimate relationship between activities and written artifacts – has made me question a classic distinction in literature on methodology, namely the distinction between analysis and presentation. Ideally, these two terms designate logically separated phases of the work with data, where "analysis" conventionally refers to the decomposing of data into elements and sorting of these into categories and patterns of relationship, and "presentation" refers to giving a written account of the analysis and its conclusion. While this separation may make sense in cases where the data are not primarily written words, it has not been clear-cut in my own research practice, although in certain periods I mostly wrote and in other I mostly read and reflected. First, writing and transcription have been fundamentally involved in the very production of data, which have introduced literary and, hence, compositional or presentational dimensions such as genre, style and mood from the very beginning (and not only in later phases of the research process as described by Latour & Bastide 1986). Secondly, though I only observed and interviewed 11 persons, the data material grew quite large due to the high level of specificity in both observations and interviews – about 400 full pages. 400 pages of words can be analyzed in innumerable ways depending on the aim of the study and the mode of presentation. Thus, while beginning to read and sort the data material, I made choices regarding the way in which I ultimately wanted to present data in the thesis, choices that were very much related to the above-mentioned criteria of writing up meaningful and useful scientific stories. In this respect, the term "writing up data" works better as a metaphor for the close weaving of analytical and presentational considerations in my research practice. Let me address the way the two criteria of meaningfulness and usefulness have guided my practice of writing up data.

Three groups of audiences

By a "meaningful scientific story" I basically mean a story that makes sense to others than the researcher herself. Whether something "makes sense" can be thought of as a question of how the reader evaluates the account in relation to his or her experience (Weick 1995), or as a question of whether it works as elements of a plot (Czarniawska 1999). At worst, the reader only evaluates the scientific story as meaningful because "it is Science", i.e. the statements themselves do not convey much meaning, but are ascribed meaning because they are part of a scientific network of references, epistemological invocations, and, for example, abstract language[22]. At best, to my view, the reader ascribes meaning to the scientific story either because he or she can evaluate the different statements directly in the light of his or her life-world, or because he or she can evaluate the chain of arguments from the basic observations to the general, or abstract conclusion.

I reasoned, that three groups of readers might come to read this thesis: the academic panel, practitioners from the field I address, and finally, "laymen" that for some reasons would be interested. Consequently, it was important to me that the analyses and conclusions of the theses should be grounded in descriptions of daily practices that practitioners of the field – i.e. physicians, nurses, and secretaries – would recognize or at least have a chance to evaluate. However, it was also important that the descriptions should be intelligible to laymen, who may have been hospitalized, but who do not know the particularities and lingo of the medical ward. Finally, it was also important that the descriptions and arguments were connected to academic literature, since this is a fundamental rite of passage in my own community, in which this thesis ultimately has to be evaluated: a rite that I also find most valuable in terms of putting the concrete into perspective.

[22] See for instance C. Wright Mills' excoriating analysis of an excerpt from Talcott Parsons' "Social Systems" (Mills 1959).

I reasoned that I could perhaps meet these demands by: a) providing specific cases, i.e. concrete stories[23] that told about a sequence of events on a high level of specificity, which would allow people outside the hospital to get a closer look into the often invisible and unmentioned processes of the ward; b) providing descriptions of the organizational context of these stories, which would position the stories in a concrete network and, thus, allow professionals practitioners, and others to evaluate whether the topics and the patterns of activity in the stories were highly specific to this network or were more general; and c) providing comments from the interviewees on the patterns of activity in the stories, which would allow laymen to learn about local perspectives of the stories and of the different types of reflections across occupational groups. Thus, in sum, my strategy for producing meaningfulness was to ground as many of the thesis' arguments and conclusions in concrete stories, descriptions, and interviews; d) providing concepts and arguments from academic literature that could throw new light on the findings and put them into perspective.

When choosing this strategy, the distinction between analysis and presentation became even harder to uphold, as it became an important analytical task to search for stories, which could be presented in the thesis and serve as foundation for and structure the further analysis. But how many and what kind of stories to present? The criterion of meaningfulness could not help me answer these questions, as they seem to depend on the practical and political purpose of my study: what the stories should be used for and by whom.

[23] The term "story" may be a bit misleading as the stories I wrote were not stories in the sense of being a narrative with a plot. Rather they are descriptions of action sequences as I observed them (e.g. a nurse's interaction with a patient). Czarniawska defines such descriptions as chronicles and argue that they do not make sense, because they lack a plot and hence a meaningful connection between the elements (Czarniawska 1999). However, rather than viewing this lack of sense as a shortcoming of the data, I see it as a valuable opportunity to analyze the connections between elements and build up multiple and partial plots about medical practice as opposed to defining these in advance. Anne-Marie Mol has coined the phrase "praxiography" for this kind of stories (Mol 2001), and I like the term better than "chronicles", because they are descriptions of practices that can be juxtaposed with other descriptions and thus make the multiple and interconnected character of life visible.

Centering on counter narratives

The concept of usefulness is deeply pragmatic: whether something is useful or not is not a question of essential qualities but of its ability to act as a vehicle in the continuation of a task or solution of a problem. As argued, I did – and still do – have the wish that this thesis should be of use to people somehow involved with EPRs and medical practice, or with information technology and work practices more broadly. Unfortunately, however, I could not and cannot predict what *will* be useful for them and for you the reader, who is reading these lines. I have had to rely on my own instinctive feelings and on the reactions and suggestions from a small circle of supervisors and commentators. Curiously, these feelings and reactions seemed to center on whether something was interesting or not. Thus, to some extent, the term "interesting" came to replace the concerns for usefulness, and I will later elaborate the way in which I tried to work up data in an interesting way.

However, concerns for usefulness to the public debate in general *have* played a role for the selection of empirical topics and analytical angles. Let me describe how. As described in the introductory chapter, mainstream and academic literature on EPRs focuses predominantly on either "implementation-issues" (often advocating best practices), technical issues in relation to connecting information systems across boundaries, or on the future of hospitals and medicine, describing potential benefits of introducing EPRs. How EPRs actually work in medical practices is only sparsely investigated, and my project entered as one of the first studies to shed light over this. I took this fact as an opportunity to deal with the widespread narratives on the role of EPRs. Yet I wanted to bracket these narratives for a while and investigate what role the EPR was actually playing in the everyday life at the hospital. In this way I hoped that I would later be able to evaluate the dominant narratives and perhaps present counter narratives.

Centering on specific change processes

Medical practice is a complicated affair, and a multitude of aspects can be addressed. I reasoned that I could not both make detailed analyses of the particular relations between humans and non-humans and paint a broad, comprehensive picture of the general role of EPRs in medical practice; I had to single out three-four topics and go in depth with these. The topics were pragmatically chosen as topics that: a) were supported by a lot of data; b) told something I found interesting about EPRs: c) related to some of the widespread core expectations from the EPR, weakening or questioning them. The four topics were "the writing and reading of physician notes", "the updating and reporting routines of nurses", "the medication process", and "the distribution of test results".

I wanted all four topics to deal with the relations among staff, patients, and artifacts before and after the introduction of EPRs. However, the problem was that the past medical practice only existed through the interviews with staff – I did not have any observations prior to the introduction of EPRs on which I could found the descriptions of practice, and I feared this would make my arguments about the past less possible to evaluate. For that reason, I decided to construct some "realistic" stories about routines before EPRs. Basically, I used the field-notes to find typical interactions between staff, patients, and artifacts. Then, based on interviews with the staff about previous routines with paper records, I wrote up small stories that exemplify how similar interactions and conversations would have developed earlier on. Thus, the stories of the past are fiction, but they are not unrealistic being based on staff's memories about a not so distant past. What is more, this trick allowed me to treat "now" and "then" analytically equal: to compare the arrangements of humans and non-humans involved in medical practice across time; to let both arrangements be commented by staff; and to analyze how roles, responsibilities, successes and failures were performed in both settings.

Scrutinizing sequences of events and causal explanations

Having chosen the stories that should act as "body of evidence" in each empirical theme, the next step was to analyze the sequences of events in

each story, literally, take the story to pieces and point to: the actors and actants that took part in each sentence/action sequence; the relations between these actors and actants; and the subtle or dramatic effects that were produced from the actions (e.g. listing the nurse, the physician, the computer, the record pages, the papers, the pens etc., which take part in preparing the "ward round"; analyzing the roles each of these entities take or are afforded; and point to the way the patient thereby becomes delineated as medical case). This was not an easy task, as I had to be aware of traps that I myself, unreflectively, had built into the stories. The stories were filled with sentences describing relations between humans and non-humans. But sentences can be treacherous in agency is distributed with the structure of sentences, allocating especially humans intentionality, skills, and power, which are in danger of being continued in the analysis as taken-for-granted explanations of interactions. Therefore, I constantly had to remind myself of reconsidering the stories – i.e. observed events – with special attention to the location of agency. I had to try analyzing the action sequences of the stories without framing the actants in advance, to treat humans and non-humans alike and point to other protagonists than the conventionally assumed.

Next step of the analysis/composition of the scientific story was to connect the analyses of the descriptional stories with quotes from the staff interviews. I wanted this connection to address two different, albeit interrelated perspectives on the descriptional stories: *a) the trajectory perspective*, which relates the descriptional story to other aspects of a duty (i.e. in what ways are the routines described in the story building on and feeding into other routines of that day's work?); and *b) the organizational perspective*, which relates the descriptional story to other routines being performed simultaneously, at other moments by other actors and actants (e.g. how are the tasks being accomplished and identities being enacted through the routine affect the practices of others across time and space?). In this way, I hoped to show that the descriptional stories of interactions between humans and non-humans are not isolated events but part of a vast and recurring organizational network of medical practice, whose qualities result from the interaction among multiple and dispersed trajectories of action. Moreover, I wanted to illustrate that these qualities have different consequences for different actors – that the effects produced in a sequence of events may seem logical or illogical,

expedient or harmful, or natural or monstrous depending on the position of actors in the medical network.

Finally, I tried to compare the analyses of stories and quotes before and after the introduction of EPRs. This comparison entailed focusing on the aspects of medical practice that had undergone changes and explicating how the EPR was deeply involved in these changes. However, the term "explicating" may need a little elaboration. The conclusions about how the EPR takes part in and shapes medical practice grounded in analyses of specific events and routines before and after the introduction of EPRs, and in quotes from interviews with staff members. In explaining of the role of the EPR, I was summing up, or boiling down, the many small and subtle ways in which the EPR occasions modifications in relations between staff, patients, and artifacts in the ward, rather than working from a preconceived notion about what were the competencies of the EPR. This part of the analysis, in many ways, came to resemble the procedure in grounded theory of finding core categories and saturate them theoretically (Strauss 1987). As these conclusions were formulated I came to think of many ways in which these conclusions could be put in perspective: by linking to concepts, arguments, and theories from the academic literature, or by linking to recurrent discussions in the newspapers and public debate. However, having experimented with such broader discussions in the end of the first empirical analysis, I came to the conclusion that I might better off waiting until all four chapters were in place. Let me address how this went on as the last subject of this chapter on methodology.

Addressing broader patterns

As I worked on the analyses of the four empirical themes, I gradually got the impression that, despite the differences in matter, there were many commonalities between them regarding the role of EPR. One of these commonalities concerned the way practice seemed to be simultaneously better coordinated across duties and wards and narrowed down to scientific-medical aspects as opposed to for instance a holistic medicine. There were also features that pointed in other directions such as the tendency to redistribute the risks of errors rather than eliminating them.

And, paradoxically, there were also conclusions from the analyses that pointed in the opposite direction such as the role of the physician, who simultaneously seemed to be enacted in a stronger and a less central position. How to draw the study together in a way that paid due attention to all these complicated and sometimes conflicting findings?

It is hard to spell out exactly how I wrote the discussion chapter. Having chewed on the empirical chapters for some time, I decided to structure the discussion so that it moved from the very concrete level of the role of EPRs and written artifacts, to more complex levels of organizational work, to the role of professions, and, finally, to the hospital as a complex system. My aim was to show how subtle modifications on the basic level might have consequences on an aggregate level, and on large-scale entities such as professions. However, the process became much more complicated than this strategy may appear, going back and forth between data, conclusions and literature. Also, I came to realize that to make this work, I could use inspiration from other places. In that respect, this chapter came to incarnate many of the dilemmas and trade-offs that I have come to see as parts and parcel of a constructionist approach – and perhaps of many other research agendas too. I have already touched upon the dilemma between bracketing and framing. I will, therefore, shortly address two others.

The first dilemma concerns two somewhat mismatching concerns, namely, on the one hand the wish to show how entities that are taken for granted and presented as essential or natural are performative outcomes or network effects that collapse or change as networks disorganize or reorganize, and, on the other hand, the wish to tell a clear story with a plot and, hence, a casting of stable or at least bounded characters. One could argue that although I allege to avoid essentialist and reductionist explanations, my treating of human actors such as the physicians and nurses is still quite traditional. I do not use much descriptional space to show how these identities are neither fully fixed nor homogenous but recurring accomplishments. However, I came to the point where I simply had to make the discussion work and, consequently, put things in a way that corresponded with the way in which other texts talked about these things (e.g. the sociology of professions, which at large treat physicians as one homogenous and static group) – or put differently, make a closure of the analysis. Although I grant the critique of such ”reifica-

tion", I want to point to the fact that compositional and argumentative concerns are very important aspects of a scientific story too in order to create meaningful and useful stories (cf. Sommerlund 2002).

The other dilemma concerns the way conclusions are stated. As described I moved from being an optimist on the possible benefits from introducing EPRs to taking up a more pessimistic or skeptical stance. Although this movement was driven by the analyses of data, it might be argued that I have put too much weight on the problems of EPR rather than focusing on the benefits or on the possibilities of organizing things differently. On the one hand, it is important to draw things together and make a statement. But the statement is also a closure and a simplification. This is a balancing act between a gloomy pessimist position and a dewy-eyed optimist, and I am not sure I have stricken this balance yet. This brings me back to the question of usefulness, as the above considerations, to a large extent, are speculative and forestalling. It is my hope that this thesis will somehow help avoid simplistic pictures of medical practice and the way in which EPRs can change this. Also I hope to point toward aspects that work to narrow down the scope of medical practice and restrict the possibilities of patients to take active part in their own construction. But I also hope, indeed, that the analyses in this thesis will point toward possibilities: toward unexploited opportunities and to ways that things can be different – to paraphrase Rorty.

4

Computerizing physician notes: expanding the circle of authors and readers

Introduction

Dissolving the subject-bound authorship

It is customary to attribute the act of composing a text to an author – or occasionally, a couple of authors. This subjectivization of authorship is encapsulated in our institutions, which reward or penalize authors for their texts. True, most texts are certainly written or otherwise embodied by a person. But as for the different elements of the text, they derive from other state-making actants and embody different logics and interests, which might be difficult to track down if one subscribes to the narrowly defined concept of a single author. Instead, it is fruitful to consider the way a text comes into being as a long-stretched process in which "the author" encounters (that is reads, hears, and sees) statements from other authoring entities and correspondingly answers – im- or explicitly – with new statements. The successive combination of these statements forms a discursive universe, which "the author" draws on in the moment of composing the text. Thus, he draws on a network, which is already imbued with signs, narratives and rhetoric – dimensions highly relevant for his own authorship. In this regard, the gradual collocation, construction and recombination of statements are steps in a long "authoring" process, which precedes the actual text composition. (Vis-à-

vis the more heroic rendering of text-builders/world-movers in Latour (1986) and Rip (1986)).

In relation to medical notes the authoring process is even less centralized and subject-bound than normally assumed. This is true of the paper-based record, but with EPRs this feature becomes even more pronounced. The computerization allows more "authors" to contribute to the construction of patient-cases and blurs the opposition between reader and writer-positions. In this chapter, I shall describe how this comes about and analyze what seems to be the result concerning the character of physician notes and of the relationships among physician, nurses, and patients.

The EPR and the physician notes

In august 2000 an EPR-system was introduced in medical wards in Svendborg Hospital. From day one, new records had to be made electronically and old ones continued as EPRs. The EPRs can be retrieved on computers placed in the ward office and from the head doctor's office. The following figure illustrates how the computers are placed in the ward office:

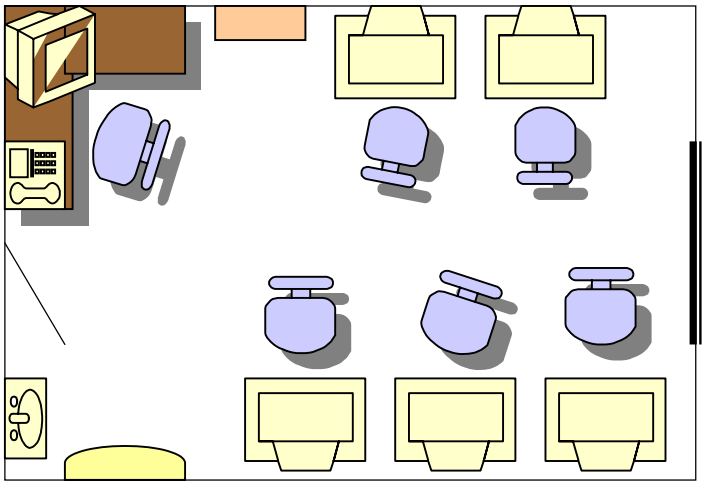


Figure 4. 1: The office in the Admission Ward. The secretary's table and computer is in the corner and the five tables with computers are for the physicians and nurses

In the new system a patient record consists of different electronic folders, are accessible from a variety of interfaces. Basically, the screen is divided into three areas. Left is a file tree, which shows the different

parts of the record and the dates for the last entries into the different folders. These parts are: MediCare cover, previous hospitalizations, state of affairs, laboratory schemes, physician notes (containing the "*kontiuationer*"[24]), nursing notes, physiotherapy, types[25]. The right side shows a specific document, e.g. the physician notes. At the top of the record is a menu bar with the following options: Record, show, state of affairs, folders, write document, prescribe, search, and help. The following figure illustrates how the EPR appears on the computer screen:

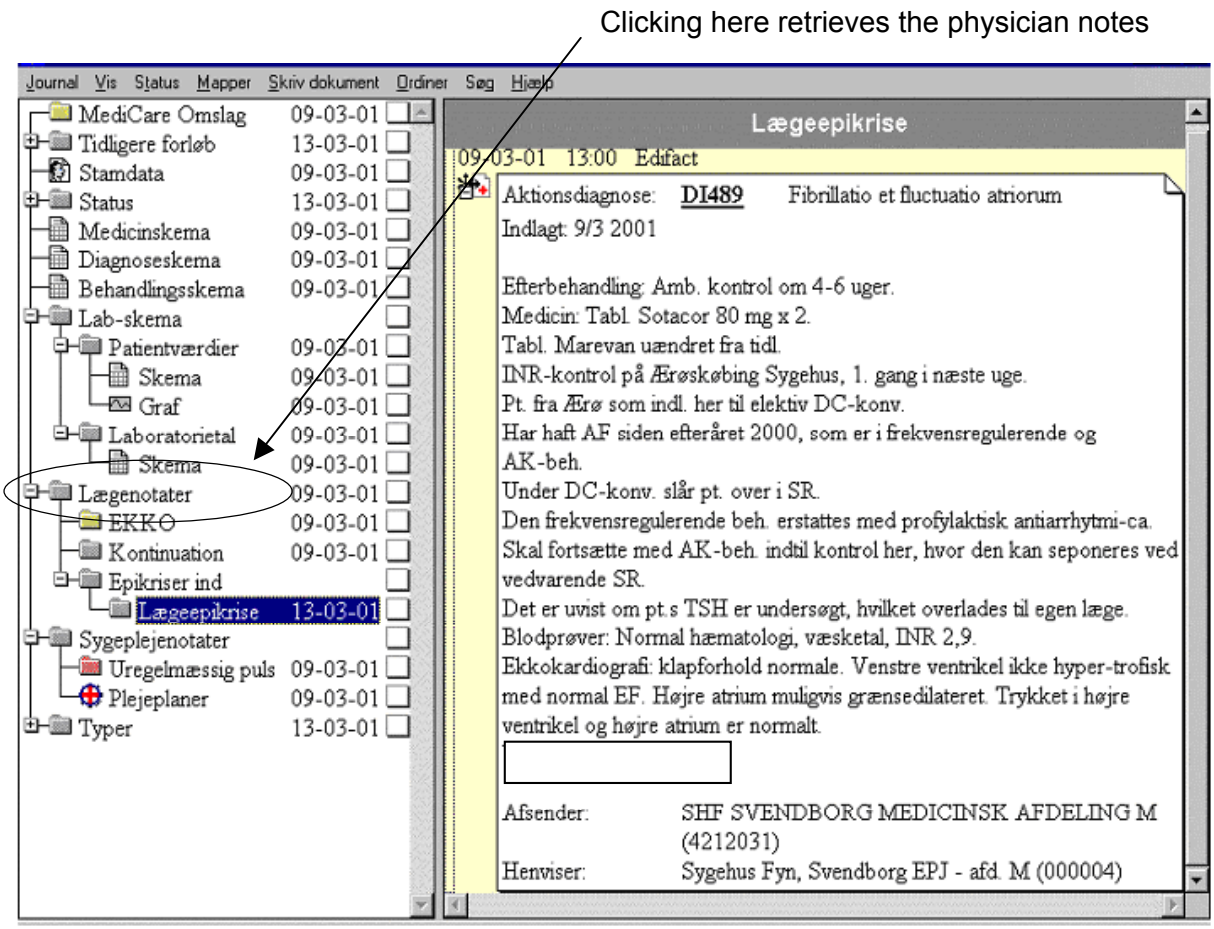


Figure 4. 2: Screen picture showing the file tree (left) and a discharge commentary (right). Original names removed.

[24] "Kontinuationer" is the Danish term for the progress notes, which are continued as long as the patient is hospitalized. Here the physicians write dated notes about the patient's medical history, current condition and tentative diagnosis, and decided actions. See figure 5 for details.

[25] "Types" is a way to get an overview of the different types of documents in the EPR. Originally, this function was added by a programmer, who thought it might be relevant. However, nobody uses it in daily practice, and it will soon be removed

The document on the right side of the screen gradually grows longer and longer as new entries are filled in. The date on the file tree shows when the last note was made.

The electronic record has a sibling, the record-cover, which functions during the period of hospitalization. The record-cover consists of a plastic folder as illustrated in figure 4.3 and holds all documents that cannot go into the EPR (or are not yet in it): the referral note, old paper-based record notes, electro-cardiograms, laboratory figures, etc. On its front-page is a label shown in figure 4.4, there is space to mark if the patient has been hospitalized before and for what. During hospitalization the record-cover is kept on a bed-numbered shelf in the office. Afterwards it is destroyed.

Figure 4.3: The record-cover

250126-1743
Holm, Marie
Old Town Road 22
5220 Svendborg
Ward: M XA
Admitted: 11-28-1999
4:15am

Figure 4.4: The label printed from the EPR. It is used to stick on blood tests orders, personal belongings, letters etc.

The keeping of medical patient records is mandatory by law. Thus, every hospital must in some way or other keep records on medical examinations and treatments of patients and store these records for at least 10 years. This recording is “technique-neutral”, which means that no spe-

cial rules apply concerning the specific recording-technology. But the recording must be able to function as:

> "…necessary internal means of communication among the personnel that participate in examination, treatment and nursing, with the purpose of securing the best possible foundation for the diagnostic process and effectuation of the adequate treatment (…) Furthermore, the record can be of significance concerning the inspection and control of physicians' professional activity. Besides this, the record makes it possible to evaluate the quality and efficiency of the work carried out and can be an incentive to professional development. The record can also have considerable significance for research in medicine " (Simonsen 1999 p. 321, my translation).

In Svendborg Hospital, the physician notes, which are called "kontinuationer", usually contain four types of entries. The four types correspond to the different phases in the patient trajectory and are made by physicians adopting different roles. The document starts with a "*hospitalization note*" signed by the physician on "front watch", who makes the initial examination and questioning of the patient. Typically, it contains a brief description of the reason for hospitalization and diagnoses; information about medicine up till now; a closer description of the symptoms and circumstances up to hospitalization; a going through of the main body parts headed "*objectively*"; a conclusion, and a plan for drugs and examinations to be prescribed. The next entry is usually a note called *a "going-through*". It consists in a written follow up by a more experienced physician working as back watch, where the first information is supplemented with further examinations, measurements, etc, and tentative diagnoses. Subsequently follow notes called "*supervision-notes*". The length of these vary from very short notes about new information and decisions to more developed reviews of previous information in the light of new discoveries. The physician responsible for the daily ward round makes these notes. Finally, the document is concluded with a "*discharge note*", summing up in brief the hospitalization process, the course of the disease, and whether the patient has been referred to other wards or institutions. Even though the specific terms can vary from hospital to hospital, from physician to physician and even from time to time,

the basic structure in the patient record has been like this for decades and has not changed with the introduction of EPR.

What has changed is the way notes are made, that is, the process from the first meeting the patient or his or her name and identification number, to writing words in the record. In the following, I shall illustrate how things have changed. This will also show why it is actually a piece of disingenuousness to call the physician note, the physician's note.

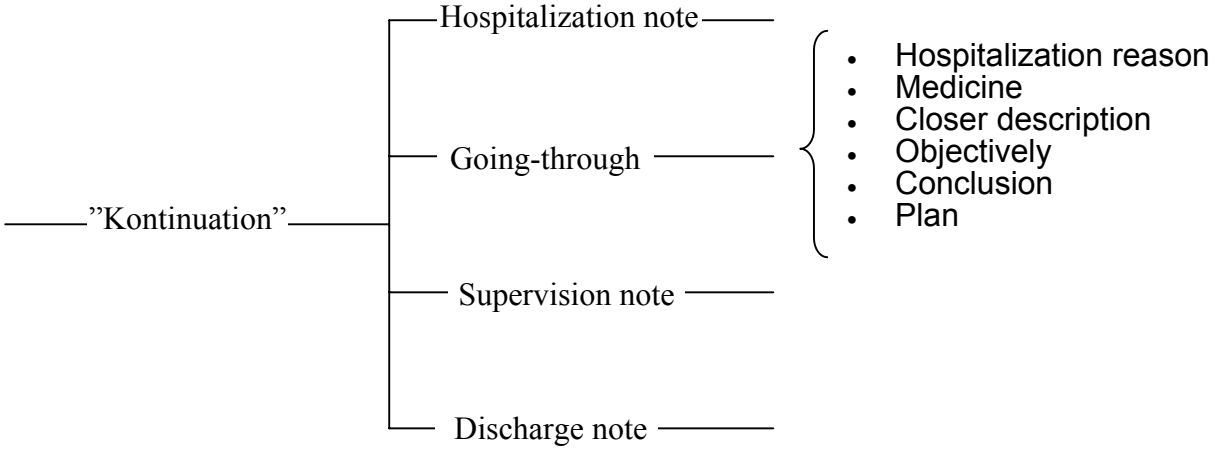


Figure 4.5: Physician notes ("kontinuation") comprise four parts, and the first of these (the hospitalization note) deals with six topics.

The making of a hospitalization note

As described above, a physician note consists of four parts. In the following, I will focus on the "hospitalization note". There are two major reasons for this focus: First, the physician dictates the hospitalization note (and the three other notes). That is for sure. But when it comes to the statements in the note – why and how the physician records and what he records – a close examination of the recording itself will not be of much help; the physician and the Dictaphone will remain black boxes. In order to understand how the note ends up containing certain statements it is useful to expand the field of investigation to the sequences of events that precedes the recording moment and shift focus from the moment of

dictating to the whole authoring process. Let me illustrate this with a description of the hospitalization of patient, Mrs. Holm. Second, this focus allows me to simulate a step back in time, as the way hospitalization notes are made resembles how things were before the introduction of EPRs (a step that will pay off later when I discuss what happens when records are computerized). The description is based on observations of a physician, Peter, in a medical reception department, and thus Peter is the protagonist of this classic story of authorship.

A classic story of authorship

> "It's 08.45 and Peter has just left the morning conference, where 12 physicians were gathered to get information about new-admitted patients. Suddenly his beeper sounds, and he phones the Acute Reception: A new patient has arrived and is waiting in the exploration room. Peter walks three floors down to the AR-office, where he meets Nina, a nurse. She informs him about the patient, Mrs. Holm, a woman in her seventies and a former nurse, who has previously been operated for a lung cancer and now has great pains in her chest and back. She is in ward 23.
>
> After looking briefly at the referral note lying at the secretary's table, Peter says to Nina: "Give her some liquid…and she needs a bacteria cultivation again!" He takes a record-cover with Mrs. Holm's name from a shelf with the number of Mrs. Holm's bed, sits down and logs into the EPR. With a quick glance at the up-coming record, he realizes it has just been drawn up; it contains just a front page with little information. "Mm, nothing here about her", he says; takes the record-cover and leafs through the papers in it. It contains comments from the nearby Radium Hospital, anamnesis sheets, and laboratory figures from previous hospitalization. He looks at the figures and utters "yes, very characteristic for bone marrow cancer!" He turns to the computer again and clicks with the mouse on the menu-line and the curtain popping up at "prescription sheet". He prescribes "broad sampling". Nina, sitting by the computer next to him, asks "Do you have any suggestions of blood test for her?" Peter replies "yes, I'm punching them in right now". Nina hands him some blood test requisitions "…and can you put some crosses on these!" He takes the forms and turns his attention back to the referral-note where he reads what kind of medicine Mrs. Holm is taking. Looking concen-

trated, he takes from the white-coat pocket a time-manager also containing a self-made reference book about drugs: “If they have high levels of leukocytes one must not prescribe X!” He clicks on the screen “medicine prescription”. On the up-coming sheet, Peter enters the name of most of the medicine she has had until now and a few new drugs. Then he gathers the papers on Mrs. Holm together, quickly crossing the boxes for the relevant blood tests and walks out of the office towards the depot to get some spatulas. Picking up some blank sheets at the printer in the office he looks at a big white-board in the hallway where all patients in the section are listed with their initials, ward number, responsible nurse etc. “Ah, ward 23!” he says and walks into the ward, knocking on the door.

“Hello, my name is Peter, and I’m a physician. I’m going to take a look at you, but first tell me what has happened to you recently!” Mrs. Holm lies in the bed. She tries to smile a little, but it ends up in a grimace, obviously she is in great pain. Whispering she tells about the last days. Peter nods and asks other questions like “do you have visual disturbances?” He pulls the duvet aside and examines her body. Sometimes she mourns when he touches aching parts of her chest and back, apart from this the room is silent. Then he asks about her previous medicine during the chemotherapy, but Mrs. Holm can’t remember it all. At her bed table lies a plastic-bag full of different drug cans. Peter goes through them and asks how many pills of each kind she takes. During the whole session he writes small notes on a paper sheet. “Listen, Mrs. Holm. Now I’ve been examining you and I think I will focus on clearing up the state of your immune response. Do you know what this means?” Peter asks. Mrs. Holm nods weakly – she has been a nurse herself. Peter says goodbye and leaves the room, heading for the AR-office.

In the office he meets the head doctor. Peter tells him about Mrs. Holm and what he intends to do about her. The doctor agrees with this and they briefly discuss what will be the most appropriate medicine for her. Peter grabs his Dictaphone and a recording tape in a box at the secretary’s table. Looking again at laboratory figures in the record-cover of Mrs. Holm, he points at them and tells me “here, you can see: she’s a classic AML (acute myeloid leukemia)”. Then, gazing out of the window, he starts dictating the admission-note, once in a while looking in the papers of the patient and on his notes. About five minutes later, he ends the dictate and turns to the computer. Now, Mrs. Holm is listed on the screen and he clicks her ordination-sheet up. New tests are ordered!

The above story is told with the physician in the role of protagonist in the sequence of events leading to the recording of the hospitalization note. More specifically, he is the data-gathering and -sorting author that synthesizes his research in the hospitalization note. Seen from this perspective – and from the perspective of medical law that holds him responsible for the content – it is his note. But it would be misleading to claim that he is the sole author. Rather, Peter is a node in a small, yet intricate authoring network of actants that contributes to the production of notes. The story could also be told in a fashion that makes Peter one actant in this network rather than the sole instigator of action. For instance, let us see what happens if other entities play the part of protagonists[26].

Introducing a variety of protagonists

Here comes the case as it could be told if we were following the physician on night shift – one of the first among the hospital staff to meet Mrs. Holm as she came into the hospital:

> *The physician on night shift, Louise Smith*
> It is 08.45, and physician Louise Smith has been on duty the whole night. She is going to the morning conference to report – and then she can go home and sleep. She is tired, and her eyes are irritated from reading her scribblings. The next patient-name to be highlighted on the wall screen is Mrs. Holm. Louise considers what to say about her. She thinks Mrs. Holm's leukemia is relapsing, and looks among her notes to find the one she made on this patient. Finding it, she

[26] This compositional principle is inspired by the dogma in actor-network theory, "follow the actor", which I wanted to practice in plurality to convey a sense of the interrelatedness and multiplicity of the authoring process. In the theoretic field of comparative literature this form is not unique, but well known as the principle of for instance Lawrence Durrell's "Alexandria Quartet" or the short stories of Raymond Carver (screen adaptation "Short Cuts" by Robert Altman). To studies of technology, on the other hand, it might be more exotic. Still, my intention is to show how a range of agents each handle the arrival of a sick person and concomitantly add to the textual universe surrounding this person-as-a-medical-patient, the textual universe on which the notes in the EPR draw.

> reads out aloud: “An elderly woman came in tonight with pain in the back and chest. She is known to suffer from leukemia. We better clear up whether something is up again!” Louise sighs and looks at her colleagues. Some of them nod in agreement. Also, she sees Peter, the next front watch, writing on a scrap of paper.

Besides the reception crew, the physician on night shift is usually the first person to talk to patients arriving at night. If it is not an emergency and everybody is busy, the physician reads the referral note, makes a short examination, and makes sure the most acute needs are tended to. Often she just writes a few cues about the case, so that she will be able to make a short report at the morning conference, as Louise Smith does in the case of Mrs. Holm. The morning conference is structured as a 20-minute meeting including all the medical physicians on duty that day. They sit around a big table with a beamer that projects a computer-generated list of names of patients that have arrived during the night. It shows their name, identification number and suggested ward placing. One by one, the patients are introduced and commented by the physician on night shift and, occasionally, some of the listeners – mainly the head doctors and the senior residents – asks further questions or suggests alternative interpretations or actions. In this way, the forum is establishing a shared body of knowledge and interpretations of the new patient cases. By reading her notes aloud the physician on night shift plays an important part in the collective framing and in the further telling of the patient case (cf. Atkinson 1995). In our case, Mrs. Holm is presented as an elderly female (age sometimes indicates a less interesting case and, definitely, a less aggressive treatment plan), a medical case (not a surgical or a psychiatric case for instance), a pain-in-the-upper-body-part case (thus pointing at relevant body parts to be dealt with), and a likely development/continuation case (not a mystery or a piece of cake). Within a few seconds, these statements are on Peter’s piece of paper and follow him downstairs to the ward office. Here, he will go about the day’s work, which usually begins with seeing the new patients. But first, he will check with the nurse. At this point, she has tended to the patient and developed her own view of the case:

Nina, the nurse

Nina has been on duty since 07.30 and is busy doing a round to "her" patients. There is a new lady, Mrs. Holm, in bed 23. Nina presents herself. Mrs. Holm doesn't look well, and says she has a lot of pain in the back and around the side, where she has had an operation for lung cancer. She is quite precise about her bodily sensations and adds that she had been a nurse herself. Nina tries to comfort her and tells her what is going to happen: that she will measure Mrs. Holm's temperature, pulse and blood pressure, and that the doctor will come and examine her later. But Mrs. Holm doesn't seem to listen anymore – obviously she is using all her energy to endure the strong pains. Nina takes the measurements as quickly and gently as possible and goes back into the office with the numbers on a piece of paper. She glances at the referral note, which lies at the table. She logs onto the computer, enters the numbers in the sheet for "patient figures", and begins writing some words about Mrs. Holm in the nursing notes. After a while, the front watch, Peter comes in, and Nina tells him about Mrs. Holm: "She is a former nurse, and has been referred by her general practitioner because of very strong pains in the chest. She seems tired and exhausted but she really tries to control herself".

The nurse is responsible for the reception of patients on the AR ward. This involves rigging up the room with a table and equipment, dressing the patients in hospital clothes and getting them something to drink, measuring body temperature, etc, and comforting and soothing the patients talking to them about their situation, briefing them bout what is going to happen, listening to their anxieties, and supporting their body with pillows, etc. (The work of the nurse has been thoroughly described in Strauss et al 1997). Through performing these activities, the nurse gets to know the patients. Typically, she notices how the patients handle their illness (basically, how he or she handles pains and worries), what they can or will understand, how their social network looks, and, very importantly, how much they do themselves, like going to the bathroom, eating, etc. Thus, the nurse gradually forms an opinion about the resources and psychosocial coping style of the patient and his or her bodily affectedness. This formation is connected to other statements in at least two directions: to other nurses' statements through the nursing notes in the electronic record and through the exchange of remarks in

hallways and the office; and to the physicians' statements through the routine interchanging of information in the office (sometimes the physicians read the nursing notes also, a point that will be developed later). Moreover, these conversations are by no means unequivocal and simple exchanges of information. An example can be found in the story of Nina above: Nina tries to counter what she thinks is Peter's bad habit of disregarding the patient's own opinion (as she later told me, the researcher), by emphasizing Mrs. Holm's professional background. She highlights a certain characteristics of the patient in order to prevent alternative interpretations.

This illustrates a more general point namely that agents mold their statements according to whom they interact with. The individual statement about the patient is formulated to help produce certain effects. But in addition, it adds also to a growing discursive web, in which the original purpose of the statement slowly fades out of sight as it circulates and is translated. Thus, presenting the physician with the statement: "Mrs. Holm has strong pains", the statement is connected to other statements about Mrs. Holm and acts in establishing the final hospitalization note that Peter will write. Exactly what destiny it will have in this note is not settled, when Peter leaves Nina, since the faith of a statement is always in the hand of others (Latour 1995) and the value of a statement is also assessed on the basis of its association with a trusted human resource (Circourel 1990). But already at this point, it is clear that Peter, who has not yet met the patient, will be anything but a *tabula rasa*, when he actually does. He will have Nina's portrayal of Mrs. Holm as an enduring person and a former nurse, various measurements of her body state, and the physician on night shift's opening comments as they are inscribed on his paper. Moreover he meets other voices before he reaches the point of dictating the note. Thus, the next actant entering the authoring process is the referral note, which carries the general practitioner's voice about the case of Mrs. Holm:

> *The referral note/general practitioner*
> It is in the middle of the night, and the general practitioner is examining Mrs. Holm in her home bed. He decides that her condition necessitates hospitalization and makes the referral note in a hurry. When the ambulance arrives for Mrs. Holm, the doctor hands the

> note to the paramedics, who take it with them to the hospital reception. The note is a handwritten piece of paper that tells the receptionist why the patient is being hospitalized. Its words prompt him to phone the physician on night shift. When this physician arrives the referral note is handed over to her. It informs her about the symptoms of Mrs. Holm giving also a short resume of her medical history. It is then carried to the secretary's desk at the AR-ward. At 7.35, the nurse, Nina, picks up the note. It tells her about the symptoms but doesn't capture her attention long – its "hen scratches" make it a little difficult for her to decode the message, and she puts it down between other papers on the table. Some minutes later, the secretary digs it out and it explains to her the case of Mrs. Holm, but soon it is placed foremost in a record-cover and put on a shelf. An hour later, Peter, the front watch, comes by, takes the cover and rummages through it. He finds the note and takes it with him to the computer, where it tries to tell him about Mrs. Holm, competing with the screen and other papers for his attention. It beats the rivals by informing him about Mrs. Holm's medicine. Then it is put back in the record-cover, where it lies for half an hour until it has to repeat the words about medicine: first, when Peter enters information in the computer; and second, when he dictates the hospitalization note.

The comic-like anthropomorphism aside, the sequence above shows how the referral note enters the authoring process at several times: a) when the physician on night shift admits the patient; b) when the secretary draws up the electronic record; when the nurses prepare for meeting the patient; c) when the physician on front watch prepares for the examination of the patient; and also d) later, when he prescribes medicine, orders tests, and finally dictates the hospitalization note. Being both an entry ticket to the hospital (by stating the presence of certain, medically acceptable bodily conditions, which require deeper medical clarification and treatment) and a collegial message (about the patient's previous medical history and present condition in terms of acknowledged medical symptoms) the referral note is an important enunciator in the authoring process. Through it, the general practitioner states the case as having manifested certain symptoms and positions it in a trajectory of previous diseases and present drugs, thereby indicating a probable frame of interpretation. But while the note builds up a professional rendering of the case, an equivalent reading is not guaranteed. Some general practitioners

are rumored among the hospital physicians to be "admitting every living thing" and referral notes from their hands are read with suspicion. No matter what, any referral note will sooner or later be included in the record cover, where its status is once more translated. But prior to this follows a line of work with the patient case done by the secretary and technologies, such as the electronic records system, databases, and archives. In the next story, we shall follow the authoring process via the record cover's prime "chaperon", that is the secretary:

The secretary

Mrs. Andersen is a secretary at the ARW. She has just arrived and is sorting the papers on her table. She starts with the upper left corner, where the papers about arriving patients are placed, and finds a referral note on a Mrs. Holm. She skims it and opens the patient list on the computer, but Mrs. Holm's name doesn't figure on it, which means that she is not yet registered as a patient in the hospital. She checks if Mrs. Holm already has an electronic record by entering the name and identity number of Mrs. Holm, which she reads on the referral-note. Nothing comes up. "Hem, there might be an old paper journal on her to order from the archive, but for now I'll just draw up her record, so we can get some labels!" Mrs. Andersen says loud to herself, clicks on the mouse and fills out boxes and spaces thus shaping a new record. Automatically, this puts Mrs. Holm on the patient list. Then, Mrs. Andersen puts a label-sheet in the printer and prints out 32 labels with Mrs. Holm's name and other data. She takes an empty plastic cover, sticks a label on its front page, and puts the referral note that was brought in with Mrs. Holm and the rest of the labels in it. Taking a label with her, she walks out into the hallway and down the stairs to the archive, where she meets the clerk: "Good morning, I'm just checking if we have something on this", she says and waves the label. On one of the long shelves, stowed with thousands of paper folders, she finds a thin paper record on Mrs. Holm. Mrs. Andersen checks the record out and takes it back to the office. After answering the phone and talking to one of the nurses, she takes the old record, flips through its content, sorts a few sheets with old laboratory figures into the new record cover and puts the rest in the back of it. She then opens the database of county-hospitals and enters Mrs. Holms name. A list of hospitalization occurs – some in this hospital and some in the central hospital -and also a list of available documents. Mrs. Andersen looks at the dates and diagnostic

codes, takes a print of them and, in addition, the latest X-ray comment, and places the prints in the record cover. After a couple of other errands, she continues with Mrs. Holm's cover. Mrs. Andersen clicks up the front page of the electronic record and enters the address of Mrs. Holm. Also, she lists the different hospitalization events. On the front page of the record cover she writes the dates of the previous hospitalizations too. "Alright, now everything should be in perfect order", she says, and puts the record cover on a shelf for the bed in question.

During nighttime there are no secretaries in the ward. Thus, all basic paper work, like drawing up electronic records and record covers, retrieving old records, etc., has to wait until the secretary arrives at 8 am. In principle, the night physician or nurse could do some of this, but usually they are too busy or do not consider it part of their job. Moreover, they don't know many of the subtle procedures and codes that are necessary. Usually, the secretary can easily spot if some physician has tried to draw up a record himself. Her job is to ensure a standardized registration of names, identification numbers, dates, diagnoses, figures, pictures, and documents. To help her with that she has an array of different techniques and artifacts. Some of these are homemade as for instance the way she arranges papers to be dealt with. Others are officially approved although not exactly written down (e.g. the procedure for handling new patient cases). Through this procedure, chunks of information are assembled and placed in position in order to produce a document about the patient. This document has to meet two requirements: First, it must be set up in a way that ensures the record will be acknowledged as the official, and legally binding, record about the hospitalization. This entails stating the case in a way that prevents future misunderstandings about who the patient is and where, why, and how long he or she has been hospitalized. Second, it must serve as a tool for internal communication among the staff. This is why the labels, the patient list in the electronic record, and the record cover must be produced in a proper way, as these artifacts will later act as reference points, key maps, bulletin boards, in short, communication facilitators and discipliners. Also, she seeks to retrieve further material by connecting the identification number to different kinds of internal and external databases. From here, she selects and copies information and fills it on and into the cover.

By the pigeonholing work of the secretary, Mrs. Holm becomes a "real" case, measured out and lined up in prefabricated boxes and spaces, equipped with numbers, dates, and codes – translated into bureaucratic building blocks. But searching, retrieving and sorting information is also a framing, a narrowing down of content. Though not many consider such standard procedures an issue, the secretary loads the record with statements; statements that will be repeated over and over again in the further process. In general, when a physician dictates or writes the physician note, he repeats information already printed on the record front page or on papers in the cover. So does Peter in the end, when he dictates the hospitalization note. But before that, he invites another actant, the reference book, to join him in the decision making – and thus the authoring process – concerning Mrs. Holm:

> *The reference book*
> The reference book has been sitting for quite a while in Peters white coat pocket. It consists of a homemade appendix to Peter's time manager. Suddenly, it is taken up and Peter is leafing through its sides. "Chronic obstructive lung disease…, diabetes…, immune response – high leukocytes: no X" it directs him firmly, and is then put back in the dark.

Although trained to remember lots of details, physician's memories have their limitations faced with the vast registers of diseases and drugs. Thus, their offices are equipped with different kinds of encyclopedias and summary books, which are consulted every once in a while. References can also be found other places like the Internet (e.g. the Medicine Catalogue and the so-called "Instructions", which is a locally developed Intranet protocol about the procedures to be followed in case of certain common diseases) or pocketbooks, which has the advantage of being small and thus portable. Still, the point is the same, namely that these texts enter the authoring process as "objective" voices, that is scientifically recognized authorities, that guide the physician in his further actions: which actants can he let in? Which must he avoid? Even though they are not mentioned explicitly in the final hospitalization note, such almost-formal laws (in joint action with the fingertip knowledge of the physician) act in the text as implicit authorities, which lead to certain structures and successions of propositions and, furthermore, justify the

connection between the different parts of the hospitalization note, between "situation", "objectively", "conclusion" and "plan".

To be useful, the rules in the reference books need a starting point, that is, physical symptoms, verbal assertions, and, most importantly, measurements. The referral note gives some hints, but the physician is obliged to undertake a thorough examination of the patient. Thus, the patient enters the authoring process as both the most and the least distinct of the participants: even though her body ends up being the most quoted entity in the hospitalization note, she, as a person, hovers between voice and muteness, between visibility and invisibility:

Mrs. Holm

It is early morning and Mrs. Holm has just arrived to ARW from the Admission Ward. She has a lot of pains, which makes her face wince as she is wheeled into an empty ward. The room is bare except for the bed, a chair and a closet. After a few minutes a nurse enters. Mrs. Holm whispers hello, and the nurse presents herself as Nina. Nina tells Mrs. Holm that she knows Mrs. Holm has pains in the chest, and asks how she is doing right now. "Oh, I'm not that well" she says and tells the nurse about her sensations: "I have this stabbing pain in upper thorax, behind the scar from my last operation…" The voice of Mrs. Holm is a bit unclear, perhaps from enduring the pains. "You know, I used to be a nurse myself, and now I'm here…" Mrs. Holm pauses with a weak smile and closes her eyes. The nurse says something about taking her blood pressure, but apparently Mrs. Holm dozes off and doesn't listen.

20 minutes later, a physician comes into the room. He begins asking Mrs. Holm about the course of events. She answers in short sentences: "I…I, have had these twinges for some days now in the upper thorax, and, and…no, no nausea". Mrs. Holm sighs; the simple act of speaking seems to cause her trouble. The physician helps her taking her shirt off and starts examining her body. Her limbs are lifted, her organs palpated and she breaths deeply to let the physician listen in his stethoscope. From time to time she moans when the physician touches her body. "My body feels sore all over", she utters and closes her eyes. The physician asks her what medicine she takes, and Mrs. Holm points at the bag on the small table. "I think everything is there!" she says. Finally, he tells her that he will go and do, and she nods and closes her eyes.

Almost all of the arriving patients share the experience of being ill and encountering the hospital network in a somewhat enfeebled condition. To some, this is not a great deal, since they might be used to it and know how to handle the different situations. To others, in contrast, hospitals invoke feelings of powerlessness, despair, or distrustfulness. Also, the sense of body and mind can vary a lot from person to person, why they state their situations quite differently. In our case, Mrs. Holm is a former nurse. From her profession she knows the medical names and locations of different body parts and thus she determines her pains in a way that fits nicely into the physicians' network. She also knows that hospital staff will want to know about medication and has brought her pills with her. At the same time, she is weak from the rage of the diseases in her body and does not have the strength to tell much. Thus, paradoxically, she enters the authoring process as both the central figure of the text and as a very restricted narrator; restricted by her own constitution and by the physicians' professionally ingrown disinterest in the patient's verbalizations (see Foucault 1972 for a detailed account of the birth of the clinic and the development of the gaze as the prime epistemic tool). What comes from her tongue is not as strong a statement as the deflection on the sphygmomanometer, the reddening on her skin, and the conspicuous mark on the X-ray picture. The stronger statements share being mediated by technology and by the hands and categories of the physician[27]. What makes them strong is the way these mediators, each or in combinations, translate one message (e.g. the flow of blood in the arteries) to another (e.g. the sphygmomanometer needle dropping from one number to another) to a third (e.g. a professionally agreed too low blood pressure for such a person), which in the end fits perfectly into the routines, task definitions and resources of the hospital. This means also that

[27] An important part of the clinical examination is to palpate the patient's body in order to determine the organs' size and condition. The different body parts will in theory – or customarily – give clues to what is affected and how, which will later be reported in the note under "objectively" and give rise to further interpretative statements as mentioned above. But a curious thing goes on in this "objective examination". For instance, the "renal region" is a standard area to be assessed, and conventionally, it has to be "free and non-sore". But when asked how a "free renal" feels, many physicians admit that actually this is hard to say. Even so, statements like this appear in the majority of hospitalization notes.

statements, which cannot make alliances with other actants, risk being ignored or not paid attention to (how technology and organizational routines embody standards, which silences non-fitting entities is demonstrated by many studies within social studies of science and technology see for instance Star 1991). Thus, Mrs. Holm shapes her future representation in the hospitalization note more than usually, when she involves anatomical terms and drug containers in the interaction with the physician. By doing this, Mrs. Holm makes herself translatable and increases the chance of being heard by the physician the way she wants to. It is for example pointed out by Sally Macintyre that physicians' and nurses' questioning of a patient is guided by commonsense typifications about different patients and their assumed competency to answer the questions – unless the patient elicits information that disprove the predictions based on such assumptions (Macintyre 1978).

By now, we are almost at the final stage, where Peter dictates the hospitalization note. Only one more actant needs to be followed, namely the head doctor, whom Peter meets in front of the office after leaving Mrs. Holm. Once more, propositions and comments are introduced, nesting and negotiating with each other:

> *Head doctor Johnson*
> Mr. Johnson finishes a visit to a patient and heads for the office to put back the record-cover. In the hallway he meets Peter, a young resident, who stops him and begin telling about the new patient in bed 23. Mr. Johnson listens for a while – by the look of his face one senses that he thinks the case sounds quite obvious: "A classic AML" he utters and continues "alright, you seem to have everything ready. I guess she can't take common antibiotics. What about giving her some Hexamycin?!" Peter nods and says that he agrees. Then, they walk into the office.

The group of physicians at the medical ward comprises young residents on training; more experienced "1. residents" and head doctors who are the experts and professionally responsible. Shifts are manned so that a team consists of both experienced physicians and apprentices. During the shift, younger residents will often discuss their cases with the experienced residents and head doctors, who must supervise and instruct as part of their position.

When Peter, the young resident presents the patient case to Mr. Johnson, two things of importance to the authoring of hospitalization note happen. First, the case is summarized once more (the fifth time during the hospitalization trajectory of Mrs. Holm) now face to face with a medical supervisor and, therefore, stated as a chain of propositions and arguments legitimating a certain conclusion. Second, the head doctor confirms the validity of this conclusion (by not disputing it), and states the inference that additional medicine must be prescribed – thus framing the further action to be taken. When Peter leaves Mr. Johnson and dictates the hospitalization note these statements are still in the air, ready as narrative templates and discursive fragments. As for all the other statements made along Mrs. Holm's hospitalization trajectory (the referral note, the nurses rendering of Mrs. Holm etc.), they too embrace Peter, even though some of them are not supported by other actants than the mere memory of Peter. Loaded with statements, he begins the sixth – and official – summary of Mrs. Holm, the hospitalization note.

Recapitulating the textual universe

By this last narrative fragment, the scene with Mr. Johnson, we have by roundabout ways reached the place in the opening story where Peter takes his dictaphone, quickly glances once more at the laboratory figures, and begin dictating the hospitalization note. And now, the overall story is no longer a single, uniform narrative about a physician encircling a medical problem, capturing the essence of this in a note. By cutting up the Peter-story and inserting other actants as protagonists, making a row of siblings[28], the story is now about the introduction of a patient into an intricate and inherently conflict-ridden network of multiple enunciators – into the material and discursive universe of the hospital.

[28] This expression is taken from Lawrence Durrell's introductory note to Balthazar, the second book of the Alexandria Quartet. He explains that he wants to write a four-decker novel whose form is based on the relativity proposition (sic!) Accordingly, the four novels follow a pattern of three sides of space and one of time. He states that: "…the three first parts, however, are to be deployed spatially (hence the use of 'sibling' not 'sequel') and are not linked in a serial form. They interlap, interweave, in a purely spatial relation. Time is stayed" (Durrell 1958).

What has happened by taking these detours? First, it is illustrated how different entities each play a part in making, modifying and controlling the textual universe on which Peter draws when finally he dictates. Second, it becomes possible to follow what kind of logics the single agents pursue and what they consider important actants for advancing these interests (e.g. the secretary views the patient basically as a file that needs to be systematically integrated into a database to maintain a certain level of order). To obtain this she uses different kinds of artifacts, or actants: the label, the external databases, and the plastic-cover. From these activities grows different texts (the front page and the patient list in MediCare; and the record-cover and its content), which, in turn, becomes actants in the physician's actions. Thus, when he prepares himself to meet the patient, or when he dictates the hospitalization note, he draws on a body of statements pervaded with certain logics – logics, which might be more or less consistent with his own. Third, the detours enact a view of record authoring as a gradually collocation, molding, and negotiation of statements. In the moment of recording, the composition of the hospitalization note is driven by a request of the physician to account for the medical examination and intervention. However, the compositional elements in this hospitalization note are made by other entities and loaded with different modes of ordering: logics of filing; of medical supervision; of drug accounting and of linear medical history; of personality characterizing and behavioral shaping; of measurability and expression-ability; of scientific recognition, and of linguistic convention. What ends up as the official, medical description of Mrs. Holm, her latest 2-3 days, and her body are in fact an entangled combination of "raw" phenomenological descriptions, technologically mediated signs, and medical clichés from discursive "surplus stocks". To talk about the author in singular is thus a piece of disingenuousness, of granting – or blaming – the physician too much responsibility.

After this long journey into distributed authorship of physician notes, it is time to turn back to the paper's main topic: the introduction of EPRs and what consequences this have for the authoring and reading of physician notes. In the hope that the story about Mrs. Holm have worked to convey a sense of the interrelations between humans and non-humans encountering and making statements about the patient-case – statements that flow into the reading and authoring processes – I will

make a leap forward in time. Thus, in the following I will describe how computerization affects the ways in which statements are connected and molded, and consequently, how the authoring and reading of physician notes are altered.

The EPR as a conjoiner and separator of authors and readers

The EPR did not play a prominent part in the production of a hospitalization note, although it shapes the overall frame in which the note is later incorporated. This is due to the fact that the hospitalization note is made at a point in the patient trajectory where little is written about the patient and almost nothing in the EPR. As such, the way the hospitalization note was made resembles how things worked before the introduction of computers to the staff. The EPR is much more radically involved at points further on in the patient trajectory. In the following I will focus on instances of authoring and reading where the EPR redistributes other actants' roles and relations. En route, I shall use the hospitalization story above as a backdrop to compare how things have changed: First, I will show how the computerization of EPR has occasioned the physicians to begin typing notes themselves, making them their own instant readers. Second, I describe how the distance between writing and reading record notes seems to be shortened as the EPR permits more actants to read and write notes simultaneously and to shift continuously between doing one or the other activity. The placing of computers next to each other makes readers and writers exchange more comments and remarks on each other's texts. Third, I argue that the physical structure and location of computers change the ways EPRs are read and accordingly how information feed into the authoring process. I shall develop these aspects below.

Typing in: transforming roles and relationships

In the case of the hospitalization note above, the physician recorded the note into a dictaphone. Instead, he could have chosen to type the note directly into the EPR. He would then have had to open the page for writing an entry, type the note in, and save it as a "physician note" (which the hospitalization notes is part of). At present, the physicians must type in prescriptions in the medicine scheme, and actually, the hospital management encourages them to type in their notes also. Some physicians still prefer to dictate – for reasons I will go into later. But two of the four physicians I followed entered notes themselves several times during their duty. It happened only in situations where the notes were small, but it nevertheless made a difference: the note was read while it was still in the "making page" and often modified. An example will be helpful:

> A physician has just had a meeting with a patient and his wife. They were to be informed about the conclusion of several examinations into the extent and consequences of a blood clot in the brainstem. The physician goes into the office, logs onto the EPR, selects the name of the patient and reads the physician notes from the last 2-3 days. Then he opens the writing page and enters a short note about the meeting, its content and conclusions. When finished, he skims the note and corrects a few misspellings and adds a few words here and there. Then he saves the note and logs out.

How does this example differ from a physician dictating notes? It is not the corrections and modifications – physicians often rewind a little and change a sentence, when they dictate. The difference lies in the reading, even if it is quick and fleeting. When the physician reads his own statement, he suddenly turns into a proofreader and editor engaged with issues like redundancy avoidance and readability. When dictating, these roles are delegated to the secretaries (who put the finishing touches to the official statement about the patient), and while they sometimes spell better than physicians, they can have problems with harsh sounds from the tape, which makes the terms and names come out quite distorted. Moreover, they will never change, restructure, or delete the dictated text like the physicians do. Thus, when the physician types in the note him-

self, he will not only fill the role of secretary, but will do this with more authority and greater autonomy – performing the role of an editor with the assistance of the EPR.

Admittedly, the editing process might not be a radical revolution – bringing about only small alterations in the content and structure of the physician note and in the physician's job. But to some physicians, this small alteration in their job is certainly big. The following snip is from an interview with physician A:

Physician A: *"I write as little as possible, yes, I'd rather dictate it, so the secretary can write"*

Interviewer: *"Is it because it's easier, or because you concentrate better or…?"*

Physician A: *"Well, that's in order to move "non-physician work" away from the physicians. In my view, we spend too much time sitting and writing papers about this and that and this. It's obvious that when I suddenly have to type in prescriptions and also have to enter ordered tests…it takes time from us. It takes a lot of time – sometimes we have to type in 15 types of medicine. You easily spend 10 minutes on this whereas earlier perhaps you dictated it in 30 seconds and if you have to do this with 15 patients a day – which often occurs – well, that's many hours of work. So it is actually… I would rather dictate" (…)*

Interviewer: *"What would you rather spend your time on?*

Physician A: *"On reading: I don't have time to read periodicals; I don't have time to teach; I don't have time to supervise my colleagues, because I've go to do secretary work. That is what I want to spend my time on. And we don't have time for that. So the question is how we dodge this"*

The physician explains that the very act of typing does not count as a proper activity for physicians; it is non-physician work and thus takes time – that is, time from the real tasks: reading periodicals and teaching. Compared to dictating, typing is understood as a more time-consuming

way to record notes about the patient – and an antagonist in the struggle for maintaining professional territory and matter. Seen from here, there is not much support for the claim that typing does something more substantial to the form and content of the physician notes. However, the issue is less settled, when turning to another physician, physician B, who types in often:

Physician B: *"I dictate if it is a whole record or a going-through on a new patient, I don't write a whole page (…) it takes too long, then the secretary does it quicker and better. If it is only three lines, then it takes more time to put a tape in the machine, dictate, deliver the tape, and the secretary has to take it…so it's a question about doing it rationally"*

Interviewer: *"Do you think there's any difference between typing in those small notes or dictating them?"*

Physician B: *"I guess, if there is a difference, it is that the written effusions become smaller now (…) the record text fills less, because I will make an effort to make it more compact when I record (…) Well, it is easier to get an impression of how it appears when seeing it on the screen. With a dictaphone one easily runs on and it gets bigger and bigger"*

Interviewer: *"Does it mean anything clinically or medically that it gets shorter?"*

Physician B: *"No, I don't think so…maybe it's easier to read"*

In this quote, the narrative of controversy is exchanged for a narrative of rational decision-making: when the note is small it is more efficient, in terms of total use of energy, if the physician types in himself. Interestingly, rationality is here located not on the level of the medical profession, but coupled to the operation of the hospital – typing in is appropriate when it pays off on an organizational level. That typing might make a difference to the note *per se* is acknowledged only as a passing remark: the note might get shorter (because the physician is disciplined by the physical representations of his wordings, and by the size of the screen,

not seduced to make pleonasms because the dictaphone cooperates so tacitly) and might be more readable.

Looking more carefully at the statements from physician A and physician B, a curious tension seems to arise. On the one hand, typing in is stated as an inconvenience to carrying out "real" physician's work; on the other hand it is admitted that typing in makes the notes more concise – which, to me, should help the accomplishment of medical work after all. Physician B denies that shorter, more readable notes should be more clinically relevant. But it is hard to follow this statement in the light of the multiple occasions in which other physicians and nurses later employ the note in the ongoing performance of medical work – as indicated by the story of Mrs. Holm.

Another difference – not mentioned by the two interviewees – is the difference in the bodily work and posture between dictating the note and typing it in. This is important because the relations between the physician and his concrete surroundings differ accordingly in the moment of recording. When he is going to dictate, the physician often searches for an isolated room, or corner of a room, to cut off noise and action so that he can concentrate. If he is in the office, where there usually is a lot of people, he will probably turn his face down toward some papers or look out of the window staring blankly while dictating, deliberately shutting others' action and their noises out. Other staff will rarely interrupt when the physician strikes this pose. When typing, in contrast, the physician sits in front of the computer looking at the screen, at his papers, and at the keyboard. Often, he sits next to others, and hearing their conversations he might sometimes stop writing to utter a comment to this or a remarks to passers-by. Thus, he continues being active in the flow of work practices.

During both recording situations, the physician will now and then look at documents, pictures, and at the computer screen for information about the patient. Concerning this, there is no big difference save the difficulty in reading one electronic document while writing in another. The major difference is the degree to which the physician cuts himself off from other people in the moment of recording. In the first situation, the physician is alone with a couple of artifacts and together they compose the note. This facilitates a concentrated, forward composition movement. In the second, the physician remains accessible and active in the office

life turning from the note to something else and back again – a situation, which facilitates a flickering recording process allowing other voices to enter by chance.

Perhaps, this difference in posture and relatedness is also a key to the apparent dislike for typing. The picture of a concentrated, contemplative physician in solitude synthesizing the medical case, resembling Rodin's *Le Penseur*, is in tune with the widespread notion of medicine as a noble discipline reserved highly educated and skillful individuals – a notion sustained by the rhetoric and professional politics of the medical associations and institutions. Conversely, the picture of a physician sitting next to other occupational groups holds a less glamorous connotation, namely that of leveling professional status to that of the secretary or the nurse – making commonplace the fine art of medical recording. It is a general point that division of labor (in this case, the division of work in the recording of a note) is by no mean just a technical matter but mixed with issues of power, status and moral (Hughes 1971).

Actually, the tendency toward a leveled relationship between nurses and physicians are supported by new possibilities for reading not only the physician notes but also all other recordings concerning the patient, which in turn affects the authoring as well. I shall dwell with these issues for a moment:

Intersecting readers and writers

In the story of the hospitalization of Mrs. Holm, documents changed hands from one reader to the next. After computerization the number of simultaneous readers has grown. This happens because the access to and availability of documents is altered. But let me sketch first how things used to be.

As mentioned in the beginning of this paper, the EPR contains a variety of documents – besides physician notes also nursing notes, laboratory figures etc. Earlier, these documents were distributed around different localities: the physician notes were kept together with the laboratory figures in the office near the secretary or were in use somewhere in the hospital; and the nursing notes (called "Kardex") were usually placed in the office on the table where the nurses sat for pauses or reporting. This

physical separation between the two kinds of documents were mirrored in a similar division of their respective readers: physicians read their own notes and practically never read the nurses'; whereas nurses read their own notes and read the physician notes only when a specific purpose made this legitimate.

Now, this has all changed: if you find a vacant computer, you can access all documents within few seconds – both documents on existing patients and on previously hospitalized patient. Only staff that is professionally related to the patient holds the right to read information about him or her, but at present this is not monitored. People all over the hospital can work simultaneously with the same electronic patient record and even with the same single document – which is why it can sometimes be hard to tell the status of a document and whether it really is "the same" record. The physical restraints on access to patient recordings are thus dissolved as the patient records are redistributed across old space and time boundaries. Due to this, the population of readers has changed accordingly, and a slightly different reading pattern seems to forge ahead. Let me describe shortly how, as this seems to bring about new circumstances for the authoring of notes as well:

Nurses check routinely in physician notes – often 5-10 times during a shift. Sometimes, they even read these notes more than nursing notes. Because of this, the nurses are well informed compared to the time before EPRs. (This is, at least, how some physicians experience it. One even states that "earlier, many nurses hadn't read the record at all!"). They are usually acquainted with the physicians' framing of the patient case and can often conclude from this where the case is located in the physicians' line of work. This knowledge makes the nurses comment on physician's work. I observed, for instance, a situation, where a physician was reminded to fill out the medication sheet since the nurse had read in the physician note that he had prescribed medicine (thus insisting on the right administrative procedure); and another where a nurse referred to a certain diagnosis in the physician note as explaining a patient's condition, and the physician, who had not read the note, was thus led to take it into consideration (thereby competing with the physician within his own field of medicine). Even more markedly, the easier access to physician notes influences the nurses' own authoring of nursing notes – inducing usage of more scientific or medical loanwords – and their making of the

so-called "patient-list", where every patient is described with 10-15 keywords (typically tentative diagnoses, special physical conditions and important things to be done such as MR-scanning). Also, the reading of physician notes helps the nurses organize and adjust their work to that of the physicians. The computerization of records thus seems to push forward an alignment of the nurse's routines and own writings to the actions and statements of the physicians'. The nurses keep on doing their job (soothing patients, administrating drugs etc.) but they do it with a view to the physicians and a remark now and then to a physician about his or her individual performance, rather than suggesting alternative programs – thereby reinforcing the medical (also called "the curing[29] ethic" by Pellegrino 1985) and administrative network around the patient-case.

Physicians do still not read much in the nursing notes, although some state that they do this more often than before (presumably, the nursing notes are easier to absorb in the medical discourse, since now the nurses often enroll medical terms in their texts). However, the physicians have become frequent readers of the patient-list, which, as described, is also made by the nurses. The physicians print out the patient-list as an opening routine on their duty, keep it in their pocket, and take it out frequently to read or write additional notes on it. Even though nurses make the patient-list, they take the key words from documents like the referral note and hospitalization note. Thus, the patient-list ends up holding medical statements sorted by nurses, and is in that way symptomatic for the nurses' way of handling the relation to the physicians: nurses nursing the physician's texts!

Concerning the physician notes, the physicians still read them a lot – that is a central part of dealing with a patient. And the broadened access to these notes – because of the computerization – has produced a new reader role: the *curious reader*, which seems to influence the authoring

[29] According to Pellegrino, the history of medicine can be capsulated by the two words: cure and care: "The ancient grounding of medicine in care and compassion is now challenged by a biomedical approach which defines medicine simply as applied biology. On this approach, the primary function of medicine is to cure, and this requires that the physician be primarily a scientist. This model still includes containment of illness, by slowing down its symptoms, but it focuses on *things* to do for a particular disease that are measurably effective" (Pellegrino 1985: 10).

process indirectly. Let me illustrate how this curious reader comes into being:

> Physician Madsen sits in front of the computer in the office and does some errands. At the same time another physician talks to a nurse about anticipations for a patient. Madsen overhears the conversation and gets curious. He enters the patient's name, reads the physician notes and medicine scheme about him, and exclaims his interpretation to the other two: "He has cancer…I would suspend Corodil (a drug)".

In this example, the physician becomes interested through the conversation, reads in the EPR, and makes his own interpretation of the case. In addition, he offers his opinion out of hand and adds thus to the state-making network around the patient trajectory in question. Earlier, such an event would be rare since it would take much more work – physical and explanatory – to locate and read "irrelevant" records. Now, the EPR has made it a much more obvious thing to do, thereby occasioning more voices (beside physicians, nurses, aides, and secretaries can act in this role as well) to enter the negotiation about what the patient case is and how it should be handled. The other side of the coin is that this easier access allows also the reading of documents for surveillance purposes or for prying into other's affairs – turning the curious reader into a *clandestine reader*. That such activities do take place confirms a nurse in an interview:

> *"I happened to discover that a colleague of mine had opened a patient record on a patient from another ward that we've nothing to do with. I told her that she really wasn't supposed to do this; that she had better stop it immediately".*

As mentioned, the record system is equipped with the possibility to trace the different users' activities (the event log), such as reading irrelevant records. But in practice it is impossible to keep track with the thousands of daily record call-ups. And furthermore, the staff often forgets to log out and leaves open the access to all records when they leave the office. Thus, control is solely a question of individual moral – and of the physical presence of colleagues.

Returning to the overt activities, the new reader roles add to a more complex web of reading routines in which old status patterns are challenged. In principle now, everybody can see each other's writings. But across the occupational groups there is an asymmetrical reading pattern: predominantly, nurses read physician's note and not vice versa. Inside the occupational groups the reading pattern seems more uncertain, although my data suggest that younger persons read more curiously in other's writings – which after all is not so strange as observing others is part of learning one's way into being a full-fledged professional.

The altered reading routines become important to the issue of authoring. Not only has the physician begun typing physician notes himself, he also does this in a room where he sits next to others, who type in, read, or talk. Ward offices were also crowded and busy before the introduction of EPR, but the computers seem to structure the interaction between staff and documents in a fashion that makes it likely that more people know about the patient cases than before and thus can mold their behavior accordingly or make explicit statements about the cases and the handling of them. Furthermore, the whole authoring process (as the introductory story of Mrs. Holm touched upon) now develops in a milieu, where the human participants are better informed by increased readings of primarily medical documents – in step with and sometimes even ahead of the physician responsible for the note.

Summing up, the new reading possibilities lead to the development of a new work role, namely that of the curious reader, which in turn makes more agents – both nurses and physicians – interfere with the authoring process of physician notes. Thereby, the number of contributing statements is being multiplied, and, furthermore the distance between reader and writer positions diminishes. Notably, this enhances the overall medical discourse rather than challenging it. Also, the increased reading occasions nurses to monitor physicians' administrative rule following.

Leaving the description of how patient records are accessed, I shall go on to show how the patient records are concomitantly also made harder to transport due to their affiliation with immovable computers. The computerization has altered the graphical representation, the maneuvering roads inside and between documents, and the material layout of the ward – dimensions that I refer to as the internal and external to-

pology[30] of information. And this alteration has implications for the main focus of this chapter: the reading and authoring processes. These implications are addressed below.

A redistributed topology of information

Pursuing the effects of computerization on authoring and reading processes, I have addressed the beginning movement from dictating to typing and the redistribution of records across time and space. I argued that these new features transform the character of physician note and the relationship between nurses, physicians and secretaries. Yet another dimension needs clarification in order to conclude what seems to be the overall effect. This concerns the very change of media, the move from portable, "leaf-able" paper to rooted, "scroll-able" screens: how does this influence the way a record makes itself available and readable, and how is the authoring process subsequently affected?

As might be remembered from the story on the hospitalization of Mrs. Holm, the physician reads before he meets the patient: he reads the referral note and some laboratory figures from a previous hospitalization. No electronic patient record has yet been made, and thus there are no record notes to read at this specific moment. At other points in the patient trajectory – where the record is drawn up and full of information, the physician will prepare himself by reading physician notes and other documents in the record, e.g. laboratory figures. He will usually read the latest documents or the ones he has a special interest in.

Before the introduction of EPRs, the physician would find the paper record and read it (if it was not missing!). A mere look at its outside would indicate the character of the case: a thick record – a big pile of papers – suggested a complicated, prolonged case; whereas a thin record prepared him that the case could be new or simple. By convention, the documents in the record would be sorted in a certain way: First, the phy-

[30] Inspired by John Laws usage of the term, which concerns itself with spatiality, and in particular "with the attributes of the spatial which secure continuity for objects as they are displaced through a space. The important point here is that spatiality is not given. It is not fixed, a part of the order of things. Instead it comes in various forms" (Law 1999).

sician notes, then the laboratory figures… The paper form had the virtue, the physicians say, that it made it easy to find the exact document. Color, graphics, and quality of the different papers all worked to tell the different documents apart, and the physician knew by experience where he should open the record to find what he wanted. Also, the paper form allowed a long document to be spread on a table, thus being viewable in its entirety. This was useful because the eyes could easily glimpse back on the pages, reviving and comparing information, thereby speeding up sense making and reinterpretation of the document (for a thorough analysis of how the physical attributes of the paper-based record guides the physician in determining the character of the case see Heath & Luff 2000).

Many physicians regret that the record's physical attributes (its internal topology) have changed. Browsing the electronic records is allegedly hampered by the standardized graphical representation (all documents are typed with twelve points Times Roman, single line spaced, and on a white background); by the scroll-principle (you have to scroll to read more of a document – it cannot be opened in full); and by the laborious operation procedures from one document to another (it is not possible to view two documents at the same time as it is for instance in Microsoft Word, and you have to click 3-4 times on different menus to change document). This means that the physician spends more time maneuvering the EPR than he did with the paper record. Still, the EPR does not leave the physician quite as bewildered as might appear. Each electronic record has a file-tree in the left side of the screen (as shown in figure 1), which lists the different types of documents available and the dates for the latest modifications. Although not mentioned by the physicians, these features seemed to act as guiding tools during most interactions with the records.

But the *external* topology has changed too: The patient record is now bound to the computer, which stands firmly in the office – immovable, as the hospital budget do not allow portable computers. Thus, the physician cannot bring the record along to the patient's bed and let it participate in conversations with the patient, as was the practice earlier. Instead, he must prepare himself in front of the computer, reading the relevant documents and maybe taking a few notes on a scrap of paper or on the patient-list, before he meets the patient on the ward-round. This

way of interacting with the patient record does not satisfy all physicians (see also Berg 1999). One of the opponents explains why:

Physician A: *"The paper record offers an advantage, especially if the case is complicated. For instance, if one stands by the bedside, examining the patient, then this is where you get ideas about what's actually wrong here and what's to be further clarified. And to do this you use the record: has this been assessed before and what has it shown? (…) What one is considering can be checked in the record immediately. Then, being with the patient, you could just look in the record and say: is there a reason for us to do this? Now when we have EPRs, you can't do that. Now, you have to grasp it all in your head – and you can't"*

Interviewer: *"What do you do then?"*

Physician A: *"Well, if it is a complicated case, I think it deteriorates from having EPRs. And I have to run back and forth if I'm going to have (information). And even if I try to acquaint myself with the electronic information, information will often still be lacking"*

Interviewer: *"Do you think your interaction with the patient has changed?"*

Physician A: *"Well, that goes in both directions. On the one hand, one could say that now I don't have the record to look at but only the patient to look at. But on the other hand, you can't remember all the information and then you feel often a little…you lack something. If you get an idea or something and say: hey, we must have this assessed. Then you stand there and have to ask the patient if it has been done before, and he can't always reproduce or remember what he has been assessed for. If I had the record I could look it up and move ahead (…) I use less time with the patient, because I sit and read for a long time in front of the computer (…) you have to be more careful when you read in order to remember it when you are with the patient. Previously, many did the ward-round without having read in the record. They simply began the ward-round and opened the records at the bedside and went ahead. In this way*

they spent more time with the patient. Whether this is better for the patient, I don't know"

On ward-rounds before the EPR, the paper record acted as third part in the interaction between physician and patient. It helped the physician to remember (or sometimes simply be familiar with) the case, and it took charge of assisting the patient in reviving and clarifying his medical history. Now, the physician experiences the ward-round as somewhat slashed, since the EPR is not present (which is to some extent exaggerated, as he still can bring the record-cover, which contains laboratory figures, heart rates etc.). And actually it is not just the paper record that is missing in front of the patient; previously the nurse always participated in the ward round. Now, more and more physicians do the round alone, but it is up to the single physician to decide how he or she wants to structure the ward round.

To remedy the lack of these memory assistants the physician works harder and longer at the computer. Also, he meets with the nurse in advance and they talk about the case and exchanges additional information – sometimes while the physician simultaneously reads in the electronic patient record. Reading and information exchange are thus displaced from being performed in front of the patient to being done in beforehand at the office, which in turn reduces the time left for encountering the patient. And, it might be added, the new ward round routine also performs the physician in a less imposing role without the nurse as his demonstrative subordinate. Strictly speaking, the previous ward-round routine could be seen as not solely an opportunity for information exchange and coordination, but also an important disciplining and socializing event for the physician–nurse-patient-hierarchy. This is now dismantled.

How this new ward-round-routine affects the physician-patient relationship is not clear. The physician suggests that the reduced time could be undesirable for the patient, but the opposite conclusion seems just as likely, namely that the time is now more direct and "qualitative better" for the patient because the physician focuses on the patient and not the record, and furthermore, because the physician might be more prepared when he has read the record in advance. What seems to bother the physician though is the way the speed and appearance of the decision-making process is affected. Partly, collocation of information is hindered

as the record is in the office and he meets the patient without further back up than his memory and communicative skills – slowing down the decision-making process. Partly, the physician fears that he might appear incompetent, turning the ward round into a confession of ignorance.

It seems hard to make a crystal-clear evaluation of the new ward round routine, because it depends on how it is framed. Is the purpose primarily data gathering, analysis and on the spot decision-making (the ward round as a nodal point in the medical decision-making, granting the physician the role of decision-maker)? Or is a polite gesture and a checkout of the case-construction (the ward-round as an element in a long chain of case-building, granting the physician the role of case-presenter)?

Discussion

Where does all this leave the issue of reading and authoring notes? First and foremost, the introduction of EPRs seems to push forward a reorganization of ward-rounds; a reorganization, which influences how statements are made and exchanged between physicians, nurses and patients. Secondly, the physician's reading in the record has been displaced from bedside to computer screen. This means less face-to-face time with the patient and more time with the documents (reading or maneuvering). Also, the physician's interaction with the patient is now more direct, that is unmediated, but less conclusive because the physician have to go back to the computer and check information before further decisions can be made. Thirdly, the displacement alters the way in which information in the record is read. Earlier, it was read in front of the patient. It was read quickly because the patient was waiting; and read consecutively because it were mixed with and inspired by the conversation with the patient. Now the reading is part of a routine preparation, where the physician bodily anchored in the chair shifts between reading different kind of texts (documents in the record cover, in the record, and in different reference books and online databases) and having conversations with the nurse or colleague physicians – an action chain of longer duration than standing reading in front of the patient. It seems likely that this longer duration allows the patient-case to be read more thoroughly and be more discussed than before, although it might impair the physician's ability to compare the record's statement with the patient's. But notably it does

not seem to modify the overall medical frame in which the case is authored. Rather, the increased number of statements is based on and elaborates the medical logic even more markedly than before, since the nurses read and are inspired in their own writing by the physician notes.

Conclusion

The making of a physician note has never been reducible to mental operations within the head of the physician, but is a distributed, interactive, and long-stretched process beginning long before the physician starts recording. In this process reading and authoring is intertwined – each being the other's starting point – and carried out by a multitude of human and non-human actants. This was true even at the time of the paper-based record, but with the introduction of electronic patient records these features are accentuated, because the network in which statements are encountered, made, and combined has been rearranged and transformed.

Physicians do increasingly type in themselves. This change in the physicians' recording technology transforms the work division of the recording routine (assigning the physician the role of typist, proofreader, and editor) and modifies the physician note. Even though the notes are most likely be more concise and readable the new work role is not fully acceptable to all physicians, since they do not see it as a rational employment of physician time. This rejection seems more understandable when viewed as an issue of status erosion: typing in takes time from the profession's mythical core activities such as reading scientific periodicals and supervising apprentices. Furthermore, it places the physician on the same footing as nurses and secretaries and demystifies the act of making a medical note.

At the same time, computerization allows the same note to be viewed simultaneously by many readers. This leads to new reading patterns and the development of new reader roles. The nurses read much more in the physician notes, which occasions enhanced adjustment of nurses' activities and statements to the physicians' and monitoring of the physicians' performance in relation to medical and administrative logics.

In this way these logics are supported through the nurses' actions. Physicians read a little more in the nursing notes than earlier and much more in the physician notes. This occasions more interfering with "other's cases" and expand the number of state-makers participating in the authoring processes – without changing the overall imbuing scientific-medical rationale. Also, it permits more illegitimate readers (from both occupational groups) of the patient-case.

Finally, the changes in internal and external topology of the record contribute to the ongoing reorganization of the ward round in a fashion that shortens face-to-face time with the patient, but also makes it more direct and open-ended. This seems to influence the authoring process (and its companion, the decision-making process) in a paradoxical manner. On the one hand, it is further dispersed and prolonged (counteracting effective problem framing and solving if conceived in individual-oriented model of information processing). On the other, it is better founded and incorporates more knowledge (making it more robust if conceived in a broader model of socio-technical distributed cognition as developed by for instance Hutchins (1995). No matter what, the new arrangement enforces rather than challenges the scientific-medical logic behind the reading and authoring of physician notes.

If anything, the authoring of physician note becomes more long-stretched and distributed than before. Long-stretched in the sense that it involves more back-and-forth maneuvers between humans and non-humans and more reading; and distributed in the sense that more actors are involved with the authoring process, thereby co-constructing the overall textual universe from which the physician note incorporates statements. But this interaction and distribution do not promote multiplicity in terms of diverse rationales or logics. On the contrary! It is an increased activity within the limited boundaries of scientific-medical (curing) and administrative logic. To many physicians this increased activity is threatening and inconvenient. They seem to experience an undermining of their personal status and of their time to engage in other activities (activities that first and foremost seem to touch the heart of the medical profession, more than the medical logic *per se*). Paradoxically, the computerization equalizes the relationships between physicians and nurses a bit, but heightens the dominance of the scientific-medical rationale.

In the coming chapter, I shall shift focus and follow the practices of nurses. But, as will be clear, physician and physician notes are also integral parts of these practices.

5

Reporting and updating through the screen: nurses' information work across shifts and territories

Introduction

Nursing is centrally involved with almost any practice at the medical ward: from a patient is admitted to the hospital, till the moment he or she leaves the hospital. All 24 hours, nurses are on duty at the medical ward. Through reporting and updating routines – an ongoing information work – they constitute a "living" organizational knowledge about the patients hospitalized at the ward.

Yet the introduction of EPRs has in a subtle and incremental manner changed the ways in which nurses perform this information work. In this chapter, I will describe how and point to the wider consequences for other aspects of nursing – for nurses' roles and relations to their colleagues and patients. I argue that nursing practice is documented in a more structured and semantically narrower way. Moreover, coordination between shifts is increasingly done through writing, in which medical aspects of the patient are brought to the front. In some respects nurses move towards equality vis-à-vis the physicians, but in other respects their role is still subordinate and servicing. The relation to patients becomes more oriented toward medical aspects and less towards holistic care and patient involvement. Finally, the roles and relations among nurses themselves are shifted, tending to cast nurses as individualized agents rather than as members of a collaborative enterprise.

In order to line up the arguments behind the claims, the chapter has four parts. The first section introduces the ward where data were constructed. It describes how the nurses' work is divided and coordinated, and the basic features of the EPR relating to nursing. The second section is about one facet of nurses' information work, the reporting routines. The third section deals with another facet, the updating routines. Finally, the fourth section summarizes how the EPR has entered the network of the nurses, and how documenting, coordinating, and, in effect, nursing have drifted towards a more medical focus.

The division of nursing work

The Apoplexy Ward (AW) is one of four specialized medical wards in Svendborg Hospital. AW is for patients with cerebrovascular and other brain-related accidents, but the Ward also gets patients, which are difficult to place in the three other Wards (Gastro-Intestinal, Lung, and Endocrinology Ward) e.g. because of minor neurological diseases, or because the other wards are full. The referral is made, while the patient is at the Acute Reception Ward.

Mostly, patients in AW are old (70-90 years) and often "heavy", that is they need a lot of assistance because of their age and because many have paresis of some sort. AW comprises 15 beds in 5 rooms, an office, a kitchen and rooms, such as laboratory, flushing room and bathrooms as shown below:

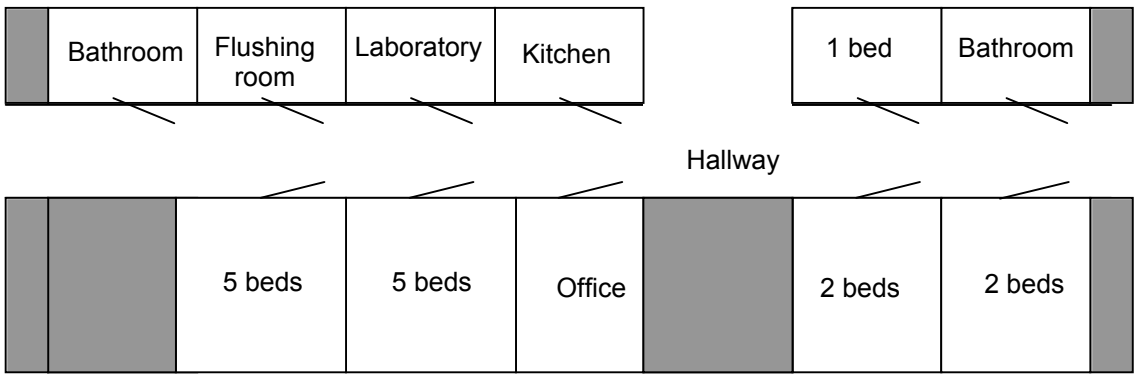


Figure 5.1: The breakup of the Apoplexy Ward

AW is manned at all times with nurses, who work in day, evening and night teams. 3-4 nurses are on day-duty (1 ward leader, 2-3 ordinary nurses) assisted by an aide and sometimes by nurse students. In the evening there are 2 nurses and 1-2 aides, and at night here is usually just 1 nurse on duty. Some nurses are permanently on day-, evening-, or night-duty; others change from day- to evening- to night-duty. This means that the constellation of a team on duty changes accordingly and also according to holidays and time off in lieu of wage. In total, 20 nurses are affiliated with the AW.

The basic division of nursing work

Basically, the nurse shifts are divided and specified in order to support the circadian rhythm of the patients and the time rhythm of institutions. The patients – and the different numbers and specimens representing them – have to be ready for the opening hours of different institutional departments and services, for the physicians' ward rounds, and for the contractual 8 hour workday of the nurses. Moreover, work has to be carried out so that patients' metabolisms are maintained and different treatment regimes accomplished. Accordingly, the work tasks and rhythms differ from shift to shift and from weekday to weekends and holidays. I shall briefly describe how:

The day shift
On weekdays, the team on duty has to wash and dress patients, help them to the bathroom and serve breakfast. Also, different measures have to be taken, and prescribed medicine poured and dispensed. This has to be done before 9.30 a.m. at which time the physicians will come to the ward and attend to patients on ward round. But first they will talk with the nurses and hear if anything new has happened to the patients during the last 24 hours. Whilst the physicians do the ward-round, the nurses go about carrying out a multitude of tasks: making sure that prescribed tests are executed (order laboratory technicians for blood tests, send urine test to the laboratory, call for hospital orderlies to take patients to scanning, physiotherapist or other in-house or out-of-house services); checking the medicine stock and order more if certain drugs are running out; soothing

patients when they call for help; give students supervision; tidying up in laboratory and flushing room; tidying up after discharge of patients and wheeling clean beds and tables in place for new patients; holding meetings with patients and relatives; and participating in a variety of other meetings (informational and educational meetings; coordinating meetings with other wards, hospital departments, or institutions outside the hospital such as home care). Around noon, lunch is distributed and afterwards the nurses continue the ever-growing list of errands to be done.

During all these activities the nurses read and write regularly in the electronic patient record. They read the nursing notes, physician notes, and the physiotherapy notes and they check the medicine scheme, especially after the ward round to check the details of newly prescribed medicine. In relation to this, the nurses print out medicine cards for the pillboxes and what is called "treatment cards", which are small paper cards for fluid medicine or other preparations, such as saline-drip-bottles. Old cards are replaced with new ones, and the nurses check routinely if the different cards are in agreement with the statements in the EPR (the details and dilemmas of this activity will be elaborated in Chapter 6). Also, the nurses write nursing notes in the EPR and they update the "patient-list", filling in and deleting key words for the different patients. In weekends the day shift is calmer and accordingly manned with less people.

The evening shift

The evening shift begins at 3.30 p.m. Usually, the nurses start with updating themselves on the patients through the EPR and then take a round to all patients. Then follows tasks that stem from the updating and the round; checking up on the medicine and accessory stock; tidying the different rooms; preparing (pouring and measuring) evening medicine; measuring temperature and the like on patients; and the distribution of dinner and medicine. Between 6-8 p.m., a physician will come for an evening-round to patients in need of special attention. Sometimes, this entails new things to be done, but often there will be time for coffee or eating before the patients are helped/put to bed around 9 p.m. (which entails helping them to the bathroom, on a bedpan, or giving enemas; helping with tooth-brushing; and putting on nightwear). Before leaving,

the nurses write nursing notes and update the numbers in the temperature-schemes for the patients.

The night shift

The night shift – there is only one nurse – arrives at 11.30 p.m. and also begins by talking to the evening nurse, who has stayed on to report on the patients. Sometimes, she will listen to this while reading in the EPR also. She prepares medicine for the night and distributes it to patients. Then follows tasks like calculating the patients' fluid balances; updating the whiteboard in the hall (with the names of nurses on duty); and ordering meals (normal and special diets for the patients) for the next day. From time to time – and sometimes very often – patients who need help call for her, or she goes and turns some of the patients on specific hours. Often, there will be much waiting time, which the nurse uses for instance to update herself on the patients in the EPR. In the early morning hours, she measures temperature, blood sugar, etc. and enters the numbers in different schemes. Finally, she writes nursing notes and reports to the arriving day nurses.

The firm 24-hour organizing principle aside, it is not possible to standardize the routines on a shift completely due to the different conditions and characteristics of the patients, and due to the difficulty in getting a substitute when a nurse is absence due to illness (see Strauss et al. 1997: 153-155 for an account of the conditions that mitigate a rationalization of medical production). Thus, to a large extent every new duty on a shift is unique. Precisely what the nurse must do, how long it will take and whom she has to cooperate with is to a large extent unpredictable and has to be estimated and planned in the beginning of every shift. What kinds of patients are in the ward? What needs to be done? What should be avoided? How many are at work? Questions like these tacitly (or explicitly) occupy nurses in the beginning of a shift and are, as an activity of *updating* oneself on the state of affairs, part of information work as a generalized articulation strategy (Strauss et al. 1997: 160) between nurse shifts on the medical ward.

The coordination of shifts

Smooth updating is possible insofar nurses on the previous shifts have done an appropriate amount of written or verbal reporting. Thus, information work also entails the task of reporting significant events and interventions in order to ensure continuation of tasks across shifts. Customarily, one of the nurses stays 15 minutes into the next shift in order to give a report of the situation on the ward. In addition, nurses routinely write notes about the specific patients so that it becomes possible to check the nursing history of the patient.

Earlier, these notes were made in a special folder-system called *Kardex*. It consisted of loose pieces of paper (one for each patient) arranged in flap-able plastic covers that could be opened and closed quickly. Each piece of paper was divided into vertical columns, which would sort the notes about the patient under different headings. Each heading represented a patient problem that should be dealt with. Typical headings could be "pains", "insomnia", or "constipation". Once a heading was made, a problem defined, the column would gradually be filled with statements about what was being done and with what effect, and continued as long as the problem existed. The different statements could be distinguished from each other by date and by the color of the writing: nurses on day shifts wrote with a blue pen, on evening shifts with a green, and the nurses on night shifts with a red pen.

This problem-centered structure of *Kardex* is maintained in the EPR's nursing-notes: the notes are still made in relation to different stated problems, and colors differentiate the entered notes. However, the way a problem is set up has changed: a function has been added, in which a new problem must be given a "nursing diagnosis" from a nursing classificatory system, the LKS-system[31]. This is done by filling out a pre-designed sheet, which is structured as shown in figure 1. The sheet has boxes for a nursing diagnosis, a problem formulation, an overall objective, and an overall action plan. Thus, classification is coupled to the formulation of an intervention-strategy – an extension to *Kardex* that

[31] This classificatory system was initiated by nurses in Rudkøbing Hospital and further developed by nurses in Svendborg & Rudkøbing Hospitals, since the official attempt to constructing a system was not yet finished (and still isn't).

was one of the original core-demands from the nurse representatives to the development of an EPR.

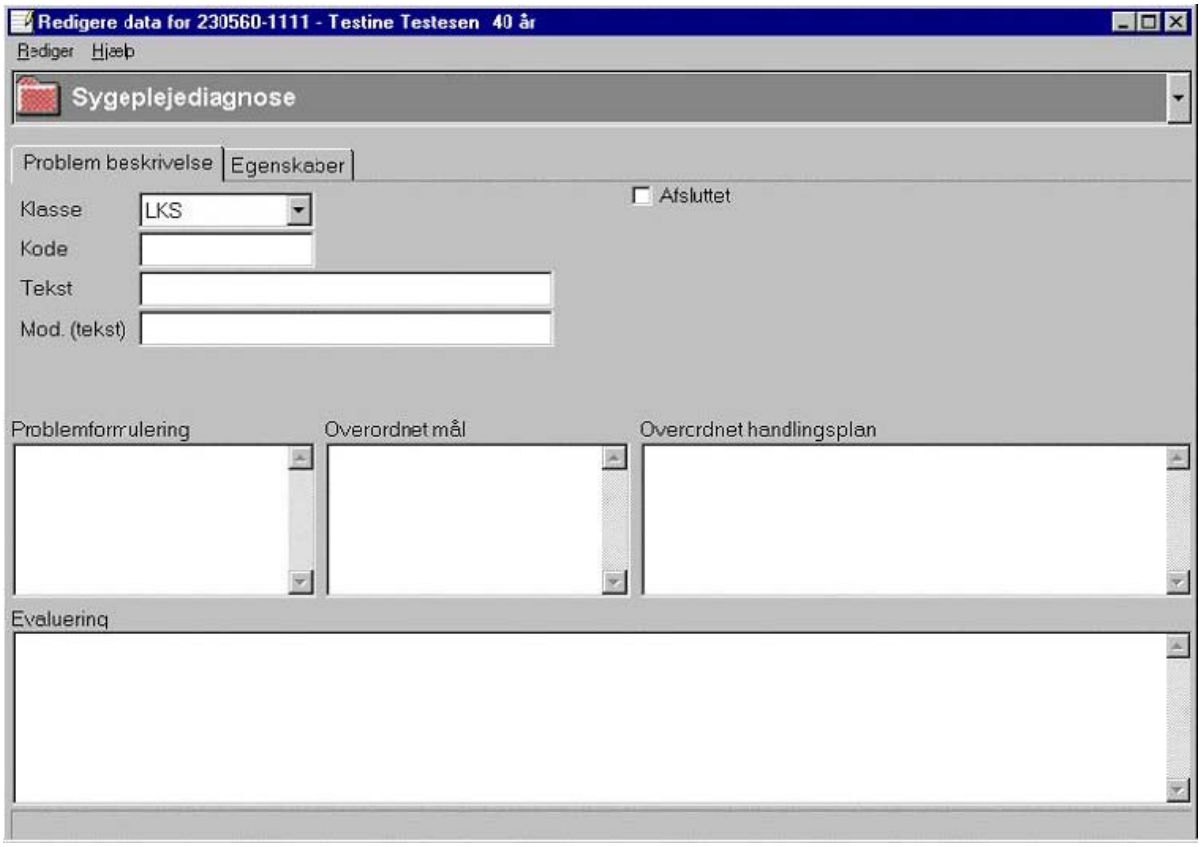


Figure 5.2: The box for drawing up a problem and giving it a nursing diagnosis

Once set up, the problem appears as a heading in the file tree under "nursing notes" and clicking this heading retrieves the notes about the problem.

The notes can be sorted by date also. Clicking on the headings "nursing plans" or "nursing notes" list all the different notes made day-by-day and thus makes it easy to view the activities of, say, the last 24 hours. Figure 5.3 illustrates how the notes related to a specific problem appear on screen and how the file tree to the left list the problems of the patient and the date of last entries for each.

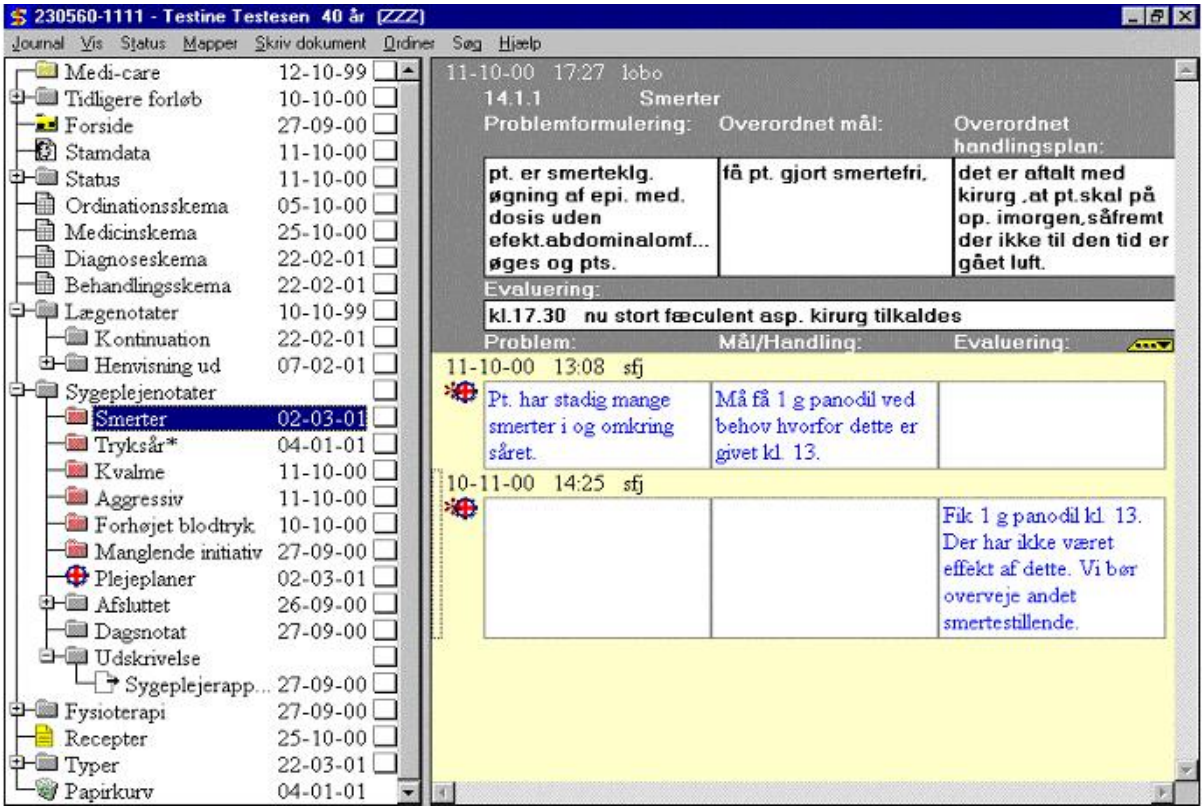


Figure 5.3: The nursing notes related to a specific problem, ”pains”.

In addition to this modification of the nursing notes, the EPR includes a whole new function, a patient-list. This function provided an overview of the patients currently admitted into the ward and it is possible to enter a number of key words for each patient (such as diagnosis, main symptoms, and scheduled appointments). The secretaries are responsible for updating the list in terms of patient names and bed numbers, but it is the nurses who enter and delete the descriptive key words.

Wardlist

Ward M XH

Room	Bed	Age	Name	Text
24		75	John Hoff Nielsen TO BE TURNED IN BED + diape	MxH Room 24 vacant DIAPER 10/3 NIDDM (Non Insulin Dependent Diabetes Mellitus) BS x 4 Now disoriented + venflon
25	1	79	Elsa Marie Sørensen	Readmitted after 1 hour at home. Primarily admitted because of inoperable cerebral tumor
25	2	68	Thorkild Jespersen	COLD (Chronic Obstructive Lung Disease) Kan walk a few steps with walker + much verbal support! Ergo: 11 am at ward (Lizzie) Phys: 10 am (Anne) MAGNYL

Figure 5.4: Excerpt from patient-list (names changed and hand-written notes copied from original handwriting).

The computerization of nursing notes means that simultaneous reading and writing is now possible and that writing involves new aspects. At the same time, however, reading and writing is restricted to the computers in the office. In the following, I shall describe how the simultaneous widening and narrowing of possibilities affect the way in which work is documented and coordinated across shifts.

In order to do this, I make a somewhat crude distinction between the nurses' reporting and updating routines. By "reporting", I allude to the way in which nurses construct written and oral statements about their activities and about the patients. By "updating", I hint at the ways nurses connect to different sources of information in order to determine and prepare themselves for the work to be done. In reality, reporting and updating are, of course, almost inseparable parts of nurses' information work; sometimes both aspects are comprised in a single action. However, for the sake of the argument, I have found it important to distinguish between them.

Reporting routines

This section focuses specifically on the task of reporting, which allows me to describe how nurses make statements in the first place, statements that later circulate in the hospital network and through the nurses' updating routines act as resources in the work of nurses (and other occupational groups too).

As mentioned, reporting entails both making *written* notes – in the form of mainly[32] electronic nursing notes and descriptions on the shared patient-list – and giving *oral* messages and comments. Since computerization has directly altered the conditions for written reporting, I shall begin with these (addressing first the nursing notes and then the patient-list) and subsequently show how this transformation affects also the role of oral reporting. I end the section by discussing the overall effects, arguing that more and more coordination is done through written statements and less through oral communication. In this movement, the roles and relations among nurses are redefined and medical aspects of nursing put forward.

Writing nursing notes in the EPR: documenting or coordinating?

Nursing notes have been part of nursing work for a long time (at Svendborg Hospital nursing notes begin figuring as part of patient records from roughly 1970). The notes obviously work as tools for exchanging

[32] Reporting are also done through other types of written communication across shifts like: entering a message to be shown as a screen saver, posting notes and photocopies at a whiteboard in the office, and leaving personal notes on the nurses' coffee-table. I have not considered these to be of paramount importance to the theme of my study – the influence of computerization on the work roles and relations of nurses, secretaries, and physicians – and therefore not addressed them directly. However, there is yet another electronic artifact called "condition-sheet" (in Danish: "statusark") that seems to play a certain role among nurses. This is a sheet that holds basic information about the patient (such as names of relatives, marital status, home situation). It is filled out by nurses at the Acute Reception Ward, who undertake a "hospitalization interview" with newly admitted patients. As the condition-sheet is not part of the reporting routines per se at the Apoplexy Ward but rather a resource in the updating routines here, I have chosen to deal with it in the section about updating.

information in order to *coordinate* between shifts. However, during the last 25 years nursing notes have progressively been seen as means to *document* the work of nurses too: by having nurses write down what they do on a shift and sort this information notes into distinct categories of activities, nurse leaders hope that nursing work becomes more visible. Visibility and classification of tasks are thought of as instruments to argue against downsizing plans and to support the nursing profession, which throughout its history has struggled to establish and consolidate itself as a profession[33]. In this context, nurse leaders have pursued a mix of different and sometimes mutually conflicting strategies. One has been to accept the effort of scientific management (and its successor, new public management) to rationalize and streamline medical work[34], in order to gain access to the strategic and resource allocating organizational levels. Yet this involves also a close surveying of nursing work (Melosh 1982). Another strategy of the nurse leaders has been to establish their own research in order to gain autonomy and legitimacy vis-à-vis the physicians. The basic premise for this strategy, however, is a systematic production of data on the work of nurses (Bowker & Star 1999). Thus, in both strategies, providing data on the amount and variety of nurses' work – *documenting* nursing – is crucial.

The dual aspect of nursing notes, being both a coordination tool and a documentation device, has not altered with the introduction of EPRs. What has changed is the way in which these two aspects are performed, and hence, their significance and characteristics. In short, the redesigned nursing notes contribute to enact documentation in a more streamlined fashion; while due process of note making and the new electronic artifact, the patient-list, contribute to enact the coordination aspect in a way that produces special attention to physicians' work. Let me begin the arguments underlying these statements by describing how electronic nursing notes are made.

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[33] What it takes to be a profession is somewhat disputed. However, some frequently mentioned aspects include the success of delineating own territory and control own education (Hughes 1971) and establishing a field of research, which can be claimed as the nurses' own (Bowker & Star 1999, Krag Jespersen 1999).

[34] Even though the work-tempo thereby became more hectic, nursing work became at the same time better defined, visible, and distinct (Melosh 1982).

The process of note making

Entering notes is an integral part of the nursing work. In between the different tasks the nurse writes in the nursing notes. Or rather, she writes when time allows her to, which differs from day shifts to evening and night shifts. During day shifts, the nurse usually writes after she has finished the work of getting patients up and handing out medicine. Through working with the patients, the nurse gets an impression of their present condition and may notice new things to be taken care of. Having finished this work, she will go to the office, click up the nursing notes for each of her patients, and skim the list of stated problems before she begins writing. Seeing the lists of problems and perhaps some of the specific notes helps her framing her experiences with the patients by sorting them into the categories presented, and negotiating them with statements on the screen. While skim reading the existing notes, she might decide to write a comment on a specific problem, draw up a whole new problem, or refrain from making any comments on the case. During this process, she might also click up and read the physician notes, the medicine scheme, and the patient numbers, just as she sometimes talks to nurse colleagues and the physicians. Thus, documents and staff participate as actants in the encirclement of what should be reported as a nursing note. Consider for example the way three notes –about constipation, *decubitus*, and wounds respectively – are constructed in successions:

> The nurse, Sonia, has been attending an old lady, Mrs. Hansen, who is ill from erysipelas in her legs. Combined with age and a bad immune response the disease has made the patient very ill and added a variety of other complications. Sonia has bathed Mrs. Hansen, given her a clyster, and dressed an evolving pressure sore. After a small coffee break, she sits in front of the computer and clicks up the electronic record on the patient. She sees the physician responsible for the ward round and the leading nurse both heading for a computer, and says to them: "Have you talked to Mrs. Hansen about hemorrhoids?" The physician says no, and Sonia continues while showing him a medicine box she has fetched in the depot: "Well, she would like to have this ointment prescribed!" Then, she looks at the file tree for the nursing notes and then the physician notes about the patient. From this she sums up to me the researcher: "they have reduced *Prednisolon*…which is great because I saw that Mrs. Hansen's skin was now very fragile". She clicks up the medicine scheme,

reads, and utters to the physician sitting next to her: "…and she must have Laxoberal regularly, not on demand as it says here". The physician answers while he alters the prescription: "All right, now it is changed". Sonia clicks back to the nursing notes and writes a short *note* under the heading "Constipation: Has been on bedpan, ++ water ÷ faeces; has been put on regularly Laxoberal" Then she draws up a new problem, "Decubitus", by giving it the nursing diagnosis: 9.10.4, and writes a *note* about it: "Has beginning pressure sore at the behind. Has put on gloves[35] with water" Then Sonia skims her scribblings on the printed patient-list and writes a *note* under the heading "Wounds: Has abrasion on right hand. Jellownet is put on + dry bandage + skin friendly plaster – must be soaked with water NB NB" Finally, Sonia prints out a treatment card on Laxoberal and closes the record on Mrs. Hansen.

In the making of these three notes, the nurse interacts with many different actants and seems to carry out several other things at the same time: she checks whether the physician and nurse-colleagues have acted on the hemorrhoid-problem; suggests that the laxative drug, *Laxoberal*, is given regularly; updates herself on changes in the prescribed medicine; evaluates the change against her impression of the patients condition; evaluates a stated problem of constipation; notifies her colleagues on the change in medication; draws up a new problem of *decubitus* and reports her actions toward that; elaborates a stated problem of wounds, reporting the enrolment of different accessories (*jellow-net*, plaster etc.) to help relieving the problem and then advising her colleagues how to further act; and finally, prints out a treatment card on the altered prescription. These diverse activities can be grouped into four types of subprograms: 1) evaluating stated problems, 2) pointing out new problems and classifying them, 3) informing about interventions or novel arrangements and hereby guiding further action, and 4) simply pointing out alterations in other EPR-documents about the patient. Accordingly, the act of reporting is not simply a question of writing a few words about the patient, but involves navigating, monitoring, interpreting, and evaluating state-

[35] "Gloves" are disposable gloves that are filled with water and put on the patient to relieve body parts with pressure wounds.

ments in the notes and, consequently, adding new appropriate statements.

Reporting does not always entail as many and as long notes as in the above story. Sometimes a note can be very brief such as "+urination in bed" and more often, no note is made at all. Whether the nurse decides to write something about the patient or not seems to depend on a number of aspects: it takes time and effort to log into the computer and click up all the sheets and boxes of the EPR. Often, the nurse is busy and, accordingly, she will only make the most important notes (prioritizing the notes of great importance to the nurses in the following shift). The easiness with which the statements are coming – how easy they can be formulated – plays also a role. For instance, if the nurse knows exactly what to write, she might enter the note despite being busy. In sum, the imperative to document, the pressure of work, and the ease with which a note can be formulated compete with each other. What is more, these dimensions change during a shift. If the shift has been busy, reporting is often put off until the last minutes, and at this point it can be hard to remember all details, just as login in and writing a note can seem too much trouble when the clock has already passed leaving time. Oddly enough, a calm day can occasion more writing than else because the nurse has time to read more in the notes, formulate evaluations on these, and search her mind for things to be reported. On the other hand, some nurses state that if they find that something is important to report, they go and write it in the nursing note immediately. Moreover, the urge to make a note differs from nurse to nurse. In the wordings of an interviewed nurse:

> *"I guess, as people we're different from each other. I'm the kind of person that wants a problem to be solved to day and not tomorrow. And if Mrs. Petersen doesn't eat and is to be sent home Friday, then she needs to be tube fed today, which is why I go and write a note, so at least something is under control".*

As the quote indicates, making a note can also escalate the importance of a problem or an intervention – expanding the nursing note's role beyond mere representation of patient problems and nursing tasks. Thus, nurses do not make notes for the sake of documentation only; neither do nurses document all aspects of their work. This fact bothers nurse leaders somewhat – an issue to be addressed later in this chapter. However, the EPR

facilities for writing nursing notes *do* work to promote a more standardized documentation of the nursing.

Easier editing

Before the introduction of EPR, the nursing notes were, as mentioned, written in Kardex. The vertical columns of Kardex and a pen would be key actants in nurses' construction of notes. These actants could assist the nurse wherever she went (if Kardex was not used by another nurse).

Now, the nurse has to sit in front of a computer in the office, open the sheets on the patient, and enter the notes by filling in pre-designed boxes. According to nurses, this new procedure does not alter the content of the notes. The notes are still about patients' problems, what has been done about these, what this has resulted in, and how to act from this – but opens op new possibilities concerning the way notes can be modified and presented:

Nurse: *"Now, it's easy to go and edit. I can add something to what I've already written, which was hard in the old days when it would be, like, cramped. Now, it all just moves. Earlier we just wrote in hand and we wrote downwards. If I were to insert something, something I had forgotten above, well, it wasn't possible; there was no space for it. That is easy now. I can change the time of entering the note and thus fit it into the chronological order of documents".*

Interviewer: *"Do you do that often?"*

Nurse: *"Yes, if for instance I've written a note about something to be observed and I later on make an observation about it and write a note, then it's handy to place these two notes on the same level!"*

In the quote, the nurse points at the way in which computerization facilitates the insertion of additional statements and allows her, by manipulating the hour for entering a note, to graphically place the entries side by side, visibly tying together problem definition, action plan, and evaluation. Although this does not modify the actual wording of the notes, it seems reasonable to think that graphical juxtaposition of the nursing note elements makes it more likely that these notes will be read

consecutively, and thus perform a small narrative about the handling of a problem and its destiny. Instead of being scattered across columns in Kardex, mingling with other detached entries like elements in a chronicle[36], the entries are sorted to fit nicely into straightforward problem oriented logic. Compare for instance the difference between the order of entries in Figure 4.2 with the following, where problem, action, and evaluation are aligned:

Problem	*Action*	*Evaluation*
"Still has strong pains in and around the wound"	"Can have 1g Panodil, why this is given at 1pm"	"Got 1g Panodil 1pm. No effect. We should consider alternative pain relieving medicine"

By adopting this format nursing notes are no longer just descriptions of the patient and what nurses have done, but sort these descriptions into small linear stories each with an opening, an action sequence, and a closure. What is more, this tripartition seems to be rooted in cybernetics, the science about problem-solving systems, which has as the basic principle that feedback mechanisms enable the system to adapt to changes in the environment (here, continuous feedback loops between patient's problem-nurse's actions-patient's problem gradually will lead to the elimination of that problem). This mechanistic logic might sound fairly reasonable and effective. However, it rests on the assumptions that patients have definable problems; that nurses can direct their efforts to solve or minimize these problems; and that it is possible to obtain ap-

[36] Addressing the intersections between oral and written communication, Jack Goody describes how lists in different shapes formed part of historically early writing systems – writing systems that have played a momentous role in shaping society and human behavior and cognition. In Goody's term nursing notes is a chronicle ordered as an event list. It keeps track of important occurrences whenever they take place and works to piece together 'epic' material (here, descriptions of patients) to a 'historical' form, although the narrative element is more or less limited. Goody argues that lists increases the visibility and definiteness of classes, makes it easier for the individual to engage in chunking, and more particularly in the hierarchical ordering of information which is critical to much recall" (Goody 1977: 111). By sharpening the narrative element in the electronic nursing notes, this impact might be even more distinct.

propriate information in order to evaluate the effect of these efforts on the problems. But in real life, this is not always the case: problems might often be hard to express and define; and moreover, nurses do all kinds of things not strictly aimed at well-defined problems. Despite this, the above premises guide, control, and shape the entering of nursing notes – patients and nurses' actions have to be described in a fashion that is compatible[37] with this logic.

Although notes are not always lined up as orderly as above and some notes are made as day-notes, the new editing and makeup possibilities in the computer invite the nurses to streamline their notes graphically and semantically after the problem-oriented principle. Thereby, the notes together build up a text, which takes after the structure of a novel rather than that of a chronicle: the single propositions are not to be read separately and flexible combined, but work as elements in over-arching narratives about well-defined topics (e.g. constipation and wounds).

This sharpening of the structuring principle – the narrative element – could, of course, be thought of as a way of organizing and sorting nursing notes to better describe the crux of the matters. However, it has been argued that a great deal of our knowledge and experience cannot be shared in an unequivocal, straightforward way as the one implied in the problem-oriented mode of ordering (Bruner 1986, Czarniawska 1997). The modernistic narrative principle of problems, interventions, evaluations, and solutions is only one narrative principle among many and involves usually the deletion and summation of much ambiguity and complexity. Accordingly, it seems likely that much of the nurses' experiences with patients are watered down, when they have to be represented as narratives that fit the three distinct categories. This may not be the big issue as nurses do communicate with each other through other means – by talking to each other for instance. But as will be demonstrated below,

[37] What happens then to renderings that do not fit in? Actually, it *is* possible to write a note without defining a problem. This is called a day-note and may be about something that is more of a message than a report, like "the patient's sister has called. Will visit him tomorrow". However, this kind of note is not very typical and is not read as much as the problem-oriented notes. Thus, although notes are not always lined up as orderly as above and some notes are made as day-notes, the new editing and makeup possibilities in the computer invite the nurses to streamline their notes graphically and semantically after the problem-oriented principle.

the nursing notes are progressively becoming the preferred media, which reduces the time left for other ways of communicating and coordinating.

The streamlining of nursing notes toward the problem oriented structure is fuelled by the fact that the creation of a problem is no longer a question of giving a column a self-made heading, but involves choosing a nursing diagnosis from a laminated list that is placed next to each computer. This list is yet not exhaustive; it is still possible to label a problem with a self-made diagnosis. But the majority of nursing notes is made under the headings of standardized nursing diagnoses. Together with the eased editing and make-up facilities this strong categorization of nursing notes seems to push standardization and problem-orientation[38] further ahead – the notes become more structured. Earlier, nursing notes were primarily used for coordination between shifts. Now, the above features act to promote documentation rather than support coordination. Although the nursing notes still convey a lot of relevant information for nurses on the following shifts, and hence, ensure coordination, it seems likely that the strong structuring of notes will contribute to a more narrow coordination. Often when making a note the nurse does not start from scratch, but writes a note to follow other notes. In this respect, a story is lined up in advance, and the nurse will often be guided by the problems that are already defined and set up in the tables. She will not necessarily document what she has been doing or has noticed, but how she perceives a stated problem of the patient – and thereby the semantic universe of the reporting process gets narrowed down – and hence the coordination subsumed into the documentation logic.

Circumscribed access

While introducing new possibilities of rearranging and classifying notes on screen, computerization restrains the way in which notes can be

[38] I will argue that a problem-oriented logic rest on a principle of "definability", i.e. that something can be defined as a problem, given a name, and treated as a singularity. This is exactly what the classification system and editing facilities of the EPR do. It seems unclear what this enactment of problems does for nurses. Or more precisely, it seems that it facilitates documentation and thus the recognition of the nursing profession and the coordination between shifts and territories through narrowing down the semantic content of the issue that need to be coordinated.

moved around in the ward. Basically, Kardex was a booklet that could easily be carried from the office to a patient's bed and back again, which made it easy to involve him or her in the note making. In some wards, they had even developed an "open Kardex", which was placed at the patient's table. The nurses would then go to the patient, write in the Kardex, and discuss the information with the patient, thus implicating him or her in the making of the notes, which also helped the nurse because questions about for instance the patient's home situation could be clarified immediately.

Now, it is much harder to involve the patient in the note making. The computer cannot be brought to the patient, and patients are often not capable of walking to the office – or it is not customary to invite patients here. Therefore, the notes must be printed and brought to the patient, and this happens almost only when the patient explicitly asks to see the notes about him or her.

Earlier, relatives would often ask to see the open Kardex if, for some reason, the nurse had taken it with her to the office. Now it seldom happens. In this way the computerization of nursing notes seems to downplay the occasions for patients and their relatives to read the notes. There are both pros and cons to this: on the one hand, insight into statements about oneself can be very valuable, since it can support the patient's feeling of being treated with dignity and respect, and help relatives understand and support the caring of the patient. On the other hand, many patients are not capable of giving a clear consent to let other people read notes about them – a consent that by law must obtained. Thus, open Kardex left nurses in a dilemma: should they let other people read the notes without consent and perhaps risk that illegitimate people would nose into the patient's condition; or should they remove Kardex from the patient and turn the notes into professional secrets? This dilemma does not arise so frequently anymore.

Another feature of the now abandoned open Kardex was that it encouraged notes made in an easily understandable language with a minimum of medical expressions and technical terms. Even though some nurses say they still try to keep each others' language in control and make sure nursing notes do not resemble the physician notes too much in style and content, the termination of open Kardex and the consequent

decrease in requests from patients and relatives to read the notes, means that this effort is now supported by the nurses' own morals only.

Summing up

On balance, the move from paper to screen seems to affect the making of nursing notes in at least two ways:

First, the new editing facilities and the adding of nursing diagnoses support a problem-oriented and standardized representation of nursing practice in which nearly all activities and statements are categorized under headings that represent problems agreed upon by the professional community (and if not, degraded to a day-note). This implies a movement in literary genre from Kardex, where notes were only loosely sorted as in annals; to the computerized nursing notes, in which the notes are predominantly organized as parts of classifiable problems and thus as mini-narratives presupposing an inherent coherence. This streamlining of nursing notes seems first and foremost to serve documentation purposes: to represent nursing activities in a medical science-like way[39] thus building up a vast pool of data to make nurses' work visible and supply emerging nursing research with own data. However, writing nursing notes is not simply a straightforward representation of the nurse's actions. Rather it is a many-sided and complex maneuver, where notes can also be entered to point out modifications in other EPR-documents to nurse colleagues or guided by existing problems – thus mixing documentation and coordination purposes in the note-making process.

Second, the stationary computers make it harder for patients and relatives to access nursing notes (and vice versa). The nature of the set-up means the nurses are inclined to do their note making in the office. Most likely, this weakens the imperative to write in layman-style and to involve patients in the formulation and evaluation of nursing statements. Paradoxically, the professionally supported efforts to render nursing activities visible and suited for scientific research seems thus to work against other nursing programs, such as the principle of patient participation and de-mystification of the reporting lingo – both elements in what

[39] Interestingly, the streamlining of nursing notes to fit a problem-oriented logic seems an even more radical project compared to the way a problem-oriented medicine has been disputed within physicians' own row (cf. Berg 1999).

has elsewhere been described as a caring ethic (Pellegrino 1985). In this respect, computerization and the thereby occasioned rearrangement of nursing practice makes one aim in the professional program conflict with another illustrious professional aim. Thus, the computerization of nursing notes gives rise to a reshuffling of nurses' reporting routines, in which patient cases and the work of nurses are increasingly being represented through the optics of medical problem-orientation. Other aspects of health care, such as overall comfort of patients or patient involvement, are proportionally toned down in the note making process.

The design and structural organization of nursing notes seem to privilege standardized documentation, which to some extent come to determine the content of the notes, and hence, the agenda passed over to nurses on duty in coming shifts. On the other hand, the process of making nursing notes entails also trade-offs and errands that work against the imperative to dutifully document nursing. Moreover, nursing notes are not the only means of coordination as will be described in the following section.

The patient-list: mediating between documentation and coordination

The EPR-system has another feature, the patient-list, which lists the patients hospitalized in each ward. Clicking the ward's name on the EPR main page retrieves it, and it can easily be printed to fill a letter-sized paper. Practically all ward personnel interacting with patients use the patient-lists: nurses, aides, secretaries, and physicians read it frequently and carry it around, although they do it for different purposes. In that respect, the patient-list acts as what Susan Leigh Star has called a *boundary object*[40] – although it is not a completely neutral link between the different occupational groups, as I shall later show.

[40] Leigh Star has coined this term in order to describe how scientists can cooperate without agreeing about the nature of objects: "Boundary objects are those scientific objects which both inhabit several communities of practice and satisfy the informational requirements of each of them. Boundary objects are thus objects, which are both plastic enough to adapt to local needs and constraints of the several parties employing them, yet robust enough to maintain a common identity across sites. They are weakly

The ward secretaries maintain the basic information on the patient-list, adding and deleting patients' names, bed numbers and ages as they enter and leave the hospital, or are moved from one ward to another. Earlier, the ward secretaries also kept patient-lists, but they were normally hand-written and placed on the secretaries' desks or another centrally placed table, helping them to take stock of the ward-situation and help the nurses to remember important task related to specific patients. Now, it can be accessed from multiple sites, and noteworthy, it can be elaborated by key words about each patient.

Nurses take care of entering and deleting key words on the patient-list. Usually, the nurse responsible for the specific patient fills in key-words about him or her (such as diagnosis, important appointments, and special equipment like wheel chair or intravenous line). Other nurses will in turn add and delete information as they work with the patient, come across other documents about the patient, or encounter something planned or carried out by other professionals. Thus, the nurses decide that this or that information is important and needs to be put on the patient-list on an ongoing basis. For instance, it is practice to enter a key word on the list if a physician has decided to order, say, a MR-scanning of the patient. On the patient-list this would appear as "MR-scanning" next to the patient's name. Typically, the nurses enter keywords on the patient-list if the ward round has occasioned the ordering of a new intervention or a rearticulation of the patient trajectory; or if something should be taken up at the next ward round. For example if a patient asks the nurse if she can have more pain-reliving medicine. The nurse will then make a note about it on the patient-list and expect that a nurse on the day shift will take this question up with the physician. In this way, the patient-list is continuously elaborated, modified and revised – adding up all entries on the patients. And when opened on the screen or printed out as in Figure 5.3, the list with patient names, ages, bed numbers, and key words establishes distilled up-to-date versions of the patient cases and intervention strategies.

The patient-list seems to be an important actant in the remembrance of what has happened and need to be reported. Thus, all nurses print out

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structured in common use, and become strongly structured in individual-site use"(Star 1994: 26).

the patient-list as soon as they get to work, and keep it for the rest of the shift. They will take it up from time to time and then read it or scribble small additional notes against the different patient names. During a shift the printed patient-list thus grows more and more detailed and act in the reporting situation as an ultra-condensed summary of what is significant about the patient and the plans of action. I will elaborate this further, but first let me analyze the content of the patient-list. This is interesting because although there are no explicit rules or regulations prescribing what should go into the list, it seems nevertheless that a pattern has emerged concerning what types of information are allowed into the patient-list.

The hierarchical order of key words

As mentioned above, the key words on the patient-list are typically about diagnoses and symptoms, important appointments with other institutions or specialized units such as out-of-house scanning and physiotherapists, and if the patient has special needs such as a wheel chair or an intravenous line. But actually it is a bit more complicated than that, because the amount of key words and their content change from patient to patient, from ward to ward, and presumably also from nurse to nurse. Two paradigms of key words seemed to be in play in the patient-lists I came across during the observations. For the sake of the argument, I shall call the two paradigms medical and social paradigms respectively[41]. In the following, I shall demonstrate how and when these two paradigms appear in the patient-lists.

In some patient-descriptions the paradigms are presented side-by-side, whereas in others the medical paradigm dominates the descriptional key words. Consider for instance the following excerpt, which describes a patient with key words from the medical paradigm:

[41] I acknowledge that this distinction can be criticized for granting medical and social paradigm a priori status. To me, it is not very important whether such paradigms exist in beforehand of the nurses actions, but that the entering of key words ends up rendering the patient as primarily a medical case or a more heterogeneous case in which medical diagnoses, organizational arrangements, personal capabilities, and social relationships are mixed. In turn, these different representations of the patient act as different resources in the staffs' further interaction with the patient.

Room	*Bed*	*Age*	*Name*	*Text*
25	1	75	Cathrine Moeller	Rheumatic arthritis. Progressive pains and raising temperature. Increased in Prednisolon

In this example, diagnosis, physical symptoms and change in drug dose solely represent the patient case. Generally speaking, patient descriptions dominated by the medical paradigm concern medical symptoms and classifications of the patient; important drugs; the medically induced arrangements with other professional actors; and the bodily conditions that necessitate technical ancillary equipment – thus stating issues of paramount interest to a physician.
The following excerpt shows how these medical propositions in other patient descriptions are supplemented with other types of key words (name changed):

Room	*Bed*	*Age*	*Name*	*Text*
21	3	80	Robert Paulsen	Apoplexia cerebri + Infarct in left he. + Persantin vesp. 10/2! After recent home visit is discharge planned at Tuesday Ergo: Friday 10/13, 9.30, training for dysarthria Can walk alone with stick, must be accompanied on stairs Hairdresser 10/12, 12.45 Phys: 10.15 (Susanne) Would like to go to wedding 14/10 - (week 41) – here in town

Here, medical diagnosis and prescribed drug are joined by information about planned discharge date; appointments with occupational therapist, physiotherapist, and hairdresser; physical capabilities; and the patient's wish to go to a relative's wedding. In this example, the patient case is elaborated beyond the medical core-characteristics to include the patient's position in the hospital trajectory, and his relations to other professional groups and relatives. Especially the last sentence "would like

to go to wedding" works to convey a picture of the patient as more than simply a diseased body – or, more precisely, an injured brain. The patient is seemingly a person, who is part of a social network and has the will to take part in this in spite of his illness – information that is important for the nurses and aides that have to organize and coordinate activities in the ward in order to take care that the wedding-excursion does not collide with other organizational arrangements for the patient.

The question is how such different renderings of the patient come into being? Here, it is important to remember that not only are patients different from each other (e.g. in terms of age, hospitalization reason, and stage of patient trajectory) so are the nurses entering key words on the patient-list, and the sources of information they have access to. It seems to be the case, that newly arrived patients are first and foremost described with key-words from a medical paradigm, whereas more heterogeneous statements appear side-by-side in descriptions of patients further in their trajectories.

This difference can be seen as reflecting the distribution of interests and energy among the different professional actors during the patient trajectories. In *early* stages of the patient trajectory, the patient is by and large a medical case entering the hospital network by his or hers symptoms and diagnosis. The symptoms and diagnosis work as organizing principles around which the hospital network organizes itself and handles the case. The condensed, staccato-like style of the patient description indicates the concentration of physicians around the patient case and their narrowly focused interactions with him or her through regimes of technologies and techniques. In this stage of the patient trajectory, the key information about the patient concerns the presence of certain symptoms, diagnoses if any, and the next step in the medical exploration or treatment. Three taciturn propositions, such as the first excerpt's "Rheumatic arthritis. Progressive pains and raising temperature. Increased in Prednisolon" suffices to line up the patient case, as he or she is primarily in the hands of the physicians, who typically prefer conciseness in the delineation of the medical mystery to be solved. The briefness seems to denote the gravity of the situation and the subordination of other activities to the medical program. Whatever else the nurse entering the key words on the patient-list knows about the patient in this phase

she leaves out and reserves the "descriptional space" to medical core-issues.

In contrast, patient descriptions made in *later* stages of the patient trajectory often reflect the dedramatization of the patient case in medical terms, where the patient's condition is somewhat stabilized and further treatment planned and organized. At this point, the case is no longer of great interest to the physician, who now mostly deals with the patient in a routine fashion (although sometimes the patient can suddenly take a turn for the worse and a new crisis sets in, which necessitates rearticulation of the patient trajectory as described in Strauss et al. 1997). To the nurses, however, the patient continues to demand special attention and planning as his or her treatment still goes on (often with an expanded crowd of therapists including dieticians, occupational therapists etc.), and moreover, the patient's social relations and life outside the hospital progressively enter the scene. Thus, the network around the patient becomes more and more heterogeneous, which in turn gives the nurses more and more diverse things to take into account and remind their colleagues about – a growing organizational complexity being reflected in the increase of diverse propositions on the patient-list. In sum, the fewer propositions about the patient on the patient-list, the more important the case is medically; and the more propositions, the more important the case is cross-disciplinarily.

It seems that nurses have developed an unspoken rule-of-thumb about what should go into the patient-list when and what should not. This rule-of-thumb seems to prioritize the physicians as target group, and accordingly, the nurses privilege medical key information rather than information about for instance the patient's social network or experience with hospitals. Only when the physicians' interest and focus decrease, the nurses let in other types of information, now targeted at themselves. Across time, the way a description of a patient changes on the patient-list (and the shift from a medical to a social paradigm) reflects the changing distribution of interest and energy among the professional groups – and especially, the move from a medical focal point to a medical trifle.

In addition to this principle of selection, patient-cases differ in terms of complexity, thereby occasioning more or less information. Also, some nurses seem inclined toward a concise, scientific-medical writing style

and others toward a more unrestrained style of narrating. What is interesting to the present topic of how nurses report their work, though, is the way in which these different patient-list renderings of the patients act as resources in the making of nursing notes (and also in the making of physician notes, as described in the previous chapter. Let me return to this issue.

A buffer between flow and documentation

As mentioned above, nursing notes are made during the shift and often postponed till the last minutes of a shift. Especially the last aspect has led chief nurses to worry that nursing notes become imprecise and sloppy when not made as soon as "data occurs" (SHIFT-EPJ 2001: 64). This might be the case, but it seems important to consider the role of the patient-list in the note making, since the patient-list interacts with this in a double and interrelated way: as both a scratchpad holding notes to be entered in the EPR later and as a memory-assistant reminding the nurse of things to carry out.

The nurse nearly always carries the patient-list in her pocket and takes it out from time to time to look at it and write on it. She might, for instance, make a hand-written note on the printed patient-list if somebody tells her a new thing about the patient; if she discovers something in the physician or the nursing notes that she thinks is important information too; or if she wants to remind herself about a new development in the patient case or a step she has taken in regards to it (e.g. a question from a relative, a new bedsore, the smearing of a rich lotion etc.). Through this scratchpad-function the patient-list changes role from a shared summary of the patient to her summary, in which new things are added and existing statements commented on in some way. Later, when the nurse finally sits in front of the computer, ready to make a nursing note about the patient and her activities, she does not only rely on her memory: the patient-list will work in aid of her memory, and tell her what she found important earlier, being a container for semi-manufactured notes about the patient.

Thus, the worry that nurses lose important details in their reporting neglects the way "data" is remembered and how this entails an intricate collocation and negotiation of statements already made about the patient. But maybe this is not negligence, but a concern that documentation risks

being subordinated to other discourses or programs in the ward. The patient-list works as a way to compensate for the time lag between action and documentation, allowing the caption of notes and comments in the making. However, it is not a neutral, intermediate artifact, but a space for descriptions42 of the patient; descriptions that connect to diverse programs such as the physicians' strong medical program, the intra-organizational program of a smooth flow of patients across units, or the patient's and relative's program of articulating hospitalization with life outside. By scribbling provisional notes on the patient-list, the nurse's "data" are translated into descriptions of the patient instead of descriptions of the nurse's work; taking the detour of the descriptional space of the patient and not entered straight into the classificatory space of nursing notes. This is probably practical for the coordination of nursing activities with the actions and interests of physicians, patients and physiotherapists, but it can be counterproductive to the interest of rendering nursing work visible. Accordingly (as the chief nurses hint), subordination of nurses' notes to other programs means that nursing notes are not one-to-one representations of the nurses' different activities but rather reporting of what nurses have done or noticed of relevance to others' programs – coordinating with these.

It is questionable, however, if documentation can ever take the form of distilled one-to-one representations of the diverse activities nurses engage in. In the related phenomenon of constructing a nursing classificatory system, Timmermans, Bowker & Star describe how this work entails different dilemmas, among them a trade-off between visibility, control, and intimacy (Timmermans et al. 1998). Thus, a classificatory system is never a neutral categorization of something but has trade-offs and politics inscribed at its very heart. Likewise, I shall argue that documentation involves a related trade-off, namely weighing the imperative to document all nursing tasks against the natural flow of carrying out these tasks. If the nurse lets the documentation concern dominate, she will often have to bracket whatever she is engaged in and go to the

[42] 'Describing' a patient should be considered an active, interpretive or creative act, rather than an "objective" act of reproducing "facts". Cf. the argument made by Stanley Fish 1995, who argues that the debate whether an interpretation is true to a text is an aberration: there is no "real world" outside interpretation and the act of describing something entails active construction all the way.

computer to write a note. If she had a Palm Pilot or similar tool and was able to make a note on the spot, this would also demand her attention and interrupt other activities, letting the flow of work pay the prize. On the other hand, if she deferred documentation until the end of her shift, the notes would not be very accurate representations of what she actually had done. The nurse has to juggle this dilemma between *visibility* and *flow*. Here, the patient-list comes in handy as a way to mediate these opposite demands: acting both as a billboard highlighting and juxtaposing statements about the patients circulating among the different occupational groups, and as a scratchpad for statements about the patient, that is provisional (and problematic) documentation fragments.

As described, other aspects of the nursing notes work against straightforward documentation of nursing work too: the very problem orientation of the notes introduces a framing and selection of the observations that might counteract an "uncharged" representation of practice; also, the inclination towards writing notes in a scientific style in order to upgrade the value of nursing notes can distort the picture of what has been done and why. Harold Garfinkel, touches upon related aspects of recording. He argues that "natural, normal troubles"[43] interact with any recording practice in a way that systematically, inevitably produces certain, regular biases in the recordings. This is because "clinic persons have established ways of reporting their activities; because clinic persons as self-reporters comply with these established ways; and because the reporting system and reporter's self-reporting activities are integral features of the clinic's usual way of getting each day's work done – ways that for the clinic persons are right ways" (Garfinkel 1967: 191).

From these objections against a conception of nursing notes as carbon copies of nursing practice, let me sum up the overall impression of how written reporting works in the Apoplexy Ward.

[43] For instance, Garfinkel explains, added information often has a marginal utility, which does not always counterbalance the efforts necessary to produce it. Also, the amount and meticulousness of recording depends on whether recording are conceived as a decorous and respectable thing to do compared with the exercise of other skills in their occupation. And finally, is recording affected by concerns for the strategic consequences of avoiding specifics in the record, as the record might be used as a part of the ongoing system of supervision and review (ibid. 194).

Summing up

Remembering how the layout of computers, the editorial functions of the system, and the nursing diagnosis primarily support documentation, it is interesting that the patient-list seems to alleviate or maybe even work against this tendency. Performing a cross-disciplinary delineation of the patient-as-a-case – hereby also conveying a sense of the case's position in terms of trajectory and professional focus – the patient-list affords convenient space for on-spot scribbling of notes. Furthermore, by scribbling against the patient-list's names and keywords the nurse's notes are linked and accordingly translated into being negotiated statements about the patient and not about the nurse task per se; by using the patient-list and not a blank paper, the notes get deeply embedded in the overall hospital web of physicians, patients, time schedules, drugs, etc. – toning down the documentation aspect. In conclusion, the written types of reporting (the nursing notes and the patient-list) produce somewhat mixed effects, serving both documentation purposes and intraorganizational/cross-disciplinary coordination through the delineation of the patient-as-a-case.

However, written reporting is not the only sort of reporting going on. Of course, nurses do talk with and remind each other of things to be carried out or remember, but the occasions for talking with each other seem somewhat challenged after the introduction of EPRs – changing the content and frequency of the oral reporting. The next passage deals with this aspect in order to complete the picture of how reporting is performed after the introduction of EPRs.

Oral report: just making both ends meet

Beside informal exchange of remarks and comments among nurses in and across shifts, 15 minutes are officially allotted to oral information exchange between leaving and arriving groups of staff. More precisely, one of the leaving nurses ("the overlapping nurse") stays 15 minutes into the next shift. But the entering of information in the EPR takes more time than earlier, which reduces the time left for oral reporting. Often the overlapping nurse uses a great part of the 15 minutes to make up for notes or numbers she did not have time to enter during the shift. This is

not to say that oral reporting is now neglected, but that it is not a fixed routine as earlier. Furthermore, although the overlapping nurse uses the 15 minutes in front of the computer, she might actually overhear the arriving nurses' conversation about the state of affairs (which they construct mainly from the nursing notes and the patient-list) and once in a while cut in with a remark or clarification – the 15 minutes are seldom used solely on giving oral report. This contrasts to some extent with the time before EPRs, where the overlapping nurse would often sit together with the arriving nurses and go through patients in Kardex, summing up the latest developments[44]. And it contrasts definitely with the work culture in other wards, where arriving nurses expect a coherent oral report.

As I shall describe below how the downplaying of oral reporting – and oral communication on the whole – is further underlines with the introduction of EPRs. Here I will dig further into the balance between oral and written communication by shifting focus to the nurses *arriving* on duty. But before that, it is time to sum up what seems to be the overall pattern in nurses' reporting routines after the introduction of EPRs.

Discussion

At the Apoplexy ward, the nurses reporting routines consist of written notes and of oral exchanges of information. The written reporting is mainly done through the electronic nursing notes and through the patient-list. The computerization of nursing notes has introduced new editing facilities and nursing diagnoses, which enhances standardized and problem-oriented documentation, but the nurses seem to interact with these features in a way that also serves coordination across time and disciplines. At the same time, however, the physical location of computers and the habits of the nurses tend to exclude patients from being informed participants in the reporting.

The patient-list participates in the reporting process too. Playing the double role of memory aid (reminding the nurse of the patient-as-a-case

[44] Earlier, the 15 minutes were either not always spent on formal oral reporting, e.g. if the arriving nurses were familiar with the patients and the overlapping nurse was busy with something.

and of things to carry out) and of scratchpad (allowing nurses to make notes on the spot and later link these to existing descriptions of the patients) it acts as an intermediary artifact between the organizational network, the actions of the nurse, and the official rendering of them in the nursing notes. However, this shapes the formulation of notes in a way that makes them propositions about the patients, rather than mere representations of the nurse's actions and tasks. Thus, in contrast to the electronic nursing notes, the patient-list seems mainly to perform coordination of tasks across shifts and disciplines. And this coordination seems to be in favor of first the physicians, then the nurses.

Nurses give high priority to the new reporting technologies and spend more time on writing notes, which in turn reduces the time left for oral reporting. The nurse leaders encourage this development. But, although the leaving nurse do report information that can be hard to spell out in writing, the sparse time does not seem to offer the opportunity of professional development (as leaders suggest). The time is primarily invested in living up to the documentation imperative.

In conclusion, the computerization gives rise to increased tensions in the nursing profession between documentation and holistic, patient-centered care, and it introduces new dilemmas in the daily work: securing documentation versus securing flow of work versus securing cross-disciplinary coordination (and nursing the physicians' overview). In the following, I shall show how the tensions and dilemmas increase further when looking at the way in which nurses keep up-dated about the work of other nurses and physicians after the introduction of EPRs.

Updating routines

This section focuses on the nurses' updating routines. By updating, I refer to the various ways in which nurses get up to date with the state of affairs in the ward (e.g. the patients' conditions and the line of work to be done) when they meet on duty. This implies many diverse activities from talking to the over-lapping nurse to reading in the EPR; activities that carry on throughout the shift in order to help the nurse determine

what must be done and how. The EPR has acquired an increasingly central role in the way updating is performed; reading has become a larger part of the nurses' updating routines. This seems to downplay the frequency of face-to-face communication with colleagues, and increase the use of physicians' notes as sources of information. In the following, I shall describe how this comes about and discuss what seem to be the consequences for the nursing role and its interrelations to patients and other professional groups. First, I address the situation when nurses arrive on duty after the introduction of EPRs, and subsequently, how updating is done throughout the rest of the shift.

Arriving on duty: towards individualized browsing

Although no formal description exists on how nurses are to begin their duty, the observed nurses agree that when they arrive on duty an important task is to get an overview of the situation. The nurses must determine the work to be done and how many hands that are available to carry out the work. Whereas the last issue can be determined right away, the first one entails more complex collocation of information and the gradual production of an overall picture – a synthesizing process that I will here call updating. Basically, updating involves three groups of actants – the arriving nurses, the overlapping nurse, and the EPR – and entails subtasks such as clarifying the number and kinds of patients and the programs that must be kept going or executed.

The way in which the overall picture is produced depends on a number of contingencies, which influence the methods and duration of updating. For instance, nurses' duty rosters vary from person to person: some nurses works only on one type of shift, whereas others shift between working on day, evening, and night shifts. Furthermore, some nurses work full-time, others part-time. Thus, a team sometimes consists of persons that have been on duty the preceding days and who are therefore familiar with the patients; other times, a team consists of persons that have been off for weeks. If, for instance, most of the arriving nurses have been on duty recently they often go straight to the computers and check up on the electronic patient records. If, on the other hand, the arriving nurses have been off work for a longer period (e.g. because of holi-

day or sickness) and are therefore unfamiliar with the specific patients, they will usually encourage the overlapping nurse to give a brief report on the state of affairs and browse the electronic patient records afterwards.

Moreover, the busyness of the overlapping nurse affects the way updating is performed. If for example, she still has some writing to do in the EPR, the arriving nurses might begin browsing the EPRs until she is ready. Also, some nurses might have a special preference for, say, browsing themselves, and will therefore just ask the overlapping nurse if something important has happened. The reverse is the case with other nurses who find it hard to begin working without having a proper report from the overlapping nurse and they will encourage her to do so.

As can be imagined, the first thirty minutes of the shift can thus develop somewhat differently from shift to shift and from team to team. It is, however, possible to distinguish two extreme ways in which the state of affairs on the ward is encircled. In the first extreme point, collective talking between the nurse overlapping and the nurses arriving dominates; in the other extreme point, the arriving nurses and the EPR mark the updating process. Let me describe these two different situations.

Collective talking

Sometimes it happens that updating is performed solely by listening to the overlapping nurse and talking to each other – for instance if the arriving nurses are unfamiliar with the patients in the ward and the overlapping nurse has plenty of time. In this situation, the arriving nurses (and aides) gather around a table or computer and the overlapping nurse goes through all patients and explain their problems and what has been arranged for them. Typically, the overlapping nurse has a printed patient-list with her handwritten notes on it, which works as a disposition for the reporting and a *memory aid*. Usually, the arriving nurses also have a printed patient-list each and jot down small, supplementary notes as the overlapping nurse talks about the patients. During the report, the arriving nurses might ask a few clarifying questions, suggest alternative interpretations of a problem, or propose further actions. Such comments may pass quickly on or give rise to small discussions about what to do. For example, I observed that the overlapping nurse told the arriving nurses that a patient had a bedsore that would not heal in spite of putting

on “gauntlets” with water. She suggested that the arriving nurses changed the patient’s mattress to a softer and more rugged one. Then, one of the arriving nurses said: “Well, I guess gloves and mattress will then neutralize each other and make the situation even worse, but we can try jellow-net”. Also, the overlapping nurse might hint at the patients’ temper or social situation, which then again can occasion the nurses to make comparisons to previous patients.

After the oral reporting it is custom that the nurses agree on who takes which patients, go to see the patients, or look up further information in the EPRs before attending them. All in all such an oral reporting might take up to 20 minutes. One nurse describes the reason behind this updating routine:

> *“Often the overlapping nurses will give a short report, especially if we don’t know the patients. Then it’s nice to hear that Mrs. Sorensen is so and so, and is capable of this and that. Instead of having to read a whole lot, starting with that she can’t do anything and then it turns up that she is quite capable now. And we didn’t need to know all the things in between. The overlapping nurse can tell us quickly, and we can go to the patients”*

As the quote tells, the oral reporting works not only as a way of updating on the patients, but also as a short cut for nurses through the density of information on the EPR: the overlapping nurse provides arriving nurses with the most up-to-date and relevant information.

In sum, the “collective talking” way of updating is not just a one-way handing over of information but may occasion communication of “hunches” and engage in collective problem encirclement and discussion too. According to the nurse cited above, however, the most important advantage seems to be that newcomers get a quick overview of the patients; that oral reporting is an economic way to navigate the discursive universe around the patients. Interestingly, this is diametrically opposed to the nurse-leaders argument mentioned earlier: that in order to make things more efficient, oral reporting ought to be reduced to things that are not in the EPR.

Individualized browsing

If the arriving nurses are well familiar with the patients and the overlapping nurse is busy, the updating process can consist solely of browsing the EPR – individually or in pairs. When arriving at the office the nurses greet each other, fetch a printed patient-list to see the number and names of patients, while discussing who knows about the patients and who will be nursing which patients. On day shifts, the leading nurse might already have decided on the division of work and tells the arriving personnel who will work with whom. Each nurse then finds a computer and begins reading about their patients (or sometimes they sit in pairs – one familiar with the situation and one unfamiliar. This occasions some talking about the content of the documents and the work to be done). After browsing the different documents and maybe taking small notes on the printed patient-list, the nurses go to see their patients.

To some extent, this way of updating on the patients follows the same logic as the one that guides the oral report and collective talk – dealing with the patients each at a time, trying to encircle what is the case and what has to be done. However, it also deviates from this in terms of type of information and in terms of motives. Let me zoom in on the particulars of the individual browsing routine in order to elaborate this. In the following observation excerpt, the nurse has just arrived on duty and is busy browsing the EPR:

> It is 7.30 am, and Mona has just begun her duty on the morning shift. Entering the ward office, she picks up a printed patient-list. She hears the leading nurse asking: "Who has a grasp of the patients in group A?" Mona answers: "I do!" and then talks about one of the patients in the group to a student that will follow her that day. They sit down at one of the computers, and after a quick glance at the patient-list Mona opens the EPR for the first patient, Mr. Sorensen, in the group. She skims the file list on his front page and skims the latest nursing notes. Then, she opens the record for the next patient, skims the nursing notes and the physician notes while she utters "they didn't write everything yesterday". After this, Mona opens the EPR for yet another patient, Mrs. Berg, skims the front page and says to the student: "Well, you know her don't you?" Mona opens the folder with X-ray results but it contains nothing new. "Hasn't the results arrived yet?" she asks the overlapping nurse sitting by the computer next to her. "Yes, but it hasn't yet arrived in written…it

showed *osteoarthritis*", the overlapping nurse says and adds some more information about the patient". Mona turns to the student and they talk a little about Mrs. Berg: "she's a little hard to figure out", Mona concludes. Then, another patient name: Mrs. Sonne. Mona opens her EPR and skims the nursing notes. She reads aloud: "still headache…" and adds to the student: "from this we don't know how the patient slept tonight…the nurse on night shift was busy, I suppose". Mona opens the patient's physician notes and skims the latest entry here. She explains: "we hope to pull the MR-scanning results from the county database today…the idea is to send her home, when she has got the answer". Finally, Mona looks at the patient-list and skims what it says about the last of her patients. She tells the student that this patient can help herself to eat, but can't go to the toilet. She opens the physician notes for the patient and utters "Well, it doesn't seems like she will leave from here". Mona and the student talk about the patient's defecation and the leading nurse joins them, looking at the screen over their shoulders. She asks: "what does her temperature graph look like?" Mona opens the graph on the screen and concludes: "she hasn't had fever since the 12th!" "Then, we'll put her on tablets and swab her!" decides the leading nurse, and Mona jots this down on the patient-list.

In the excerpt, the nurse browses the EPR for each of her patients. She clicks up the front page and opens the nursing notes and the physician notes from there. Then she skims slowly or quickly from case to case. Once in a while she also opens other documents such as the X-ray results and temperature graph. During the whole session, the nurse looks at the printed patient-list from time to time – apparently, it helps her decide what the patient case is about, and, consequently, what is appropriate to look up. This pattern is quite representative of the nurses I followed: the nursing notes and physician notes are opened and skimmed, and from time to time also medicine schemes, patient figures, X-ray results, etc.

According to the nurses, two main rules-of-thumb guide the browsing of the EPR. First of all, nurses state, they want to know if something *special* has happened to the patient (e.g. a rising fever or a new treatment regime) because in that case they will have to study the further details. They do this by reading the latest physician notes and the nursing notes. If nothing special has happened, they typically just skim the nursing notes for the last couple of days or since their last duty (often

by opening the "view-all" mode, "because that will show me all the latest nursing entries – I won't have to open a folder and close it and open another"). Next, they want to determine what the patient is *capable* of, especially if the nurses do not know the patient very well. This means, first and foremost, finding out what is the matter with the patient – by reading the physicians' hospitalization note and going-through – and his age. If the patient is resourceful, reading is usually done quickly. If, one the other hand, the patient has to be helped a lot, the nurse reads the details more thoroughly, especially the "status-sheet". For instance, she will try to determine how much the patient is capable of physically (e.g. can he stand on his legs), if he uses diaper, and if he eats by himself. To some degree, these browsing principles resemble the principles that guide updating by oral reporting in which the overlapping nurse's information and the arriving nurses' questions also center on theses issues.

Browsing is, however, not solely motivated by a need to know about the patients. As the excerpt hints, nurses also open the EPR documents to check if colleagues have entered things properly or followed up on agreed or suggested actions – thereby *monitoring* each others actions. Although, to some extent, Kardex already provided the possibility of monitoring the work of colleagues, the introduction of EPR has widened this possibility. Now, the physicians' statements can very easily be monitored as well, and the monitoring can be done without anybody noticing it (as described in Chapter 4 about the physician notes). Through the new individualized browsing routine, updating on patients is thus transformed into updating on colleagues also.

To call this new updating routine "individualized browsing" is, strictly speaking, not accurate. The nurse is often accompanied by a colleague when updating on the patients (or a student, as in the above excerpt) and sits next to other nurses busy on computers too. From time to time, colleagues interrupt and ask about something, participate in the browsing (as the leading nurse does above), or the nurse overhears a conversation and joins in with a remark – the individual browsing is embedded in the ongoing interactions in the office. Still, compared to the traditional way of receiving a joint oral report from the overlapping nurse, the central updating protagonist is now the arriving nurse. Usually, this means that the nurse limits her browsing to the specific patients she is responsible for. Furthermore, it is a slightly different type of in-

formation that enters the updating process. The patient-list's brief statements still perform a central role, but are accompanied by the statements in the EPR-documents and the arriving nurses' own experiences – as distinct from the overlapping nurse's additional descriptions and comments, and the questions and comments from the arriving nurses, when updating happens through collective talking.

On balance, the reduction of updating to specific patients, the extension of browsing principles to include monitoring the actions and statements of colleagues, and the employment of fairly formal and structured written data performs a different kind of updating than the collective talking. Although the main objective still is to encircle the patient as a case and the work to be carried out, updating becomes more a question of scrutinizing, comparing, and criticizing statements, than one of listening to narratives of the patients and the work of nurses. Consider for instance what Jack Goody describes happens to a statement once it is communicated in a writing mode:

> "…when an utterance is put in writing it can be inspected in much greater detail, in its parts as well as in its whole, backwards as well as forwards, out of context as well as in its setting; in other words, it can be subjected to a quite different type of scrutiny and critique than is possible with purely verbal communication. Speech is no longer tied to an "occasion"; it becomes timeless. Nor is it attached to a person; on paper it becomes more abstract, more depersonalized" (Goody 1977: 44).

Thus, the very form of written communication enables wholly new modes of relations between statement and recipient.

In between two extremes: the inclination toward browsing

As described above, most of the updating process consists both of collective talking and individualized browsing in varying combinations. It is for example sometimes the case that the overlapping nurse gives a report after the arriving nurses have read in the EPRs, and skip the details that the arriving nurses indicate they already know about. Or at other times, the overlapping nurse goes through the ward patients while the arriving nurse sits by the computer and browses the EPRs. This last

example of how oral and written updating can be combined might sound as very confusing to the participants. But a nurse explains that this can be quite advantageous in terms of making sure relevant details enter the production of the overall picture.

> *"Sometimes, I find that when you sit and click around in the EPR while the overlapping nurse reports – wherever possible, since it entails being two places at the same time – then sometimes I discover something that even the overlapping nurse hasn't seen. Actually, yesterday I discovered that there were some blood tests that should have been taken and the nurse on evening shift hadn't seen it. And then, clicking around I notice them and subsequently order them. So, it can be quite…well, it is like a dialogue between what is written about the patient and what the overlapping nurse tells. Also, there can be some details that she doesn't tell, which I find relevant. And if I haven't been here for many days, then sometimes I take a quick look. It is a balancing act, because you also have to listen to what she says".*

Synchronously listening to oral report and browsing in the EPR is both a risky affair (considering common courtesy as well as the attention to important facts) and a potentially powerful combination. When successful, the comparison of verbal statements with written statements can perform a kind of updating where the arriving nurse is informed *and* double checks the rendering of state of affairs and monitors the overlapping nurse's performance.

Generally, it seems that updating routines, which entail both oral reporting and browsing the written statements in the EPR perform a picture of the ward situation, which holds both clear and uniform statements about the patients and more vague hunches. Furthermore, sometimes the very collocation of the two sets of statements works to produce a situation where facts negotiate with each other and produce a third version of the state of affairs, an "estimate", in which verbal statements are suddenly getting another meaning because written notes tell something more and vice versa.

Although verbal and written statements are thus connected in most of the updating routines, it seems, however, that a growing part of the updating activities involve the EPR. Only on one of the four workdays I observed did the overlapping nurse engage in a proper oral report. In

contrast, the nurses all spent considerable time in front of the computer in the beginning of their duties. When asked directly, the nurses deny that the arriving routine has changed significantly through the introduction of EPRs. The observations and other statements in the interviews act, however, in a way that seems to point at some subtle but nonetheless important changes in practice. Especially when compared to other wards in the hospital, it seems that the introduction of EPRs has occasioned a rearrangement of the relations between nurses and documents, in which more and more information are interchanged as written statements in the EPR and less through face-to-face communication with colleagues (although the picture is not so clear-cut as in the Acute Reception Ward, where the nurses almost never give oral report).

Let me present some of the nurses' own indications of how things has changed.

The new routine and nurses' work

To the nurses, updating by individualized browsing does first and foremost make things easier and save time as the following interview snip argues:

Nurse: *"Now, the physician notes and the nursing notes are right in front of us, and it is easy to surf from one to the other and to go back and check; yes, you have to admit that is easy. And it is easy to go and read, if only the nurse on night shift has had the time to enter the things she has to. And if there is a very important thing she will tell us!"*

Interviewer: *"How do you think it affects the basis of your present information?"*

Nurse: *"Well, it has probably reduced the contact [to colleagues, red.], but nevertheless I think that we do talk about the important things. I don't think we lack anything. Also, it is in order to save time. As nurse on night shift you might have to complete the entering of data on the EPR, and if we also have to enter temperature and the like on the EPR, you need a little peace to work. Then it is of no use if the people next to you want to be informed at the same time. You have to*

concentrate. That is effective and there has been savings"

Here, the nurse argues that with EPRs it is easy to look up information oneself (especially the physicians' documents – physician notes, ordination sheet, X-ray results etc. – are now more readily accessible). Interestingly, the nurse's subsequent evaluations seem to be based on the implicit conclusion that this has made nurses read more themselves instead of being updated through oral report. At any rate, she states that time is being saved and, furthermore, that it is more effective and convenient for the overlapping nurse. Hereby, the nurse gives an interesting twist to the efficiency-argument of the nurse-leaders cited above: apparently, the prime advantage of cutting down the time spent on oral report is that the *overlapping* nurse can fulfill her documentation-duty, rather than improving the conditions for professional development and learning – efficiency in the sense of more documentation.

The nurse states that "it is easy", thereby conveying a sense of uncomplicatedness and neutrality. However, the designation "easy" does not necessarily mean that things have simply changed for the better. Randi Markussen (1995) thus argues that "easiness" is not as unequivocal as one would think; it has to be constructed and usually entails more work for somebody else. Notably, the nurse hints that this might very well be the case here too, when she adds that the easiness depends on whether the nurses on other shifts have made the appropriate enterings. Moreover, she makes an interesting utterance: "it has probably reduced the contact, but nevertheless I think we do talk about the important things. I don't think we lack anything". Without stating it explicitly, it is as if she argues against voices[45] claiming that the lessened contact (face-to-face contact, that is) could mean poor oral information exchange and subsequently increased work in front of the computers for the arriving nurses. Thus, it does not seem farfetched to think that individualized browsing does make it easier for the overlapping nurse but harder for the arriving nurses. Moreover, the above mentioned statement that oral re-

[45] It can, of course, be argued that my question: "how do you think that has affected the foundation of information?" leads in that direction. Still, I find the question quite neutral as the opposite interpretation: that the new routine makes more information available seems just as conceivable.

porting actually works as a short cut for the arriving nurse through the vast amount of information in the EPR underlines this interpretation. And curiously, the time saved for the overlapping nurse seems to be canalized into more enterings in the EPR – thus making the overall savings and easiness even more questionable.

The following snip, also from an interview with a nurse, indicates that the new routines entail more but perhaps also valuable work:

Nurse: *"Earlier, we sat with Kardex and read it together since we couldn't each leaf through it at the same time. One person was reading aloud. To day, we often sit by each our screen, and, I can only speak for myself, I read the physician notes more than I did before. Earlier, we had to go and get the physicians' record and rummage through all those papers. And we did it only if we had a specific purpose. Now, I read the physician notes almost automatically. If, say, there are new patients I will just go and browse the notes; or if I've had a day off; or if I, like yesterday, don't have the time to participate in the ward round, then I'll go and check what was written about it in the physician notes."*

Interviewer: *"What does that mean to your work?"*

Nurse: *"That's great for us! I think it's easier, much easier. You can more easily keep up to date with what the physicians are doing. And it is easier to make sure you remember what to do. You can quickly check: "have we done that?"*

As the quote tells, the introduction of EPR has occasioned the nurses to read by themselves, thereby increasing the actual reading. Furthermore, the easy access to physician notes means that they read the physician notes more regularly now – thus also incorporating physician notes in the textual universe that forms part of the updating process. Also, the easier access to notes in general allows the nurses to catch up with events they have not participated in by reading about them afterwards. Finally, the nurse above states that the easy access to physician notes also make them work as memory aids: by reading the notes on scheduled

treatment plans, etc., the nurse is reminded of work that she is expected to carry out.

Updating throughout the duty

The first 30 minutes on duty is the prime moment of updating on the patients and on the work of nurses on previous shifts. However, updating continues to be an integral part of the nurse's activities throughout the rest of her time on duty. As the nurse engages in work with the patients, talks to her colleagues, or comes across something (e.g. a special bandage on a patients) she now and then encounters issues that need further clarification. This gives rise to small sequences of additional updating, which take the form of asking colleagues questions, glancing at the patient-list, or looking something up in the EPR: What has been decided? What have others thought about the case in question? In the following, I will elaborate on how the different actants – the colleagues, the patient-list, and the EPR – keep on playing main roles in the nurses' updating routines throughout the duty.

Ongoing talk among colleagues

During a shift, the nurses have few moments together, where they are not each engaged in something – the occasional gathering for oral report being an exception. They can have lunch in pairs, but often the official lunch is skipped, having small coffee breaks at opportune moments instead. Thus, although the nurses are working physically close to each other, they seldom sit down together, which is why nearly all communication is done while carrying out something, in passing, or in idle moments.

The layout of the ward works to structure the pattern of communication: in the daytime, the office is usually full of nurses, aides, secretaries and physicians using the computers, reading documents, or being on the phone. In this space of time, talking tends to be related to work issues; in the hallway, the nurses have more private conversations (in low voices) and exchange rapid messages (coordinating tasks, reminding each other, or asking questions about something work-related); in flushing room and depot, the nurses talk when by coincidence having common errands

there; and finally, the kitchen provides an opportunity for all kinds of talk because here, the nurses will often pop in if they have time for a quick cup of coffee. All these different spaces and the highly interrelated and physically close work of the nurses provide many opportunities for exchanging information about the patients. On the other hand, this swarm of on-going activities also means that there are very few occasions in which knowledge about patients or, say, professional practices are exchanged or debated in common. The occasions for what the ethnologist Julian Orr has called "war-stories"[46] seem reduced.

The patient-list

As mentioned, during the first 30 minutes of the duty, the nurse will fetch a printed, up-to-date patient-list, skim it, and make small handwritten comments on it as she gets more information from talking to the overlapping nurse and browsing the EPRs. Also, the patient-list works as an intermediary between the nurse and the vast database of the EPR and helps the nurse structure her browsing.

After this initial interaction between the patient-list and the arriving nurse, the nurse usually puts the patient-list in her pocket, and now and then she will take it out to brush up on the patients. As previously described, the patient-list holds compressed descriptions of the patients and the nurse can quickly check what is the matter with the patient and what important arrangements have been made. This helps her frame the patient instantly ("Well, he has aphasia!"), trace the patient's position in the trajectory and align the organizational network around the patient-case ("Oh, I have to ask for the hospital orderlies to take Mrs. Jensen to physiotherapist at 1 p.m."), and remember to accomplish tasks ("I must take urine specimen!"). Furthermore, the patient-list also acts as a memory aid when a colleague asks the nurse about a patient (for example, if the overlapping nurse is busy and lets an experienced arriving nurse do the reporting): interestingly, the sheer glance at a name on the patient-list seems to help her remember more details about the case. In

[46] Orr has coined the term "war stories" to point to the anecdotes of experience that serve as vehicles of community memory for practitioners such as service technicians. War stories has a situated quality: "they are situated in that they combine facts about the machine [the work object] with the context of specific situations" (Orr 1990: 175).

sum, the patient-list plays an important role as a structuring device in the nurse's EPR-browsing – outlining the patient cases and helping her determinate what needs deeper exploration – and as a memory assistant letting the nurse brush up on the patient cases wherever and whenever she needs it.

Checking EPRs

It happens that the nurse comes across something in need of more clarification than the patient-list affords and her colleagues are able to give. For example, the nurse might discover a rash on the patient. Talking to the patient and a colleague nurse in the hallway does not clarify whether others have noticed this and decided what to do, and the nurse therefore goes to the office, opens the patient's EPR, and browses the latest physician and nursing notes to investigate the issue. Often, the nurse also checks other documents in the EPR such as the ordination sheet and the medicine sheet to see exactly what has been decided on the patient. Also, patient and relatives ask the nurse about the state of affairs (e.g. "have the X-ray results arrived?") which the nurse then looks up in the EPR.

However, it is not only acute needs like these that motivate the nurse to read in the EPR. The nurse also browses the EPR in a more loosely structured manner to update on the ward patients in general or to check something out that has made her curios. The nurse on night shift especially might have many breaks, in which she has time to browse the wealth of information in the EPR. She might for instance check out the longer case history of a specific patient or look up patients in the Acute Reception Ward to see what kind of patients can be expected on the ward the following days.

The nurses are somewhat uneasy about this way of reading in the EPR, though. The wide access to patient information are regulated by formal legislation in order to secure the patients' personal right to professional secrecy and prevent illegitimate readers from learning about highly personal matters of, say, their neighbor. But these rules are subject to some uncertainty. It is not allowed to look up information about patients that are not related to the ward. However, there are some gray zones as in the above mentioned, where a patient will most likely be transferred to the Apoplexy Ward and then be a legitimate subject to

read about. Another example is when a patient is transferred to an other ward – e.g. the Geriatric Ward – and the nurse is curious to know how the patient's condition develops. On the one hand, she is no longer directly related to the patient and accordingly has no right to read. On the other hand, she has legitimate knowledge about the case and can develop her skills by following its further development[47].

Despite the nurses' uneasiness, the direct and unlimited access to EPRs has made it much easier for nurses to keep themselves updated on the different professional groups' statements about the patients. For example, the nurses read much more in the physician notes now than before the introduction of EPRs. Nurses state that the increased reading means that they are much better informed about the physicians view of the patient cases, and consequently, of the different task to be carried out by the nurses. As for the medicine ordinations, nurses can now update themselves simply by looking it up in the EPR. In contrast, earlier they had to collect the different documents in which medicine information were written and compare them to find out what was the last modification (this issue is addressed more thoroughly in Chapter 6). Also, instead of waiting sometimes till noon to read the physician's conclusion on the ward round (because talking to the physician is not a guarantee that he remembers to tell the nurse everything), the nurse can read it as soon as it is entered in the EPR and act upon it. Moreover, when preparing for the ward round the nurse can now read the notes at the same time as the physician. Earlier, the physician sat with the patient record, while the nurse had to read it later, which meant that the nurse was always a little behind the physician in terms of being up-to-date.

The other side of the coin is, however, that physician notes are now scattered in different folders: physician notes, ordination sheet and medi-

[47]Interestingly, after finishing the fieldwork a new feature has been added to the EPR in order to regulate this gray area a bit more. Now, if a nurse looks up information about a patient in another ward, a dialog box pops up and asks her: "According to assigned rights NN has no access to the record. Can NN have access to the record in relation to carrying out her work? Yes/no". And by clicking the "yes" box, the person accesses the record in question. According to the development team behind the EPR this message is a compromise between the need for regulating the access to records and not work against cross-disciplinary and cross-organizational collaboration and learning.

cine scheme. The nurses spend time comparing these different documents, in order to make sure that they know all the important details. For instance, it often happens that the physician has entered an ordination in the physician note only (and not in the ordination scheme also, as he is supposed to do). Thus, the easier access to physician notes also means the emergence of a new work load, namely the task of monitoring the physicians' statements and making up for any discrepancies by constructing a third artifact, "the overall picture", to which nurses align their own work. This development is not fully approved by all nurses. One of the interviewed nurses thus states:

> *"It is, of course, toilsome to use so much time checking the ordination sheets and the ordinations. Earlier, it was the secretaries' job, but they have cried off since they have too much to do… The worst of it is when the physician only writes an ordination in one of the places when they have to write it both places. And we (the nurses) feel that we are directed to check up on this, and I really don't think it's my job. It has to be the physician's responsibility, but I know that I am ticked-off if the tests haven't been taken".*

Consequently, on the one hand, the easier access to patient documents means that nurses are now able to do much more updating in idle moments, thereby being able to keep themselves abreast of patients' conditions, the state of affairs in general, and of the framings and expectations of the physicians especially. On the other hand, however, new tasks of checking, comparing and reminding have emerged concurrently – making updating both a question of leveling with and nursing of the physicians.

Discussion

I have now addressed the ways in which the introduction of EPRs has occasioned changes in the updating routines of nurses in the beginning of a shift and in the ways updating are performed throughout the rest of that shift. The question to be pursued now is how these rearrangements affect other aspects of nursing and nurses' relations? I will do this by focusing on four dimensions: a) the relations between arriving and leaving

nurses; b) the relations between nurses on a shift; c) the relations between nurses and other professional groups, especially the physicians; and finally, d) the coordination across organizational units and the relations to patients. I try to map transformations between before and after the introduction of EPRs. However, this maneuver is handicapped by the fact that very little is written about nurses' routines of seeking and incorporating patient information in their practices, and nothing about the way different technologies might influence this (as is also the case for literature about physicians (Atkinson 1995)). In consequence, the historical comparisons are based on the nurses' own experience of how things were carried out before versus one year after the introduction of EPRs.

Nurses and the colleagues on preceding shifts

The nursing notes are important as intermediaries in the coordination between shifts. This has not changed by the introduction of EPRs. However, the electronic form is making the updating somewhat more straightforward. In Kardex the entries could be scattered across many separate pages, which the nurses should leaf through in order to spot them all. Now, dates in the file tree (in the left side of the screen) show where new notes are made and where whole new problem categories are drawn up – thus, it is much easier to get an overview of the latest entries. Moreover, nurses can now easily access the physicians' statements too, which help them follow the evolving actions and framings of the patient cases here.

The most radical changes seem to be in the relationship between the arriving nurses and the nurse from the leaving shift that who overlaps to hand over patient information. Now, the arriving nurses often go straight from settling how work should be divided to browse information on their own (although sometimes joined by a colleague or a student), guided by own or colleagues' previous experiences with the patients. The browsing is not informed by the overlapping nurse's framing of the situation neither by the arriving nurses' reactions to this framing. And often, the overlapping nurse provides missing information only if the arriving nurses find something unclear in the EPR and ask about patients. Thus, the arriving nurses now play the role of information *seekers*, sorting the

information themselves[48], rather than of *receivers* – to whom information is handed. This change is considered to make the job easier, but entails new kinds of work too.

This change from receiver to seeker marks a displacement of the responsibility for handing over information: earlier, handing-over was taken care of and structured by the overlapping nurse performing an oral going-through of Kardex and supplementing this with further details. Now, the web of available information in the EPR and the information-seeking nurses are responsible for the incorporation of information from nurses on earlier shifts. Thus, responsibility for the exchange of information across shifts is decentered from (overlapping nurse + listening arrivers + Kardex) to (EPR + information searching arrivers + busy overlapping nurse). By this decentralization, arriving nurses have much easier access to a larger number of dispersed written information, but have fewer occasions to talk face-to-face with persons having worked on the last shift. Furthermore, the whole notion of *handing-over* is thereby changed to that of *providing and updating* information, which also entails considering whether colleagues enter the appropriate amount of information in the EPR, and look up the relevant things when browsing the EPR for information.

Most likely, the growing employment of written information changes the overall characteristics of reporting and updating. As argued in the section about reporting routines, through preformatted spaces, statements in the EPR perform a different rendering of the patients: they stress patient problems and activities aimed towards these problems; and they classify the problems and interventions in a standardized manner. This representation differs from the looser structure of Kardex as well as from the overlapping nurses' oral reporting, in which reading aloud from Kardex was combined with supplementary information and personal comments. It has become harder to get the overlapping nurse's verbal comments and, furthermore, exchange of information progressively seems to happen through the written information in the EPR. Due to this,

[48] This might enhance the possibility that updating by browsing the EPR is now steered by her own idiosyncrasies, although sometimes others participates in the searching like in the above story, where the leading nurse suggest checking the temperature graph.

it seems reasonable to think that the overall scope of patient information, which connects the different shifts, is being narrowed down to a certain type of information, that is, what can be written in short statements and fits a problem oriented logic (in the EPR), or is considered very important for the cross-disciplinary community (in the patient-list). The possibilities to present and discuss more vague hunches or long, detailed accounts of patients across shifts seem diminishing after the introduction of EPR.

The relationship among nurses on a shift

The altered arrival routine affects the relationship among the arriving nurses. Earlier, they all heard the overlapping nurse's report and the different comments it occasioned. Now, they do not always gather, but update themselves more independently of each other. The nurses state that this is not so different from earlier, because they still talk to each other, just in another fashion. If the tendency gets more clear-cut, however, the relationships among nurses might be significantly altered. In the Apoplexy ward where the nurses never gather for a collective report, a nurse thus states that they talk less to each other now, which to her has both pros and cons:

> *"It is of course a problem that maybe we don't talk so much to each other any more. Without report, we work very independently…we don't have many professional discussions. Of course, we might talk about the specific patients, but earlier when we got report we actually had many good general discussions. But that is how we've chosen to work here…I think the other wards do more reporting, but that is also because they share the patients. Here, we have our own patients, so I really don't deal with my colleagues' patients and I don't need to know much about them. In the old days spent a lot of time listening to who have had defecation and I didn't care because I would not attend that patient. It was waste of time, I think".*

The quote points at a built-in dilemma regarding collective reporting and updating: on the one hand, receiving collective reporting takes time and plagues the nurses with information that might be irrelevant for their own work. On the other hand, collective reporting can occasion general discussions about nursing and the state of affairs. Thus, the downplaying of oral reporting and growing individual updating on the Apoplexy

Ward very likely means less redundant and irrelevant information but also less general discussions and less knowledge about the work of colleagues.

The relationship between nurses and other occupational groups
The introduction of EPRs has meant easier access to physician notes and patient documents in general. This has occasioned the nurses to read more in these documents, incorporating the documents as parts and parcel of their daily updating routines, which may expand the updating from being primarily an updating on the nurses' work to include also updating on physicians' work. Nurses state that this keeps the nurses more abreast of the physicians' activities. At the same time, though, it gives rise to new activities such as assembling the "overall picture" of statements about the patient and the work to be done, statements that are scattered across the different physician documents and needs to be unearthed, compared, and evaluated and to which nurses adjust their work.

The interviewed nurses tell that they find it hard to conclude on a large scale whether they speak more or less to the physicians now. In other words, the increased reading in physician notes does not seem to have made nurses talk less to physicians. Rather, it seems likely that the nurses talk to physicians in another way: more than being informed by the physician, the nurses *comment* on the physicians' statements and work and *remind* them of things. Interestingly, this is a change from a subordinate position to a more symmetrical one – a tendency which is also found when studying the new authoring processes of physician notes as described in Chapter 4.

And yet, the closer connection between nurses and physician through the nurses' reading of physicians' statements does not seem to lead to increased direct cooperation between the two. For instance, a nurse states that the physicians practically never invite the nurses to help figuring out what is the patients' problem, even though the nurses are much better informed about the medical aspects of the cases nowadays and could relate this to their own experiences with the patients.

Coordination across organizational units and the relations to patients
Nursing notes work not only as actants in the coordination across shifts. They act also as means for articulating patient trajectories across the

hospital. Usually, a patient is transferred from the Acute Reception Ward to, say, the Apoplexy Ward. But patients can also temporarily be transferred to a surgical ward or further referred to the Geriatric or the Psychiatric Ward. Earlier, the way nursing notes were formulated and organized could vary from ward to ward – some places being open Kardex, other places full of abbreviations and technical terms. Now, the nursing notes are organized in a uniform way. The nurses find that this has made the transfer of patients easier, since the nursing notes can now be more readily accessed and understood. This also implies that the nurses do not have to make a proper report to the colleagues who take over one of their patients. Of course, they still make sure that the nurses in the other ward are ready to receive the patient, but often, the nurses there have already read up on the patient and are informed (although this is not a fully legitimate thing to do).

Regarding the patients and their relatives, the nurses' easier access to statements across wards, occupational boundaries, and time make it possible to provide more information quicker than before. If for instance a relative phones to the ward to hear news, the nurse quickly opens the EPR to sum up the latest nursing and physician notes. Also, a discharged patient can call and make the nurse repeat the doses and intervals of prescribed medicine. The nurses do not find that their interactions with patients have changed in general, although the easier access to physician notes enables them to inform the patients more readily about the medical aspects and decisions. On a large scale, the introduction of EPRs has not changed the frequency of nurses' talking to patients. However, it must be remembered that the termination of "open Kardex", and concomitantly, the centralization of nurses' reporting and updating routines to the office has consequences for the relation between nurses and patients: it is less likely that patients are involved as a co-authors and co-readers of the nursing notes.

Summing up, the introduction of EPRs gives rise to subtle yet distinct rearrangements of nurses' updating routines – even though the nurses do not immediately fasten upon this. The easier access to written documents is accompanied by the emergence of new tasks, roles, and work loads that add new dimensions to the nursing job: a) increasingly, the arriving nurses perform the role of information seekers as opposed to receivers, whereas the overlapping nurse increasingly performs the role

of backstop, making up for lacking information; b) the reorganization of roles and relations between arriving and overlapping nurses reduce the possibility of having common discussions about the patients and the nursing job; c) the easier access to written information occasions the nurses to incorporate the physicians notes in their updating on a regularly basis, which makes nurses better informed about medical aspects and the physicians' activities. Also nursing documents are more accessible and understandable across wards; d) updating through the screen has given rise to a new activity, namely monitoring the actions and statements of colleagues and physicians and intervening by reminding, commenting or carrying out extra work; and e) the centralization of nurses' updating activities to the ward office contributes to downplaying patients as co-authors and co-readers of the nursing notes and consequently enacting nursing as less patient-empowering than before.

Conclusion

One main argument behind the introduction of nursing notes were that nurses should be better at documenting their activities in order to prove quality and efficiency, and in order to become visible as a professional group. However, nursing notes are also important as means to coordinate nursing activities across shifts. Before the introduction of EPRs nursing notes were placed in Kardex (which were often located at the patient's table). In turn, each nurse could write and read in it, and by the beginning of each duty a nurse from the previous duty gave an oral report, in which she read aloud from Kardex and supplemented with additional comments. Thereby, the nurses were enacted as a professional community with special tasks and concerns through an artifact that was "their own".

By the introduction of EPRs, Kardex has been replaced by electronic nursing notes, which are part of the EPR. Hereby, several nurses can simultaneously access the nursing notes and other types of patient information, such as the physician notes. However, at the same time rea-

ding and writing of notes are physically anchored to the computers in the office. In this altered network the reporting and updating routines of nurses change subtly. Reporting becomes more oriented towards documentation concerns in that nursing notes are made to fit a problem-oriented format, which implies classifying the notes in relation to nursing diagnoses. Moreover, the nurses tend to use the time at the end of their duty on entering notes rather than talking to the meeting nurses. However, notes are also made to inform nurses on the coming shifts, and this coordination is supported by the increasing use of the patient-list as scratchpad to hold important information for the colleagues in the coming shifts. But nurses read much more in the physician note than earlier, and increasingly the medical agenda comes to affect the content of nursing notes and the patient-lists as well.

Updating becomes more and more an individual task. The arriving nurses each read the nursing notes and physician notes rather than holding collective meetings. During their work with patients, they use the patient-list as a memory aid. In this way the nurse community is changing. At the same time as nurses become more individualized, they become more familiar with and co-constitutive of the medical agenda. Moreover, the occasions for discussing nursing as a distinct discipline and for collective sparring are reduced. Thus, in some ways the boundaries between nursing and medicine seem to dissolve. It seems likely therefore that the nurses' activities become more oriented toward this medical agenda at the expense of other types of agendas, such as psychosocial or ethical, although nurses are still very oriented toward the soothing and caring of patients. However, at some point patients are clearly downplayed in the new network: nursing notes are no longer written together with the patient, neither are they within his or her reach. In general, the information work of nurses is moving backstage to the office, away from the patients' presence. This might be considered a retrograde step inasmuch as it is an explicit nursing-professional aim to involve the patient in his or her own case by making the record easy to understand and by keeping open files.

6

Stabilizing medicine prescriptions? Implosion and ramification in the trajectory of medication

Introduction

Drugs are an integral part of the activities in the medical ward – as the very name of the ward suggests. During a hospitalization period it is common that a patient gets 5-10 types of medicine. And often, the patient takes 2-5 additional types of drugs as part of his or her daily life, increasing the total number of participating drugs.

In order to ensure that patients get the proper drugs and the proper doses at the right moment, a good deal of the jobs of physicians and nurses is involves deciding, administering, and evaluating the types and doses of drugs. A lot of different artifacts and technologies help perform these tasks. Thus, the seemingly simple event of "a patient getting a drug" is the effect of a multitude of interaction and negotiation processes between people, signs, and artifacts, in which "the drug" takes on different shapes and meanings as it connects to different actors and materials.

Despite – or rather because of – this infrastructure of medication, drugs do not always end up the right places. Often, the patient happens to take a wrong pill or a wrong dose (cf. Andersen & Fog 1998, Senderovitz et al. 1998) – a fact that sustains an ongoing public debate about how to bring down this high level of "errors". Blame has been put on "the human factor", e.g. the staff not writing prescriptions or copying these to other documents sufficiently scrupulously, e.g. to Kardex (cf. Haller 2000), and on the way drug containers and boxes resemble each

other by graphical layout. This is not merely a Danish complex of problems: e.g. in 1998, the US "National Coordinating Council for Medication Error Reporting and Prevention launched a "Taxonomy of Medication Errors" to help the recording and tracking of errors (NCC MERP 1998).

Recently, however, hope is placed on the ability of information technologies such as the EPRs to standardize and simplify the way medical information is entered and distributed among the professional groups in the ward (thereby reengineering the structure and diminishing the possibilities of errors due to human factors). This is also the case at Svendborg Hospital, where medication has been a core issue during the introduction of EPRs in the medical ward.

By following the trajectory of a drug – from being one possibility among many in the vast register of available medicaments, to acting in the patient's body – I will show how the introduction of EPRs changes the way drug prescriptions circulate in the medical ward. Furthermore, I will point out how this altered infrastructure of medication reduces the occurrence of some "old errors" to some extent, but continues to produce other types of "errors" or problems. These problems can relate to: Difficulties in producing an overview of the temporal structure of the total medicine prescription; a continued double bookkeeping in physician notes and medicine schemes; the design and structure of the medicine database, which limits the way drugs can be looked up and chosen; and discrepancy between the logic of an automated medicine system and the logic of disease and well-being. An underlying point is that errors can neither be traced back to human factors or to their "structural" or "organizational" backdrop, but emerge in the interplay among humans, signs and artifacts.

In the following, I will first present the trajectory of a drug before the introduction of EPRs, and subsequently describe how this trajectory has been altered since the introduction of EPRs. Finally, I will discuss how the new trajectory removes the possibilities of some problems but continues other and gives rise to whole new risks.

The interweaving trajectories of medication before the EPR

It is common that patients hospitalized in a medical ward already take several drugs as part of their daily life – often with no specific relation to the malaise that brings them to the hospital. Of course, these prescriptions have to be continued while the patient is hospitalized. Thus, clearing up what kind of medicine the patient regularly takes, is part of the hospitalization routine. The central task, however, when a patient is hospitalized, is to determine the nature and cause of the patient's disease and find the medicine that will cure or alleviate it. This process comprises several steps such as choosing a drug, making a prescription, and administering the drug to the patient. In the following, I will use the term "medication" to cover this whole process.

In broad outline, the medication process before EPRs was a process of deciding, copying, and comparing. To illustrate how this could take place, I have constructed a small case story about the trajectory and lifetime of a pill against headache. This is a made-up example, as I have not made any real-time observations before the introduction of EPRs but only gathered the recollections and memories of the staff.

> Physician Larsen is busy doing the ward round. The next patient to see is Mr. Lindstrom, who has been in the medical ward for a couple of days. He came in because of a paralytic stroke, and now the X-ray pictures of Lindstrom's brain have arrived. "Good morning Lindstrom, how are you today?" asks Mr. Larsen, and Mr. Lindstrom says that he is gaining some sense of touch back in his limbs, but feels dizzy and has double vision. Physician Larsen listens and replies that the X-ray pictures shows that Mr. Lindstrom has had a thrombus in the brainstem, and that the dizziness and double vision are typical after-effects. "I'll give you a drug that prevents new thrombosis, it is called *Persantin*!" says physician Larsen and finishes the conversation. After seeing yet an other patient, Larsen goes to the office and takes up his dictaphone. He starts dictating a short note on the diagnosis of Mr. Lindstrom: transient cerebral ischaemia. Looking up *Persantin* and the suggested dosage in the Medicine-handbook, he adds information about the new drug: "Recipa Persantin, 200 milligram

morning and evening" He takes the tape out of the dictaphone and drops it on the secretary's desk. In the hallway he meets a nurse and tells her about the *Persantin*. "Give him one now and then morning and evening!"

The nurse writes herself a reminder on a scrap of paper. She goes to the depot and takes a *Persantin*-pill and a glass of water and brings it to Mr. Lindstrom. Meanwhile the secretary takes the tape and puts it in the tape player. She transcribes the physician note and the new prescription so that it follows the latest note in the patient record. Then she puts the patient record back on its shelf.

A little later, the nurse comes back into the office, takes the record of Mr. Lindstrom and sits down with it at the table. She finds the page with the new prescription and copies the name of the drug and the dosage to Kardex[49]. Then she goes to Mr. Lindstrom and fetches his dosage box on the bed table. She takes out the dosage card and adds the information with a pencil. She goes to the depot and puts a *Persantin* in the space for the evening medicine. Then she puts the dosage box back on Mr. Lindstrom's table.

In the above story, we follow a small sequence of action making up a typical, everyday medication-routine. Or rather, we follow the shifting interactions between a blood clot, a patient, some X-ray pictures, a physician, a dictaphone and tape, a secretary, different pieces of paper, a nurse, a depot, and a pill accompanied by a glass of water. The story could have started earlier (e.g. at the point where someone discovers that the active substance in *Persantin*, *diprydamol*, works to hinder the absorption of adenosin in thrombocytes and makes it difficult for blood platelets to clot without causing an increased tendency to bleeding (Lægemiddelkataloget Online 2002)). And it could have ended later (e.g. when someone makes an evaluation of the success of *Persantin* to fight thrombosis in the patient and perhaps adds other drugs or removes *Persantin*). But the above version will suffice in illustrating an important part of the trajectory of a pill through a working organization.

[49] Usually, the medicine information would be entered on a scheme in the top of the Kardex-card. However, there was many different ways to structure Kardex from ward to ward, and sometimes medicine information was entered both in Kardex and at the back page of the medical record. No matter what it entailed that medicine information was copied 3-4 times.

If the story is read with special attention to the drug, it becomes clear that this drug is not a uniform, stable actant, but undergoes a series of fundamental translations as it connects to the different entities. From being a discursive *proposal* in catalogues and in the physician's mind, it becomes a specific medical *answer* to a designated problem; to being a decision on a tape transcribed into a formal medical *decision* in the patient's record; to being a *message* about medicine and then a rush job for the nurse; to being a *provisional pill* to swallow; to being data in the nurses' Kardex and the medicine card; to being one of the *regular pills* in the dosage box; to being a biochemical *agent* in the patient's body; and finally, perhaps, being a bodily or psychological *signal* on which to base a medical evaluation of the drug.

Figure 6.1 is an orderly version of this historical trajectory of medication, though it also hints at possible alternative routes in the course of events. In daily business, however, the relations between these translation processes were not similarly straightforward and sequential, but did sometimes depart, double, and intersect with each other – thus making it hard to talk about *one* trajectory of a drug. In principle, a "red thread" ran through all these predicates – namely the medication of a drug – but it would be misleading to claim that it was "the same thing" – i.e. a drug – that entered all these relations. In fact, it was often *different* things that ended up traveling through the tangled organizational network: sometimes, the dosage, the strength, or even the type of drug changed on the way from a semantic resource to a small, round pill to work in the patient's body. Let me explain how!

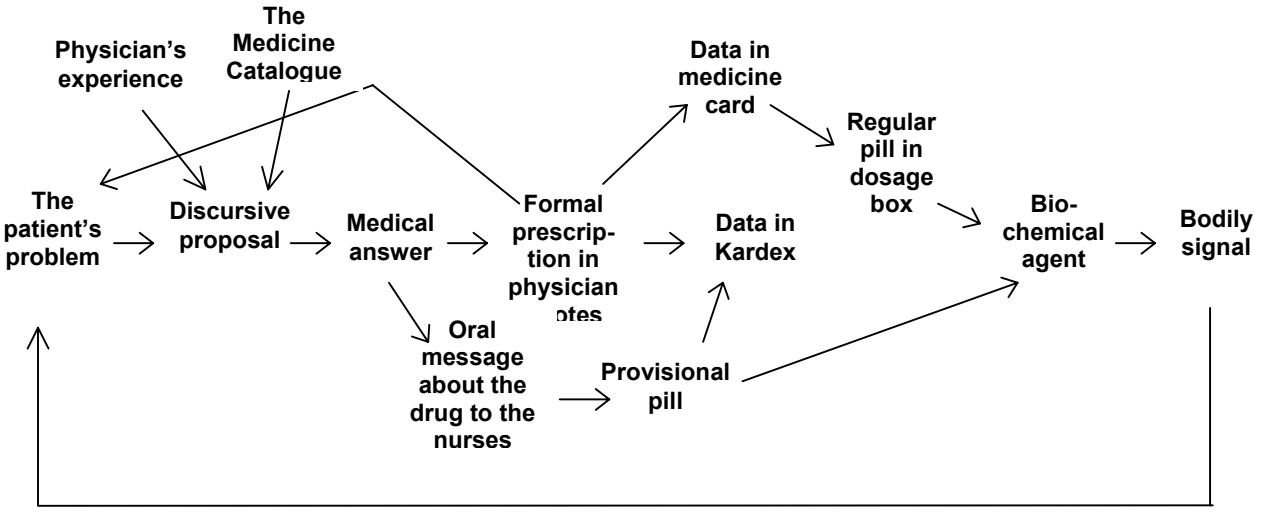


Figure 6.1: The previous trajectory of medication can be illustrated by the chain of various identities a "drug" assumed on the way from being an answer to a patient's medical problem to affecting the patient's body. The arrows indicate the translation processes between identities.

From patient's problem to medical answer

When the physician had[50] arrived to a certain conclusion – or at least a preliminary closure – on what was wrong with the patient, he almost instantaneously coupled this to considering what kind of medicine that would relieve or cure the malaise. Doing this he drew on several sources of information. First, he drew on his educational background as a physician, where he learned about diseases and the possibilities of medical treatment. Second, he drew on the medical conventions of the hospital as, often, the specific hospital ward or the specific medical specialty based its choice of medicine on special traditions and idiosyncrasies. And finally, he drew on the different handbooks and manuals about diseases and medicinal products. This last aspect was more complicated than it might seem. Formulating a specific medical answer to the patient's problem often took form of choosing among the medicinal products mentioned in the reference books. Before the EPR, the green

[50] For the sake of argument, I use past tense when addressing how medication was performed before the introduction of EPRs. However, this grammatical form can be somewhat misleading, because some of the procedures and principles still obtain. In the following section about medication after the introduction of EPRs, I will point out these areas of continuity.

"Medicine Catalogue of the Danish Medical Association[51]" was the central reference book, especially as it fits the pocket of the physician's white coat. In this book the medicinal products are divided into therapeutic groups such as "blood and blood forming organs" and "heart and circulation" after the ATC-system (Anatomical Therapeutic Chemical Classification System), but the book also have an index in which the products are listed after their sales name. Thus, the Medicine Catalogue afforded two entrances to selecting a drug: one entrance via the type of disease, which lead to the generic name of a drug (in our case the thrombocyte-disabling agent, *dipyridamol*); and another entrance that lead straight to the drug by its sales name (in our case, the drug *Persantin*). When prescribing medicine, it was considered good practice to enter both the generic name of the drug and the sales name of the chosen product. This made it possible to replace the prescribed product by a similar one, if, for some reason, the chosen product was not procurable. However, it was most common just to enter the product name of the drug. Perhaps because many of the drugs used in a medical ward was repeatedly used as standard medicine to common diseases, they gradually became naturalized to an extent that their generic name was presupposed or considered unnecessary information.

Often, the physician knew the name of the drug he found appropriate for the specific case, but could not remember the specific strengths it comes in. He would then look the drug up by its sales name in the catalogue, check the different doses, and select the one he found most appropriate. But occasionally, the physician would look up the group of diseases, read about the different types of medicine that combats the specific disease by various modes of operation, select the most appropriate or least harmful method, and choose among the medicinal products listed there (perhaps by looking them up one by one and reading about their effects and side effects).

In sum, before the introduction of EPRs the process of formulating a medical answer to the patient's problem was a process of employing the physician's fingertip knowledge and consulting the Medicine Catalogue. Usually, this was a process in which a widely approved medical answer to the specific disease was singled out. Because of busyness,

[51] In Danish: "Lægeforeningens Medicinfortegnelse".

tiredness or forgetfulness, however, the intricate combination of tacit knowledge and available reference books sometimes led to an answer determined by routine and semantic content of the reference book, rather than the characteristics of the patient and his or her disease.

From medical answer to prescription

Formulating a medical answer to the specific problem of the patient was only the first step of the medication process. Another very important step consisted of embedding this answer in the formal organizational and textual universe around the hospitalized patient. In accordance with the law, the physician had to make sure that the medical decision was recorded, and hence, the medical answer only gained the status of a medical prescription when it was inscribed in the patient record.

Before the EPR, the physician would dictate the prescription or he would write it in hand on a scrap of paper, which the secretary could transcribe and make part of the physician notes. Often, he would choose to dictate it because the patient record could be hard to locate, and the dictaphone was lying ready in his pocket. When dictating, he would mention the new prescription and of course the patient's name, and then pass the tape on to the secretary, who would transcribe it into the patient's record. However, words on a tape could be quite ambiguous and disjointed because, often, the physician dictated in a noisy office and had to hurry to the next patient. Accordingly, it was sometimes difficult for the secretary to hear all the details. Of course, she was used to the semantic universe and knew what would be the typical drug for a specific disease. Because of this skill, the prescription usually came to resemble its predecessor, the medical answer. Sometimes, however, the secretary misheard the name or the dosage of the drug and wrote something else than the physician said. Usually, the secretary was aware of this danger, so if she could not hear a word or two, she would ask the physician if he came by. But it did happen that the medical decision turned out somewhat different than the medical answer. And even a small misspelling of a drug name or a "guestimate" of the dosage could – as can be imagined – have radical consequences for the further medication process.

Dictating a tape meant passing the job on to the secretary, who had to fit the task into the multitude of other things she had to be carried out. Thus, the production time of a medical prescription was contingent on the pressure of work of the secretary, and often the process of formally inscribing the prescription in the patient record was delayed. Since it could be important that the patient got the medicine quickly, the physician often told a nurse about his prescription before or soon after he had dictated it. Or the scrap of paper with the hand-written prescription would work as the "formal prescription", which the nurses looked at. But these other ways of engrafting the medical answer into the organizational network – thereby spreading the news and speeding up the medication process – also ran the risk of slightly or fundamentally altering the original medical answer: the nurse could mishear the prescription; and the handwriting of the physician was often crabbed. Thus, the strategy of spreading the message by mouth and dictating it risked challenging the process of establishing the medical decision as a coherent "fact", although someone at a later point could discover any divergences between the different versions of the medical decision.

From prescription to a provisional pill and nursing notes

In principle, the administering of pills had to await the prescription, i.e. inscription of the medical answer in the patient record. But as just described, this process could be slow, and in daily business the formal rule was often bended. When the nurse was informed about a new prescription to a patient (for instance on the ward round), she would typically go and get the pill to the patient, so that the treatment plan could be started. Sometimes, she would add the new prescription on the dosage card and just measure out one dosage of medicine to give to the patient; other times she measured out the full dosage for the next 24 hours and spread the pills into the partitions of the dosage box. No matter what, she would usually write a note about this in Kardex and add the letters "rp" (an abbreviation for *recipa*), which meant that the action was based on an actual prescription. Thus, while the medical answer was translated into official data, a nurse would unofficially push the realization process further by inscribing the information into the dosage card and Kardex, and

by measuring one dose of the concrete drug. But this practice was also risky. In the following quote, a nurse describes how working around the slowness of producing a prescription sometimes gave rise to mistakes:

Nurse: *"(It) took a long time. I had to wait for the latest physician notes to arrive in order to see what kind of medicine the physician had prescribed. Then I had to copy this information by writing it on the card for the dosage box. If the physician didn't enter the prescriptions immediately and the secretary didn't write immediately either, well, then mistakes could happen. And mistakes could happen if for instance the physician told me he had prescribed this and that, and forgets it when he later dictates the prescription and prescribes it somewhat differently in the record".*

Interviewer: *"Prescribes it differently?"*

Nurse: *"Well, for instance it could be one diuretic pill in the morning and one at noon. But in the record he writes that the patient is to have two pills in the morning and none at noon. I had to check the physician notes and see what decision he had come to about the medicine, because it might be something he had done purposely and just hadn't had the time to tell me or change it"*

As the nurse hints, mistakes could happen when the nurses employed an interim version of the prescription – that is the physician's message – and measured drugs on the basis of this. Interestingly, this kind of "error" did not arise, because, for example, the nurses misheard the message, but because the very content of the message might undergo a transformation on the way from the physician's verbal statement to the typewritten fact in the patient record. Many of the nurses acknowledged this danger. Thus, even though they acted upon the message they got from the physician, they often tried to verify this message by comparing it with the patient record, when the secretary had typed in the prescription. However, this was not always possible to do within one nursing shift:

Nurse: *"Trying to check the prescription meant that we had to wait. And when you have made the ward round, then sometimes the papers weren't written before you went*

home. And if there was some wrong information during the ward round – the prescription could be something entirely different – and we didn't have time to clear it up, then maybe the nurses having the evening or the night watch didn't find out either. Well, sometimes it could be like that!"

In the quote, the nurse describes how the production time of a prescription collided with the 24-hour work-division among nurses. Accordingly, it could be difficult for the individual nurse to track the official fate of a medical answer within her shift. Thus, trying to work around the time-lag of the production process of a medical decision entailed balancing considerations for quick response against considerations of avoiding establishing an erroneous medical truth, i.e. "copying" an interim version of the medical decision and administering a wrong pill or a wrong dosage; the nurse had to balance the value of waiting for the formal decision inscribed in the record against the risk of waiting in vain.

Yet one aspect has to be mentioned, namely the process of translating the decision – however firm and unambiguous it was – to a concrete, physical pill: Prescribing a certain drug presupposes that the drug is actually available in the ward or is procurable within reasonable time. Thus, an important step in the further trajectory of medication was the process of locating the drug-container or bottle of liquid in the depot, measure the prescribed amount of medicine for the next 24-hour, and putting it in the dosage box. If the drug was not available in the ward, the nurse had to order it at the central medicine depot by calling them and having it sent over by the "bell-boy" or picking it up herself. Sometimes, however, the drug was neither in the ward depot nor in the central depot. As can be imagined, this meant another delay in the realization of a prescription. Furthermore, it was a problem if there were only some pills left in the drug-container: measuring only a part of the 24-hour dosage could make it difficult to know later exactly what the patient had had and when. To ward off this uncertainty, the nurses had a routine of noting in Kardex what medicine the patient got and when it was administered. However, from time to time this was forgotten or the note was not totally clear.

From medical decision to data in Kardex and in medicine cards

Before the EPR, the nurses kept their own patient record, Kardex, which was structured around the health problems of the patient. On the top of Kardex was a medicine scheme, where information about the patient's medicine was listed and edited (but as mentioned this could vary from ward to ward). As a rule-of thumb, Kardex was located in the ward office or on the patient's bed table if it was an "open Kardex". Kardex would work as the nurses' parallel to the physicians' patient record: when a new medicine was prescribed it meant that Kardex had to be updated accordingly. Nurses were not only responsible for keeping Kardex, but also for updating the "medicine card"[52] in the patient's dosage box. The medicine card consisted of a piece of cardboard with preformatted spaces to fill out in hand about drug types, dosages, and dispensing hours. However, not all medicine types are solid and possible to dispense in a dosage box. Moreover, it is not allowed to put morphine or morphine-like drugs in the dosage box. For these other types of medicine, there was a "treatment card", which consisted of a small card that was filled out with information about liquid medicine, saline drip-bottles, etc. This card was kept together with the cards of other patients in a ring binder in the ward depot.

Keeping Kardex and the different medicine cards updated were in principle a question of copying data from the patient record to Kardex and medicine card. But the process of transcribing the physician's dictation into the patient record could, as mentioned, take a long time, and because of that the nurses would seek to update Kardex and medicine card on the basis of the physician's verbal information or hand-written notes. Thus informally, the nurse entered a new prescription in advance – before she had actually read the medical decision in the patient record. Taking this short cut would speed up the process of measuring and administering the drug, though at the same time producing an actant – the

[52] The names for this differ somewhat among the informants – and from hospital to hospital. Some call it "dosage card", others "medicine list", "drug list", or "medicine Kardex"; different names that sometimes seem to reflect slightly different designs of the artifact, but other times just seem to be variations in slang. I have chosen to use the term "medicine card" throughout the chapter.

provisional pill – which unfortunately had the habit of differing from the medical decision eventually appearing in the patient record. This was due to several reasons. First, the nurse could mishear the physician's message. Second, she could miswrite this message in the medicine or the treatment card. Third, the very statement could change in the space of time between sharing the medical answer with the nurse and dictating it as a medical decision.

The nurses knew these dangers and tried to compare the provisional statements in Kardex and medicine cards with the one in the patient record, when it finally arrived. After the ward round (which was the typical occasion for prescribing or modifying medicine) the patient record would be back from the secretary at 2-4 p.m. Sometimes, the nurses on evening watch would then compare the patient records with Kardex and medicine cards and discover any divergences. But checking was not an established routine, as this quote from an interview with a nurse hints:

> *Nurse:* *"No we didn't check all the time. Well, we did occasionally, if for instance we discovered that something didn't tally with the information other places. But that was a major work task, because you had to go back through all the pages. Usually, when the medicine was prescribed it figured at the bottom of the notes (...) and next day another piece of text would come and a third one and then maybe something was changed there. You'd had to leaf back through many pages to find out whether the medicine was the right one (…). We talked a lot about making a separate medicine card that the physician should take care of, because it caused a lot of trouble. It was really laborious, if we nurses should check it".*

Thus, the very burden of ransacking and comparing statements in the different documents prevented this work from becoming a regular activity. Accordingly, it was not a rare phenomenon that information, especially alterations of prescriptions, was not updated in all documents[53]

[53] Tthat the problem of keeping patient records and Kardex in accordance with each other was not simply a local phenomenon studies of medication processes elsewhere confirm. See for instance Andersen & Fog 1998, who studied the drug prescriptions

Moreover, copying the medical decisions from the patient record to Kardex and to the medicine card was not an unproblematic thing to do. Just as the handwriting of physicians could be crabbed so could the nurses'. A sloppy writing of the name "*Marevan*" (a drug preventing blood clots) could be read as "*Marplan*" (a drug against depression), and the omission of a single digit could change a low dosage to a high one.

In sum, the further continuation of the trajectory of medication (the translation of the medical answer to data in Kardex and medicine cards) entailed, in principle, a complex process of intercepting, inscribing, locating, and comparing statements – an on-going process of "triangulating" statements in the patient record, in Kardex, and in the different versions of medicine cards. In real life, however, the pressure of work and the very trouble of locating the different documents did not allow such an audit. Often, this meant that the presupposed red thread in the medication process snapped: suddenly along the links and loops between staff, documents, and pills the medical answer was transformed into a whole new entity of little resemblance with the original medical answer.

From regular pill to a medical evaluation and possible re-medication

When getting the pill, the patient was supposed to let it work in his body by swallowing it. Then, in principle, the chemical substances of the drug would interfere with the complicated biochemical processes of the body after some time and alter the physical state in a certain direction – e.g. relieve pains, thin the blood, or combat bacteria. However, even this small chain of events implied a certain amount of work and had its own pitfalls, which could make it take an unanticipated turn. First of all, the patient had to take the medicine; that is, swallow the right amount of pills within a reasonable period of time. Due to different kinds of reasons, this was not necessarily what happened: the patient could be forgetful, or not concentrating, or he could simply misunderstand the medical instructions and take the wrong pills or a wrong dosage. Furthermore, patients often worked with an opinion about what was good for

entered in patient record and nurses' drug list. Only 75.0 % of the ordinations figured in both documents.

them that competed with the physician's directions. They might, for instance, take only half of the prescribed dosage because they were afraid of side effects. This phenomenon is well known to medical professionals, who discuss it as a problem of medicine "compliance" (cf. NCPIE 2002) or, in the United Kingdom, "concordance" (cf. British Medical Journal 1997). If all these possible deviations from the original trajectory of medication are taken into account, it seems clear, that what was actually working in the patient's body could not be taken as a given fact.

No matter what destiny the trajectory of medication suffered – no matter what had happened to the prescription during the various steps of translating it from sign to artifact – the trajectory did not end at the point where the patient swallowed some pills. It is a deeply rooted principle in medicine that an intervention has to be followed up by an evaluation of the result. This evaluation was typically based on one or a combination of different methods of measuring and determining the bodily state and functions: measuring temperature, analyzing urine samples, judging the extent of edema, looking at the patient's face color, asking to the patient's well-being, etc. In the daily interactions among nurses, physicians, patients, instruments, etc., such bodily signals and statements of the patient were constructed, collocated, and compared, leading towards a point, where a physician – as the formal protagonist albeit in real life assisted and sometimes even overpowered by a range of human and nonhuman actants – made an official evaluation of the outcome of the medical intervention and decided what to do next.

Despite this feedback-routine, it could be hard to assess in an unequivocal fashion the result of a medication. Many patients suffered from chronic diseases and, hence, the obtainable outcome was control and alleviation of the patient's symptoms, rather than curing. Moreover, the patients often got a long list of different drugs, and the way these drugs interfered with each other and created side effects made it difficult to determine the effect of a single drug (not forgetting the difficulty in estimating the appropriate dosage for the specific patient). What is more, assessing the present bodily state did not automatically lead to an obvious response. Re-medication was typically a balancing act between wanted effects and unwanted side effects, and, often, the dosage of a drug had to be changed over a period to fine-tune the treatment, or the drug could be discontinued for a period. Whereas changing drug type

and dosage implied deleting or crossing the old prescription and adding a new, discontinuation of a drug was marked with the letters "sp" [54] against the drug.

Besides the intricacies of determining the state of affairs and deciding on the response (or medical answer), re-medication involved the opening of a new trajectory, which usually ran through all the subprograms of dictating the answer, passing it on as a message to the nurse, transcribing by the secretary, updating Kardex and medicine cards, measuring pills and administering them to the patient and so on. Summing up, the closing of the trajectory of medication – the working of a chemical substance in the patient's body – often marked the opening of a new trajectory of re-medication, in which all of the above mentioned subprograms had to be performed again – thereby repeating all the risks of sliding the medical statement.

Constructing an overview of the medical trajectories

During a hospitalization-period the patient's medication was typically revised – i.e. modified, supplemented, or discontinued – several times. And each time someone took the initiative to do so he concomitantly opened up a new trajectory of medication close to the one just described. Thus, for nearly every patient on the medical ward a series of medication processes were being performed – in succession or synchronous with each other. Of course, these repetitions of the medication trajectory meant repeating the occasions for producing medication "errors", but perhaps more interestingly, they also gave rise to an independent work task of building an *overview* of the number of medicine prescriptions and their status, for example in terms of being "regular", "on demand", or "discontinued".

Ideally, a total updated list of prescribed drugs would be easy to obtain if every new or modified prescription was at least represented in the patient record. However, as described by going through the medication trajectory, it was often the case that information was missing in ei-

[54] Discontinuation of a drug is called "seponering" in Danish, hence the abbreviation "sp.".

ther the patient record, in Kardex, or in the medicine card (or, in extreme cases, in all of them). Moreover, the medical information sometimes diverged from the original medical decision regarding drug name, strength, or dosage. For that reason alone, it could be risky to base the overview on one of the documents only; most likely, the best picture would arise if the different documents were gathered and compared. But this entailed close inspection of the patient record, since the medicine information appeared not in one single place, but was scattered across the pages of running text. A physician describes how getting an overview of the patient's medicine often entails a lot of work:

> *Physician:* *"Sometimes it could be hard to figure out what the patients actually got. You had to go back to the foremost note – the hospitalization note. And then you could check: have any changes been made since then? Which could amount to a lot of pages to leaf through!"*

Accordingly, constructing an overview of a patient's total medicine entailed so much detective work that, in practice, it only happened on occasion – e.g. if somebody discovered a discrepancy between two documents, or the patient asked to get a copy of his or her list of medicine. This could give rise to a whole new type of "error", if for example new medicine was prescribed without taking into account all the other drugs that the patient got. Medication is not simply a question of choosing a drug against a specific disease, but also one of choosing a drug that will not inhibit the effect of other drugs or interfere with them in a way that creates harmful side effects.

Often, a task of a more manageable size was to clarify what were the *latest* prescriptions or modifications. Staff came and went, entered and exited patient cases, and, accordingly, it was an important task to ensure that activities – e.g. evaluation of medicine, new prescriptions and modifications of regular medicine – were communicated and coordinated across work shifts. The patient record, Kardex, and the medicine card played important roles in this coordination. E.g. as described in the chapters about the coordination routines of nurses, and about the authoring of physician notes, reading these documents were an established part of updating oneself in the beginning of a shift or on a patient case. When trying to find out about the latest prescriptions, the patient

record was in principle the most reliable document – at least it was the legally binding document. But as already mentioned the patient record could have a long production time. And worse, the patient record could be in another ward or in a special unit for some time, if for example the patient received supplementing treatment here. Below, a nurse explains how this affected the possibility of keeping herself updated on the patient's medication:

> *Nurse:* *"If the patient had gone to be examined somewhere else, then the record always followed. And sometimes they just kept it until the new note was typed in, or they didn't bring it back, and sometimes it was gone for several days (…), which meant that we didn't know what was prescribed. And if it was a patient that we was a bit unsure about then…well, if the record wasn't there then everything was gone: x-ray descriptions, laboratory figures, everything! The only thing that was not gone was our Kardex, but even that did sometimes go with the patient".*

Thus, although in principle the patient record kept track of the different prescriptions and modifications of these, it was not always possible to access the record. In these situations, Kardex and the medicine card suddenly became the key-documents for tracing the latest prescription. But as described above, data in Kardex and medicine cards were not necessarily reliable as "facts", and therefore the nurses had to treat them as "interim facts" – as indications to be falsified, rather than proofs. Thus, the activity of tracing the latest prescription among the many text versions of the patient's prescriptions could sometimes be very difficult, and the nurse or the physician engaged in this attempt would have to be content with a "plausible fact" instead of a "certain fact". This meant that sometimes the final steps of a trajectory of medication – the medical evaluation and re-medication – were forgotten because the disorganization of medical statements meant that nobody kept track of what was the latest prescription. And furthermore, the patient did not always get drugs according to the most recent developments of the medical trajectories but according to some provisional "balance sheet" pieced together from what was procurable and readable.

Summing up and discussion

Before the introduction of EPRs the processes of medication and re-medication was characterized by multiple trajectories of interaction and translation, in which a range of artifacts were produced in order to discipline and align different actors and resources. Sometimes a trajectory ran nicely through all the proper translations: from the patient's problem to the medical answer; via the triple inscription of the answer as a prescription in patient record, Kardex, and medicine card; to the measuring out of medicine; to the evaluation of the drug working in the patient's body. Other times, though, the trajectory of medication was less ordered and entailed perhaps one or more dead ends. In such an undisciplined trajectory the prescription could go astray or the attributes of the original medical answer could change somewhere in the chain of translations. The developments of the medical answer could be so radical that they fitted the definition of a "medication error: changing name, dosage, or strength of the drug; or lacking one or more of these details.

Due to the fact that a typical patient got quite a number of drugs during his or her stay at the hospital – thus occasioning a proportional number of medication and re-medication trajectories – the probability of an error in one of these trajectories of medication was considerable. Moreover, the very problem of gathering the relevant documents made it troublesome and laborious to compare them with each other and perhaps make them consistent; and to deduce other constructs from the documents such as "the overall picture" or "the latest prescription". A majority of medication processes succeeded to keep some red thread in the long and inscrutable chains of translation processes from patient problem to the pill he or she swallows. However, it seems somewhat paradoxical that the allegedly central *modus operandi* of the medical ward – the treatment of diseases by medicine – settled with such a runaway infrastructure of medication. Consider, for instance, these words of a physician:

> *Physician:* *"There were three lists of medicine: the one made by the physician, the one made by the nurse, and the one that the patient saw. And that is not so good! (…) Well,*

medicine is quite essential on a medical ward: yes, there is an idea behind all this – also for us, the staff!"

What kind of roles and relationship did this set-up afford? Let me end the first section by addressing this question. In the traditional trajectory of medication, the physician role was enacted as the protagonist in formulating a medical accountancy of the patient's problem and a medical answer to this problem. More precisely, he was afforded the position of enunciating the medical answer in various directions: to the nurse, to the dictaphone, and if the physician was in the mood: into the patient record as a handwritten note. However, a variety of texts worked to confine this role: the physician was delegated the task of formulating a statement, but medical reference books and medical statements about the patient's condition acted as co-constructing actants in the formulation process and contributed to making this statement a characteristically *medical* statement. Notably, the physician's role was to set the frame or define the agenda. Because in the very moment the physician had enunciated the medical answer he was no longer part of the further logistics and practicalities of the medication trajectory – not until the moment where the patient's condition had to be evaluated and a new medical answer formulated.

The further practicalities of the medication process were delegated to other actors. Thus, the secretary was afforded the role of impaired translator: transcribing the physician's wordings on the tape into words on a piece of paper in the patient record, but often left in the lurch, if she couldn't hear what the physician said on the tape. However, by transcribing from oral to written form, the secretary was afforded the role of bureaucratic founder: lining up the medical statement in a standardized and orderly way – thereby ensuring a uniform appearance of all patient records.

As for the nurses, the trajectory of medication afforded them the position of mediator and bookkeeper. First and foremost, the nurse was enacted as the one that materialized the medical answer as a pill. This role implied also copying the medical answer to Kardex and to medicine card respectively. Second, the nurses were afforded the position of monitoring and producing coherence of the medication trajectory by gathering and juxtaposing different documents. But the role was somewhat ham-

stringed, because the document of prime interest, the patient record, was often hard to get access to. Thus, the nursing role was cast as both a pivotal and an impaired and invisible role.

Finally, the patient was afforded the position of being a recipient of medical statements, of pills and of medical evaluations. He or she was not directly involved in performing the medication. Rather he or she was cast as the occasion for and background figure of the medication process.

The altered trajectory of medication

Having described the trajectory of medication as it was before the EPR, time has come to deal with the way things are now. Many of the steps in the medication trajectory are still the same, but a few actants have been replaced by other actants and the interactional pattern hence rearranged. In short, one obvious change is the entering of prescriptions directly into a "medicine scheme" in the EPR, which then works as a shared artifact among the different occupational groups in the ward. In principle, this means that the old routine of copying data from the patient record to Kardex and medicine card – one of the notorious weak spots in the medication process – is bypassed. However, the implosion of this part of the medical trajectory gives rise to new tasks and challenges, new weak spots and dilemmas. In the following, I will describe the altered trajectory and discuss how computerizing some aspects of the medication process diminishes some types of "errors", but give rise to other types, and, furthermore how the imploded trajectory of medication seems to afford somewhat altered positions for the professional groups. First, though, it seems fruitful to tell a story of how medication is performed after the introduction of EPRs:

> It is late noon at the Acute Reception Ward and the nurse, Lisa gets a call about the arrival of a new patient, Mrs. Brink. Mrs. Brink is being hospitalized because of newly discovered diabetes. Half an hour

later, she sees Mrs. Brink padding into the ward accompanied by a relative. Lisa welcomes Mrs. Brink and shows her into the room where her bed is. They talk about the diagnosis, which Mrs. Brink is still a bit shaken by. Lisa helps her into hospital clothes and measures the temperature, pulse, and blood sugar level of Mrs. Brink. Then she goes into the ward office and asks: “Is there any physicians here?" Another nurse replies: "No, but I’ve just called for the physician on front watch”. Lisa puts some labels with Mrs. Brink’s name on some requisition forms. Shortly after, the physician enters the office and talks to Lisa about the patient: “…and we don’t have anything on her?” the physician asks and Lisa answers: “Yes, here are some old papers, and I believe a referral is to be faxed to us". The physician is handed a piece of paper, on which Lisa has scribbled some notes from the phone call about Mrs. Brink, and goes to see Mrs. Brink. “Hello, I am Mette Hovgaard, physician”, she introduces herself and talks to the patient. “Well, I have been quite weak for some time and thirsty also, and then I went to my doctor and told him I’ve lost 10 kilograms…” Mrs. Brink says and describes then how she feels now. Mette asks Mrs. Brink to take off her shirt and examines her body. Suddenly, Lisa comes in with the referral that has just arrived and gives it to Mette. After a while, Mette finishes the examination and says goodbye to Mrs. Brink: “We have to keep you some days to find out more about your diabetes. But you’ll get some injections of insulin to start with”. Back in the office, Mette fills out the blood test requisition form together with Lisa, the nurse. Lisa asks: “Is Mrs. Brink to have insulin after scheme[55]?”. “To start with, yes!” says Mette. After having ordered a laboratory technician to come and take the blood tests, Lisa informs Mette: “Now, I’ll go and give her the insulin!” “Alright!” says Mette, who is busy entering the prescription of insulin in the medicine scheme of Mrs. Brink: “Insulin Insulatard 16+8+0+0”.

A little later, Lisa comes back to the office. She has administered the insulin and taken a urine sample from Mrs. Brink too. She logs into the computer and enters the figures of Mrs. Brink’s temperature etc. Then she opens the nursing notes and enters some notes about the urine sample: “Urine stix shows ++ ketone. Complains about burning urination”. Then she opens up the ordination sheet and signs for the tests she has carried out. Finally, she

[55] Translated from the Danish expression “give medicin efter skema”. This refers to the process of administering medicine after a regular plan.

clicks up the medicine scheme, places a medicine card in the printer and prints the medical information. She looks at the referral from Mrs. Brink's physician that mentions some tablets, *Dideronate*, which Mrs. Brink's takes against brittleness of the bones, but it is not clear when these pills are to be administered. Lisa utters to me, the researcher: "Well, I have to find out when she gets these tablets". Lisa prints a treatment card, but discovers that she has forgotten to put the right paper in the printer, because this is a treatment card. She puts the right paper in the printer and prints the card again. Then, she cuts it to the right size with the scissors and punches holes in it so that it fits a ring binder. Lisa discusses with Mette, the physician, when the patient is to have *Dideronate*, "Do you think it is two out of twelve weeks or…?" – none of them knows for sure, so Lisa asks another nurse: "Do you remember, how long a patient has to pause *Dideronate*?". She doesn't know either, so Lisa looks in the Medicine Catalogue: "Here it says eleven weeks, but I better go ask the patient!". After some minutes she comes back with an answer: "No, she doesn't start *Dideronate* until the first of January. By the way, the urine sample showed also bacteria!". Lisa logs into the computer again and writes a nursing note: `"NB. Tablet Dideronate is prescribed. Shall not start until 1st of Jan."`. The physician answers: "Well, we'll give her sulfa too!" Lisa then goes to the depot, measures out the medicine against cystitis to Mrs. Brink and goes to Mrs. Brink to give it to her. While Lisa is doing this, Mette, the physician, enters the information about *Dideronate* in the medicine scheme and checks the strength of the drug in the medicine database by clicking the right button of the mouse. Then she begins dictating the hospitalization note on Mrs. Brink, where she mentions the prescriptions of Insulin and *Sulfametizol*.

This story is based on my own observations of a medication process. It is therefore a bit more detailed than the earlier story about medication before the introduction of EPRs. This serves to remind us that the process of medication continues to be embedded in a complex and interwoven network of other subtasks such as measuring temperatures and entering figures in the patient record after the introduction of EPRs. Indeed, these subtasks are highly connected to the ongoing medical work, and continue to make the activity of entering and employing medical data a fuzzy and tangled endeavor.

Compared with the previous story about medication before the introduction of EPRs, some links in the trajectory of medication are clearly altered, while others still work more or less the same way. Basically, the core-principle of medication – the selection of chemical substances to treat or relieve diseases – is left unaffected by the introduction of EPRs. Moreover, it is still the physician, who is legally responsible for deciding on the type of medicine and prescribing drugs; and the nurse who is formally responsible for the administering of medicine. However, the participating artifacts have changed and so have the specific procedures, subtasks, links, and roundabouts in the medication trajectory as illustrated in Figure 6.2 below. In the following, I will address the areas of transformation – even though some of these are subtle and equivocal. For the sake of clarity I will do this by following the course of events in the above story. The examination provides the basis for discussing afterwards what seem to be the overall characteristics of the partially altered trajectory of medication.

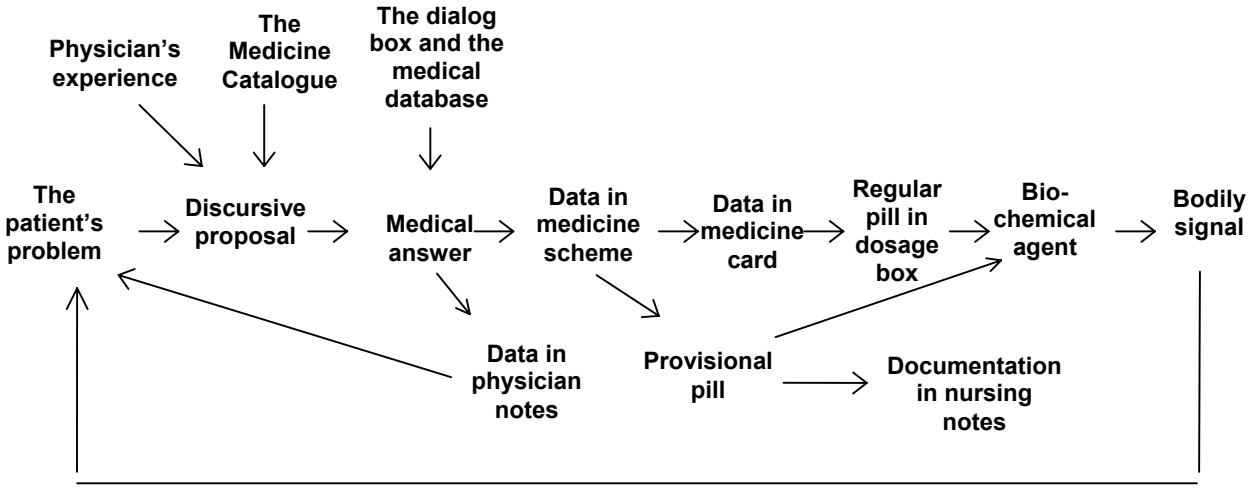


Figure 6.2: The trajectory of medication after the introduction of EPRs can also be illustrated by the chain of various identities a "drug" assumes on the way from being an answer to a patient's medical problem to affecting the patient's body. The arrows indicate the translation processes between identities

From patient's problem to medical answer

In the above story, Mrs. Brink is hospitalized under the headline of "newly discovered diabetes". This headline is subsequently translated to the medical answer: "we will keep you for some days to find out more about your diabetes" and "you'll get some injections of insulin to start with". Judging from this small narrative, the electronic patient record does not seem to play a distinct role in the distribution of roles and relations between nurse, physician, patient and documents in this translation process. However although the above story does not tell, the procedures in relation to receiving patients have changed on a few points, which in some instances might affect the formation of a medical answer. First of all, an *electronic* patient record is now drawn up, which among other features includes an electronic medicine scheme. If the patient is, for instance, being re-hospitalized within a short period, it is likely that an electronic patient record already exists. In this case, the staff can now more readily access it in order to include the medical history of the patient (and thus possible causes to the patient's current malaise and reason for hospitalization) in the formation of a medical answer. Now, however, the physician has to situate his reading at the computer, which has both pros and cons (see chapters 4 and 5 for a more detailed discussion of the consequences of preparing the patient case at the computer instead of at the patient's bed).

Moreover, an electronic database can now be employed to help encircling a medical answer to the patient's problem. The database is called "medical instructions" and consists of descriptions of the proper procedures for treating a range of frequent diseases. These descriptions are made by local physician specialists and are read as html-pages on the hospital intranet. In principle, this set of readily accessible standard procedures works to form a medical answer that is less dependent on the idiosyncrasies of the specific physician in charge of the case. However, during my observations I did not see anybody use it. In contrast, the paper-based Medicine Catalogue was used a couple of times during each of the observations, and, thus seems to continue as a participant in the formation of a medical answer to the patient's problem.

The easier access to old data about the patient affords the nurse a more directly involved position in the formation of the patient-as-a-case

(as discussed in Chapter 4). Often, she is even more familiar with medical aspects of the patient's case than the physician and, sometimes, she forestalls his framing of the medical answer and suggests administering a specific drug.

The adding of a database about proper medical procedures seems to rearm the textual universe informing the formation of a medical answer – a universe on which the nurses also draw as commentators and contributors to the medical decision-making. Nevertheless, these changes do not seem to radically alter the network of resources participating in framing the patient's problem: the formation of a medical answer is still very much prone to the same kinds of dynamics and mechanisms as before the introduction of EPRs. Forming an answer to the patient's problem continues to be an interplay between the physician's fingertip knowledge, the textual universe around the patient (the statements in referral note and electronic patient record) and around medical practice in general (the categories and propositions of the Medicine Catalogue and now also the "Medical Instructions"), and the comments and statements from the nurses. Sometimes this interplay leads to a widely approved medical answer to the specific disease (or the present bodily state, when the patient has been subjected to several trajectories of medication). Other times it leads to an answer, which is more determined by routine and semantic content of the reference documents than by the characteristics of the patient and his or her disease.

From medical answer to prescription

Returning to the story of Mrs. Brink, the next step of the medication trajectory is the move from medical answer "some injections of insulin to start with" to prescription in the medicine scheme. This step of translation is characterized by several important modifications in terms of participating actants and in the relation between nurse and physician. But in order to observe these modifications it seems worthwhile to recapitulate how things were before the introduction of EPRs:

Earlier, the physician's translation of a medical answer to a prescription took the detour of forming a message to the nurse before dictating the answer to the secretary as part of dictating a physician note.

Thus, the act of deciding on a medical answer was often separated from the act of dictating it by a time interval (until the physician had the appropriate opportunity to dictate) and by the act of communicating this decision to the nurse. In this way, the translation of the answer to a prescription was usually stretched in time and diverted via the making of a rush message.

Now, the physician enters the medical answer in a medicine scheme, which is part of the electronic patient record. As hinted at in the story, the physician does this by logging into the computer, opening the medicine scheme of the specific patient record, and entering the prescription in the pre-formatted spaces here. The following figure shows the dialog box for entering prescriptions into the medicine scheme:

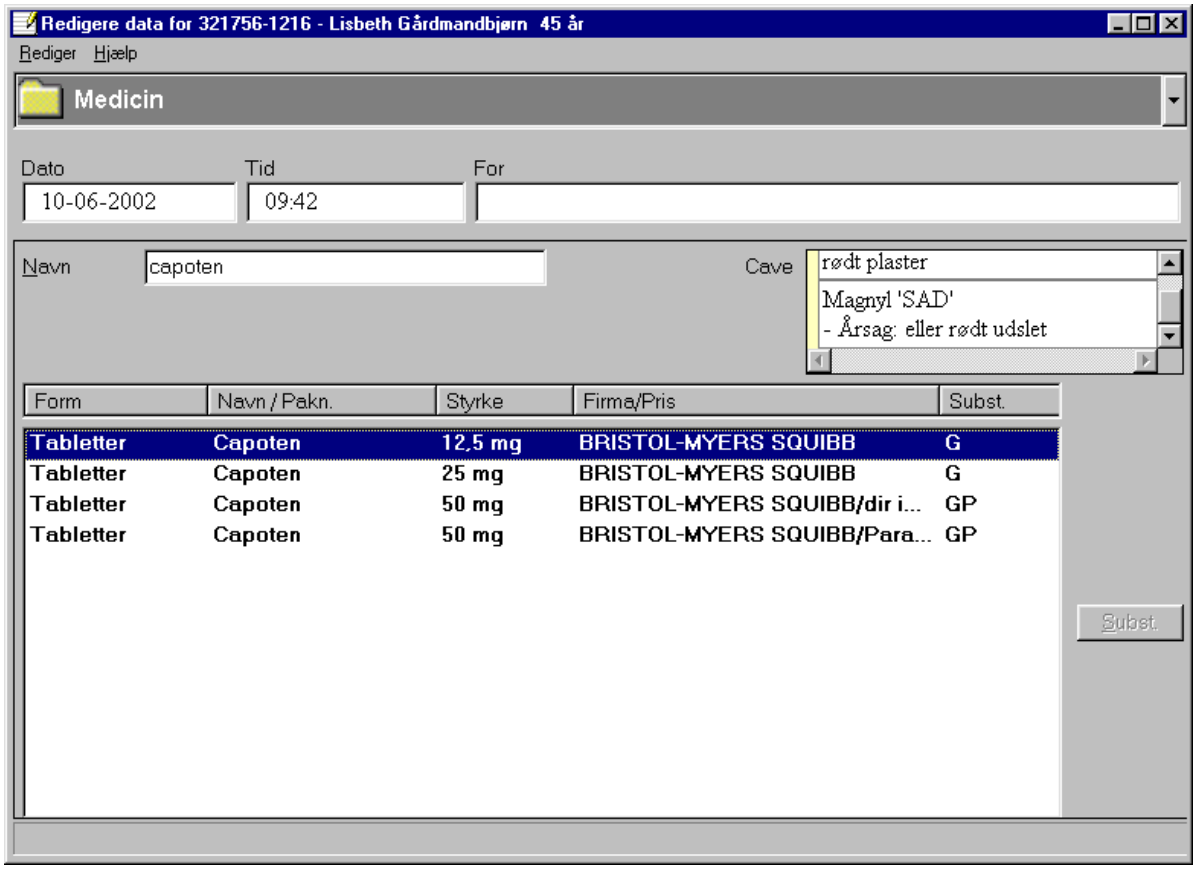


Figure 6.3: The dialog box for entering a medicine prescription in the medicine scheme. Writing the drug's name (or the first letters of its name) in the second line encircles the drug in question. Automatically the different product variants are listed below and the exact strength and type can be selected.

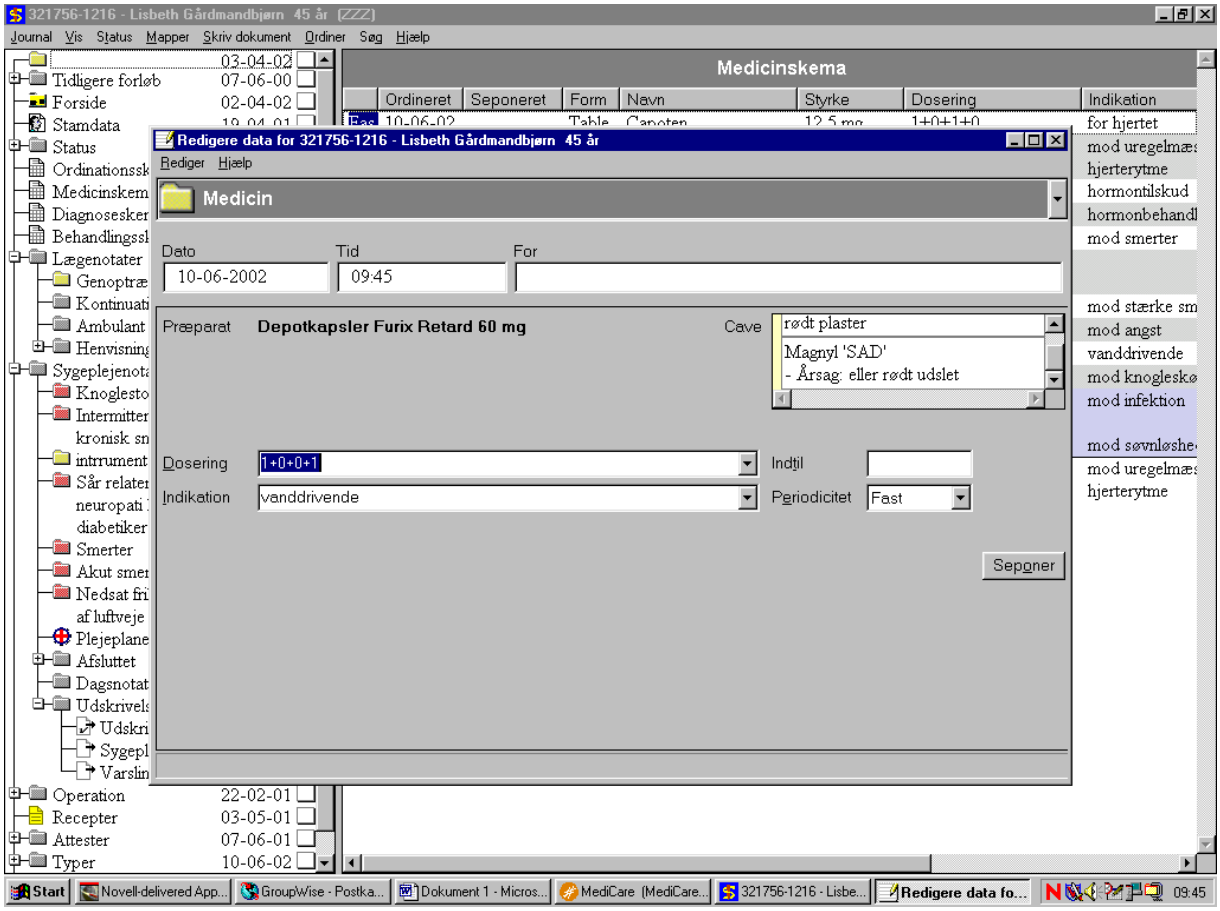


Figure 6.4: Having specified the drug and its strength, next step is to write its dosage (i.e. how many units that are to be administered morning, noon, afternoon and evening, which is written as X+X+X+X), and the indication for the drug. Moreover, it can be specified whether the drug is on regular basis or on demand.

This entering makes the prescription instantly available for all users of the EPR (i.e. nurses, physicians, aides, physiotherapists etc.) – a fact that I will deal with later. Now the nurse is no longer just informed about what has been prescribed, but also informed that a prescription has been entered in the medicine scheme. Thus, the nurse no longer meets a provisional prescription only, but is induced to look up the exact wordings of the prescription herself. Thus, the steps between the medical answer and the formal prescription are being reduced, because the physician goes straight from deciding on the type of medicine to entering this information in the medicine scheme. Hereby, three somewhat paradoxical things happen:

Stabilizing the prescription

The first effect of the tighter connection between medical answer and prescription is that the answer is more prone to keep a fixed shape – i.e. a certain drug name, a certain strength, and a certain dosage – by the rapid materialization of it as letters on a screen. Earlier, there were several occasions for the answer to multiply and transform (the interim message to the nurse could develop through its further translation into a physical pill, and hand-written notes in Kardex and medicine card; the answer could develop in the time until it was dictated; the dictated answer could slide through the tape, and the earplugs of the secretary and suddenly assume a slightly or radically new shape). These occasions are bypassed by the prompt entering of the medical answer. Now the prescription is very likely to be the same as the medical answer – the occasions for launching competing versions of the medical truth have been diminished.

> *Nurse:* *"Errors don't occur as much as earlier, because something's only entered once and that's in the medicine scheme by the physician himself. So if he doesn't miswrite, well then there's no other persons to miswrite…now I'm trustful that when he has written it in the medicine scheme, then that's what I'm supposed to administer"*

Both physicians and nurses agree that bypassing the long and risky chain of dictating, transcribing, copying, etc., reduces the likelihood of the original medical answer (i.e. the decided drug) being changed. However, some physicians complain that the new procedure contributes to enlarging a general problem, namely the filling of physicians' time with "non-physician work" – e.g. writing instead of dictating (a complaint that was addressed in further detail in chapter 4).

> *Physician:* *"Well, it means extra work for me. Previously, I just dictated the physician notes, the prescribed drugs, and, say, the prescribed scannings. I didn't have to enter the prescriptions; the secretaries did that. Today, it is an extra burden on us".*

In this respect, the physician position afforded by the altered network holds a built-in dilemma regarding the investment of time: on the one hand, the physician now performs non-physician work, which improves the overall medical practice. On the other hand, he has less time to perform "real physician work" – hereby implying that the overall medical practice suffers.

Shaping the medical answer

The second effect is that the formulation of the prescription is now subjected to the structure of the electronic dialog box for entering prescriptions. Earlier, the answer was primarily structured according to unwritten standards of how to present a medical answer. Now, the answer has to be specified in two steps as showed in figures 6.3 and 6.4: first the drug has to be defined, and then the dosage and the indication must be specified. Thereby, the answer has to fit the preformatted spaces and categories of the dialog boxes.

One way it is shaped is that the dialog box suggests that the drug be accompanied by an indication – i.e. a motive for prescribing it. This is useful in order to keep the medical context of the various drugs when the medicine scheme is printed and thus is detached from the medical arguments. However, indications are not always entered, since the physicians sometimes forget it or find it obvious.

Another way the answer is shaped is that it is only possible to enter a prescription if the box for dosage is filled out. This entails entering the dosage in a standard format that divide the 24-hour into four digits that symbolize dosages for morning, noon, afternoon, and evening. Accordingly, if a patient is to have one dosage of a drug morning, none at noon, one in the afternoon, and none in the evening it is written: "1+0+1+0". This standard is established in order to reduce mistakes concerning the administering of drugs. In principle, the physician can enter this sequence wrongly, but at least the computer insists that he enters *something* about the dosages. The "4 digits and 3 pluses"-format defines the prescription as a drug prescription, i.e. as something that should go into a pillbox and therefore will be printed on a medicine card. If the dosage is not written in this format, the prescription is defined as a "liquid" – i.e. as something that cannot be put in a pillbox and therefore will be printed as a dosage card. Thus, if the physician forgets to write the last digit be-

cause, for instance, no drug should be given in the evening and write "1+3+0", this prescription will go into the medicine scheme, but not be printed on the medicine card. In this situation, the prescription is in danger of never being administered to the patient.

In sum, the categories and formats of the dialog boxes of the medicine scheme work to structure the medical answer in a way that should reduce the risk of misinterpretations. Yet, if these boxes are no filled out properly, new occasions for "errors" or misunderstandings arise.

Restricting the answer

The *third* effect is that the selection of drug name and strength is now directly coupled to a database of drug types. The dialog box is set up in a way that requires the physician to decide whether he will prescribe or modify a prescription. If he chooses to prescribe, the computer asks him "what do you want to prescribe?" and then he can enter the name of the drug (or just the first two or three letters of the drug name) in a designated space. Entering this a list of product variants of the drug appears in a window next to the dialog box, and the physician selects one of the variants. This list is generated from a database of medicinal products, which is updated twice a month by the IT-department according to lists received from the Danish Medicines Agency (Lægemiddelstyrelsen). By entering, say, the name " *Persantin*" and clicking on the right mouse-button, the database informs about the following strengths: "coated tablet 100 mg, deposit capsule 200 mg".

To some extent this possibility replaces the function of the Medicine Catalogue, that is, if the physician knows the sales name of the drug he wants to prescribe and for instance wants to see the different strengths it comes in. However, the database is structured around the sales name of drug (e.g. *Persantin*); it is not possible to look up the generic name of a drug (e.g. dipyridamol). Thus, the electronic database facilitates only medical answers that are based on knowing in advance the sales name of the drug. If the physician wants to look up other product variants of a specific medicine he has to use the Medicine Catalogue as he did before. But since physicians often prescribe certain medicinal products from routine – because many patients suffer from similar diseases and hence are prescribed more or less the same kind of medicine that the ward keeps – the medicine database is often employed when entering the pre-

scription in the medicine scheme. Yet thereby a majority of prescriptions are entered without mentioning the generic name. And this can make it laborious to know what to substitute for the chosen drug, if, for instance, it is out of stock. Consider the following remark by a nurse:

> *Nurse:* *"Physicians prescribe the medicine that the patients get back home, and that is often other kinds of drugs than the types we have here in the ward. We have a list over the standard drugs in our depot, and it would be nice if those two systems were coupled together, because we spend much time checking what corresponds to a specific kind of drug (…) Often we write a note with pencil on the printed medicine card, but next time it is printed you have to write it again – and this doesn't always happen…So it would be nice if the system had a feature that would notify the physician if he prescribed something that wasn't a standard drug and he then had to choose something from here, or if not possible to substitute the drug, he had to positively indicate that this drug had to be administered" .*

Summing up

By the introduction of EPRs the translation from medical answer to prescription is being performed differently. Now the physician goes straight from forming the answer to entering it as data in the medicine scheme, which sometimes tends to fuse these two steps together rather than performing them as separate, sequential tasks. This new procedure seems to eliminate some common risks of generating erroneous versions of the medical decision, because the medical answer is entered directly into the medicine scheme by the aid of a row of preformatted spaces and categories. In principle, this would create more stable prescriptions – i.e. prescriptions that do not develop while having once been entered. However, this stability requires that all the boxes have been properly filled out; even the slightest omission can have serious consequences for the further destiny of the prescription. And since many physicians feel a pressure of time and find that the entering of medicine information is not a real physician activity, they skip some spaces or forget some seemingly redundant digits.

Furthermore, the drug database becomes more involved with the formation of the medical answer: enforcing the prescription of certain

sales products rather than generic products. This gives rise to less translatable prescriptions –requiring additional work of for example looking up medicinal products to substitute the prescribed one. In that respect, although some of the previous "holes" (i.e. weak ties/loose knots, where medication errors occurred before the EPR) are closed in one part of the medical trajectory, new holes seem to occur in other parts.

From prescription to inclusion in physician notes

When the physician has entered the prescription in the medicine scheme, the trajectory of medication branches off into (at least) two directions. In the first branch, the prescription is printed out as a paper medicine card by a nurse and then translated into a physical pill. In the next section, I shall address the workings of this translation. In the second branch, the prescription is translated into being a component of the official, statutory text – the physician notes in the EPR – which documents the medical interventions and conclusions regarding the patient's hospitalization. Let me address this translation by, once again, attending the story of Mrs. Brink:

After entering the prescription of insulin in the medicine scheme of Mrs. Brink, the physician spends some minutes with the nurse figuring out how to handle a drug, *Dideronate*, which the general practitioner prescribed for the patient before she arrived in the hospital. By asking the patient, the nurse obtains a reasonable answer to the proper dosage time for this drug, and the physician enters this information in the medicine scheme with the assistance of the medicine database. Then the nurse mentions that the urine tests shows indications of cystitis, and the physician replies that the patient is then to have *Sulfametizol*. Then, the physician begins dictating a physician note, which among other things holds statements about the reasons for hospitalization, impressions from the bodily examination of the patient, and the prescriptions: injections of insulin, *Dideronate* and *Sulfametizol*. In the story, this physician note rounds off the small program of dealing with the case of Mrs. Brink. We do not know whether the physician will later remember to enter the prescription of *Sulfametizol* in the medicine scheme.

Although physicians themselves are now entering prescriptions in the medicine scheme, they have refused to enter the physician notes as well (though some physicians enter notes if the notes are short and it is convenient to do it). Thus, the physicians still dictate the physician note and give the tape to the secretary who transcribes it into the EPR – thereby continuing the old chain of translations from mouth to tape to sound to writing with the built-in risks of corrupting the original statement.

Just like earlier, where the physician formulated an interim message about the prescription and dictated the physician note later, it is still common practice to enter the prescriptions in the medicine scheme first and to formulate a physician note later on, which repeats the prescribed drugs. If the physician is busy, she might defer dictating the note until she has a spare moment. However, the physician sometimes forgets to mention all the prescribed drugs and their dosages in the physician note on account of the time-interval between prescribing and dictating (or perhaps because of the intersecting activities and actants that might blur the physician's memory – although the physician can read out prescriptions from the medicine scheme if she is near the computer). Moreover, the physician can be occasioned to make *additional* prescriptions after having entered the first prescriptions in the medicine scheme like in the story of Mrs. Brink. At this moment, the physician is about to formulate the physician note, in which she includes the additional prescription. In the rush of work, it sometimes happens that this prescription is not entered in the medicine scheme later on. In principle all prescriptions involved in the medical answer have to be entered in the medicine scheme and repeated in the physician note. However, real life is different and the fate of the medical answer in all its details is somewhat uncertain: has it been translated into the medicine scheme in its entirety? Has it been dictated in its entirety as a physician note? Or, thirdly, is it fragmented into bits and pieces that is scattered unevenly in the two documents? The nurses are aware of this new circumstance and often compare the medicine scheme with the information in the physician note:

Nurse: *"Now, when we make the treatment card we just print it from the medicine scheme, but we've to check with the physician note: is it the same information here? Well, it*

shouldn't be necessary, but it happens that the two things disagree, for example if the physician has mentioned it in the physician note but forgets to enter it in the medicine scheme, which is the one we act on. But the physicians do get better and better!"

Thus, the doubling of medical data makes nurses continue their traditional role of scrutinizing, or auditing, the physician's enterings albeit now in another domain: the electronic documents. However, this audit is made easier because of the ready access to all documents through the computer.

In sum, the introduction of EPRs has contributed to coordinate the medical answer with the prescription, but at the same time the prescription is doubled in the medicine scheme and the physician note. Sometimes, the medical answer finds its way into only one of these documents. Thus, the former risk of splitting the medical answer into a provisional message different from the prescription is bypassed, but replaced by a new risk: that the medicine scheme and the physician note do no hold the same information.

From prescription to pills and liquids

When the physician has answered that Mrs. Brink is to have insulin after scheme, the nurse measures the drug out and administers it to the patient. Then she goes and prints the treatment card – having a little trouble with the paper – and cuts it. A little later she informs the physician that the urine test indicated cystitis. They make the agreement that the patient is to have *Sulfametizol* against this too, and the nurse go to measure this out and gives it to Mrs. Brink. Thus, while the physician is occupied with translating the prescription of *Insulin Insulatard* into a physician note the nurse is engaged with another translation (the second branch of the medication trajectory) namely translating the prescription to medicine card and/or treatment card, and subsequently, translating to concrete pills and liquids.

Now the medicine scheme is the key-document regarding the administering of medicine. But as we have just seen in the story, the nurse sometimes acts before the prescription is entered here (thereby produc-

ing a “provisional pill”, albeit now one with a shorter life). In principle, she has to wait for the entering. However, in order to carry the treatment out as soon as possible she bypasses this rule. Whereas earlier next step would be to add the new prescription in hand to the medicine card of the dosage box, the nurse now has to print out a new card from the medicine scheme to replace the old medicine card.

The nurse prints a card when she is informed that a physician has entered a new prescription in the medicine scheme, or if something indicates (i.e. a message from the physician, rumors, or everyday routine) that a prescription has been modified. Printing a card entails opening the medicine scheme in the patient’s electronic record, putting the right type of paper in the nearby printer (either perforated paper that can be divided into medicine cards for the dosage box, or common paper that is cut to fit the ring binder of treatment cards) and printing. Thus, in principle the new routine reduces the risk that the nurses miswrite the medicine information or cannot make out what the physician has written. But this procedure is only safe when the physician has entered the dosage properly – if he has not, the drug will not appear on the pill box card, and thus not be administered to the patient. Thus, the shift to electronic copying does not guarantee that information travels to the proper physical places. When printed, the card is placed in the dosage box or in the ring binder and guides the nurse when she measures out the medicine. The medicine card also works to inform the patient and relatives about the prescribed medicine.

Usually, one nurse is responsible for measuring out medicine for the next 24 hours in the dosage boxes of all the patients (typically 10 patients). Around noon she collects all the boxes and takes them to the depot. Here, she measures out the different types and dosages of medicine, and puts the dosage boxes back on the patients’ tables. As for the treatment cards, each nurse is responsible for checking and administering the medicine for their patients, after which they sign a box to confirm that the prescription is administered. The process can be delayed or complicated if a drug is out of stock – like earlier, drugs have to be ordered by phone and picked up by the nurse at the Central Depot.

Measuring medicine out is dependent on a foregoing process of updating the medicine and treatment cards. When the nurse responsible for measuring out medicine reads the medicine cards and acts according to

their declarations, she counts on the cards' status as current medical facts – i.e. that they hold the most recent prescriptions. Sometimes, however, it happens that a card is not updated for some reason. Therefore, the nurses regularly check their patients' medicine cards to compare the statements here with the statements in the medicine scheme? (or in the physician notes, since there can be some discrepancies between these two documents as well). This entails collecting the dosage boxes, opening the medicine schemes, and comparing the different statements with each other. If they discover any small or fundamental discrepancies they print a new card and substitute it for the olds. However, the routine is not fully established, and it is sometimes dropped because of busyness or because the nurses sometimes find the constant checking and comparing redundant (e.g. if they have been at work the whole week and have the feeling that nothing new has happened to a patient case). Thus, it still happens that medicine is measured out based an obsolete or incomplete medicine card.

Piecing together the different small routines of translating the prescription to the physical pill or some liquid it seems that the introduction of EPRs has occasioned the elimination of some types of errors, but at the same time introduced new sources of errors and continued others. Now, the medicine card is printed directly from the medicine scheme, which reduces the risk that somebody misreads or miswrites the information. However, the seemingly one-to-one transfer of data by printing the medicine scheme does not solve the problem of regular updatings of the medicine cards, as such regularity cannot be taken for granted. Moreover, even a small miswriting of dosage may lead to drug prescriptions being printed on wrong paper and thus end up in the folder of liquid drugs instead of in the dosage box or vice versa.

This is why the task of checking the status of medicine card is still very important. Only now, this task entails comparing medicine cards with medicine instead of comparing with physician notes and Kardex. Moreover, the very status of the medicine scheme as nodal point in the medication trajectory is not certain: as mentioned in a previous section, the medicine scheme and the physician notes can still hold diverging statements – thus undermining the success of simply printing from the medicine scheme. In addition, the risks of misreading the medicine card, or measure out a wrong pill or a wrong dosage persist.

Summing up, the introduction of EPRs has occasioned an implosion of the medication trajectory at one important point: making the medicine scheme the central node in the network around the administering of medicine. This has replaced one type of "copying error" (handwriting) with another type (printing on different types of paper). Thereby, the problem of maintaining conformity and validity of data across documents and artifacts is continued.

From pills to nursing notes

With the introduction of EPRs, Kardex is replaced with electronic nursing notes integrated in the patient record. As described in Chapter 5 this document serves the dual purpose of coordinating between the nursing shifts and documenting the nursing work. Nurses are still responsible for the administering of medicine. Thus, in accordance with earlier practice, the nurses record all activities that supplement or interfere with the recurring administering of prescribed drugs. If for instance a patient asks for a pain-killing pill and the medicine scheme allows the administering of such a pill on demand, the nurse will typically write in the nursing notes that one such pill has been dispensed (or if such a pill has to be prescribed before it can be handed out, she will write a nursing note that the patient request this medicine). Thus, in an indirect fashion nursing notes hold translations of the medical answer as statements about the contingencies of administering this medical answer and statements about the patient's need of more medicine. Interestingly, this recording serves not only documenting and coordinating purposes, but participates also in the returning effort to produce an updated overview of the patient's prescriptions. The following snip from an interview with a nurse describes how:

> *Nurse: The physician might for instance ask: 'I'm going to prescribe pain-killing drug as regular medicine, did the patient get a suppository or a tablet?' And I wouldn't know because I wasn't on job yesterday; the nurse on night watch had asked about changing the prescription to a regular medicine. And I say: 'Go and look in the nursing notes; it says nausea!' Well, gradually they look more and more often at*

> *what we (nurses) have written, because it is comparisons, and that is the whole idea: that they have to learn from our notes. They never did before; Kardex was something completely unknown that just lay on the table. After all, it is easier now!"*

In the snip, the nurse tells about a situation where another nurse has asked for changing a prescription from "on demand" to "regular" – thereby hinting that the original prescription has to be modified. When the physician tries to comply with this wish, apparently he cannot figure out what type of drug the prescription entailed. The nurse suggests he find out by reading the nursing note about the administering of the drug. Thus, the nurse tries to enroll the nursing notes in the physician's attempt to determine the specifications of the prescription.

In principle, the nurses made the same kind of notes in Kardex (the nursing notes before the EPR). But since nursing notes are now computerized and integrated in the EPR, the physicians can more easily access these notes. However, they do not necessarily do so, but ask the nurse if they want to know about something. And the nurses have to encourage the physicians to look up information in nursing notes themselves rather than asking the nurse; they have to work to make the nursing notes a natural part of the medication trajectory. For the present, though, the nurses still carry the weight of juxtaposing and correlating the different documents of medical statements.

Summing up, the translation of the medical answer into recordings about its administering in the nursing notes seems to enhance further ramification of the medication trajectory. By tracking the contingencies of administering drugs and hinting at the destiny of a prescribed drug, the nursing notes sometimes work as an anchor in cases where the medicine scheme and the physician notes lack information. However, this is not an obvious role: the nurses must continuously encourage and remind the physician to incorporate this artifact in the medication routines.

From pills to medical evaluation and possible re-medication

In the story of Mrs. Brink we do not hear about the effect of *Insulin Insulatard, Dideronate* and *Sulfametizol* on the patient's condition. How-

ever, as described in the section about medication before the introduction of EPRs, evaluating the effect of the prescribed drugs is of course still a very important final part of the medication trajectory.

The physicians are still formally responsible for making this evaluation and deciding if new interventions – e.g. prescriptions – are appropriate. However, as mentioned this entails talking to the nurses and the patient, looking at different measurements and pictures of the patient's bodily condition, and reading the statements about the medical history and the executed medical interventions – a whole network of actants participates in evaluating the effects. One fundamental change in the network performing evaluation is that, now, the physician has to turn to the computer to read most of the written statements about the patient; he can no longer take the written statements wherever he wants – e.g. to the patients bed – without much ado. Now, the evaluation process tends to be tied to the computer and the space around it, which, as argued in the chapters about physician notes and nurses routines of coordinating, seems to make it less likely that the patient's statements are incorporated in the collocation and negotiation processes between voices about the drug and its effects on the patient's condition. Furthermore, the computerization has changed the way in which information on prescribed medicine can be retrieved and viewed. The following figure shows how prescriptions are presented in the medicine scheme:

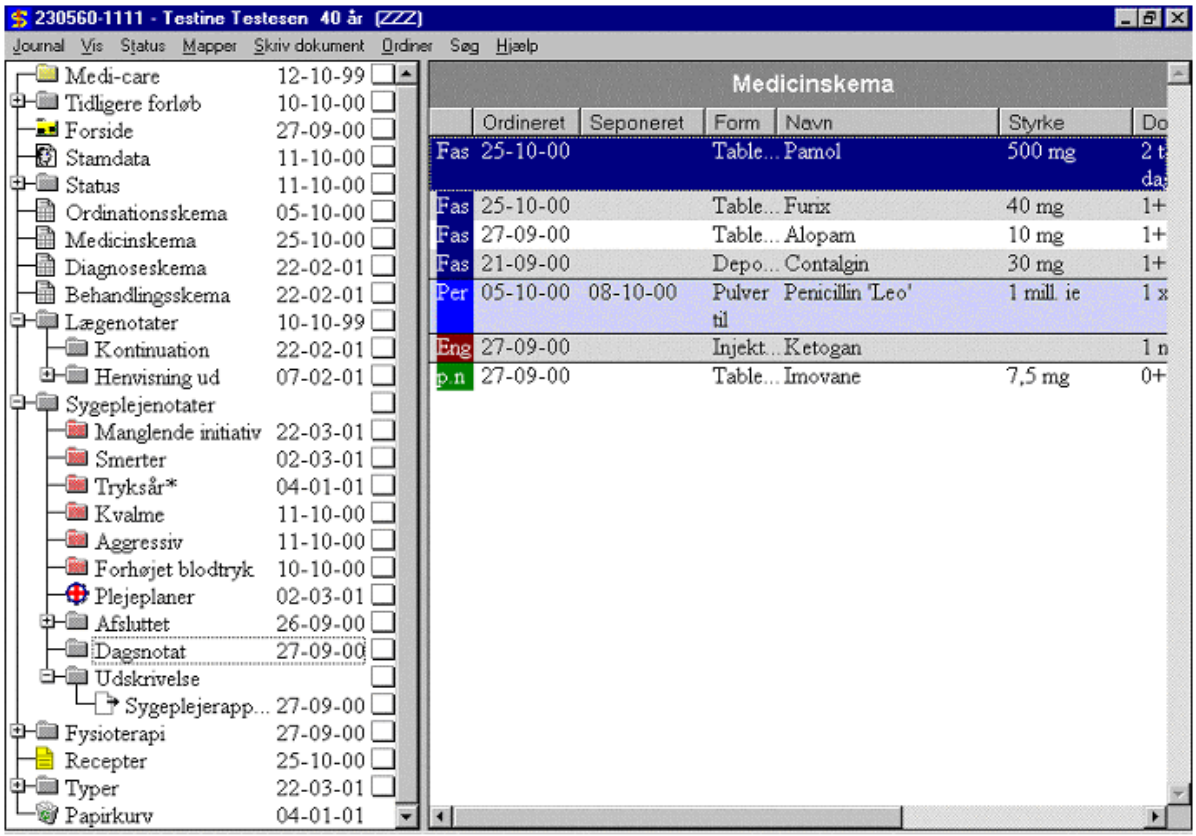


Figure 6.5: The medicine scheme as it is displayed on the computer screen (left box of the screen picture). In this case, the medicine scheme lists seven types of medicine. The first four drugs are regular medicine indicated by the abbreviation "Fas"; the fifth drug is periodic, indicated by "Per"; the sixth is a "one-off prescription" indicated by "Eng"; and the seventh drug is a drug that can be dispensed on demand, indicated by "p.n.".

As the figure 6.5 shows, the prescriptions are listed downward and color bars separate the different prescriptions from each other. However, the medicine scheme is not possible to view in its entirety; the columns for "dosage" and "indications" farthest to the right can only be viewed by scrolling. By clicking "Ctrl F6" it is possible to view the medicine scheme "in full screen". Figure 6.6 shows this full screen mode of the medicine scheme, but even in this mode, some information can only be viewed by scrolling or by compressing the width of the vertical columns:

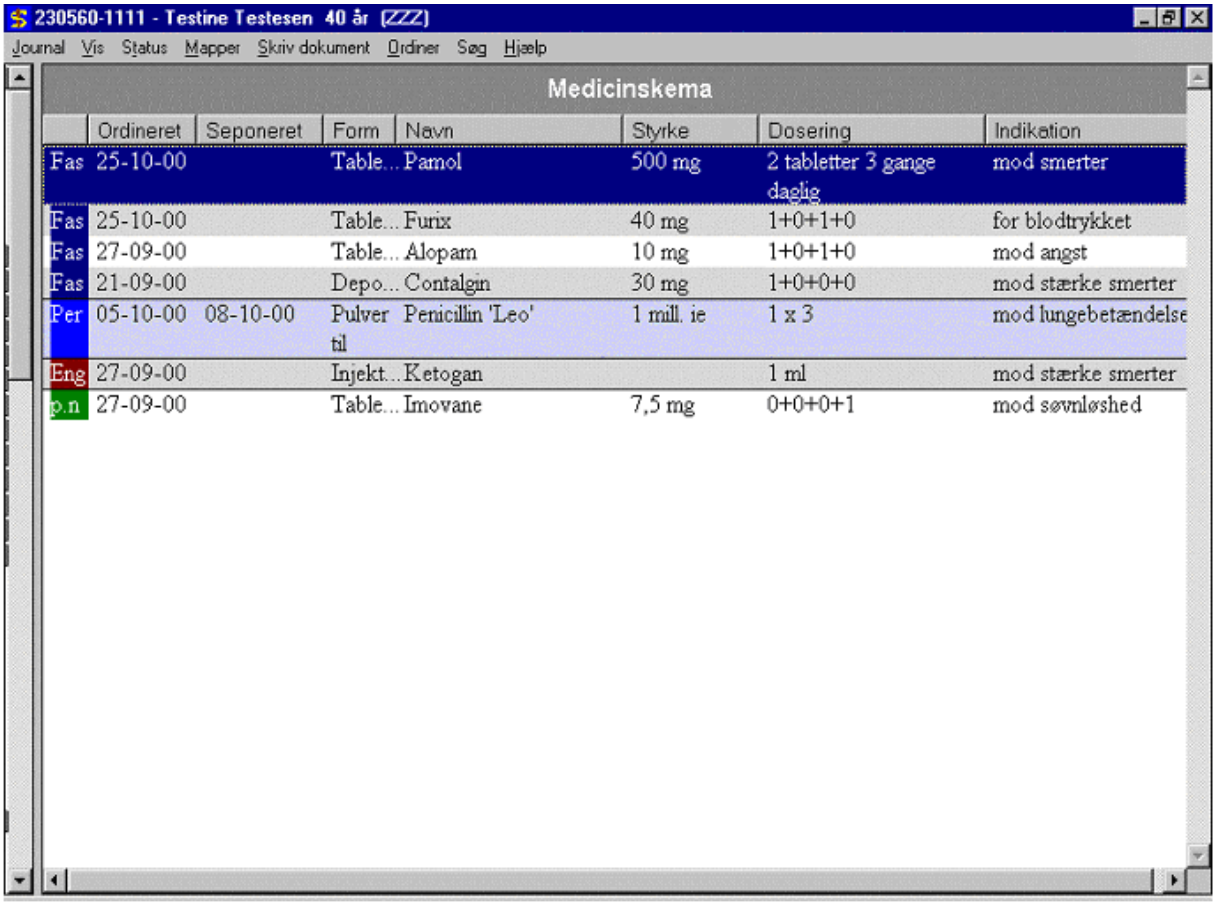


Figure 6.6: The medicine scheme in "full screen mode".

To physicians and nurses it is unsatisfactory that they have to make extra clicks to view the medicine scheme in full mode. Actually, they complain that maneuvering from one document or folder in the EPR to another in general is too laborious, which is a problem. In the evaluation routine it is important to compare information in different documents. One solution to this problem is to establish more "hot keys". In the wordings of a physician:

Physician: *"We've to have less punching. It has to be so that, for instance, I can press "P" if I want to see the physician notes, "B" if I want to see the blood tests, and "M" for medicine scheme, not something where I've to scroll the curser up and down and left and right, and having moved the tab-key onto the other side then punch again and scroll down. That's no good; it has to be made more easy to use! Now, I've to punch 4-5 times before I get what I want…but that's of course a technical problem"*

In the quote, the physician concludes that the trouble of maneuvering from one document to the other in the EPR is a "technical problem". Nonetheless, it has practical consequences on the physician now spending time on a new type of logistic: logging into the computer and finding the patient's record; retrieving documents by moving the mouse and the keys; and adjusting the size of windows so a document can be viewed as big as possible or in order to view two documents simultaneously. Moreover, some physicians see the very digitalization of documents as a deterioration of the way different documents can be handled. Before the EPR, the documents in the paper-base patient record could be spread on a table in order to view the documents side-by-side. Now, the physicians have to scroll and click back and forth, which sometimes works against the feeling of having an overview of the patient's case. It is as if the overview changes from being a physical, "handy" entity to being a discursive, "slippery" entity. What is more, the medicine scheme not only holds information about the current prescriptions, but also about the medicine that is discontinued. This makes physicians and nurses complain that they risk including irrelevant medicine in the overview of current drugs.

On the other hand, the computerization of patient information has made it easier to look up information whenever necessary. At any time, 24-hours a day, all persons with a password can look up documents about the patient, including of course the medicine scheme. This has made it easier for the nurses to participate in the evaluation of the medical answer, as they can compare the medical history of the patient with the different information about the patient's present bodily state and with the list of prescribed medicine. Thus, when talking to the physician who is formally responsible for the medical evaluation, the nurses now have better chances of forming statements about the effect of drugs grounded in the medical discourse itself. The easier access to medicine information also works to serve patients and their relatives better, since discharged patients sometimes phone to check what medicine they are supposed to take.

Thus, the introduction of EPRs has changed some basic characteristics of how medical evaluation is performed. *First*, the medical evaluation is anchored to the computer (in the ward office or at the physician's

office). This new arrangement tends to downplay the role of the patient in evaluating the effect of drugs on their condition. On the other hand, however, the new arrangement seems to afford a more informed and active position for the nurses, albeit the evaluation is still based on a medical mode of ordering. *Second*, the dimensions of the screen, the ways in which one can maneuver between documents, and the very immaterial character of the signs on the screen make it somewhat harder for the physician to produce a "handy" overview of the medicine. Also, the structure of the medicine scheme tends to place the different drugs on equal footing – sometimes occasioning the staff to mix up current and old drugs. In sum, the computerization has not lead to any clear-cut reduction of errors regarding the evaluation of the drug; rather it has occasioned a rearrangement of the network around the patient-as-a-case in a way that performs the role of evaluating actors differently and gives rise to new types of work and errors.

Constructing an overview of the medical trajectories

Ideally within a medical mode of ordering, the story of Mrs. Brink's medication could be continued until a medical solution had emerged that relieved the problems connected to her diabetes. However, I do not know how her hospitalization ended and I must turn to a more general level of affairs to finish the description of how medication is performed after the introduction of EPRs. As mentioned in the section about medication before the EPR, termination of one medical trajectory often introduces the opening of another. Moreover, a typical patient ends up getting 4-5 different drugs – which have been traveling separately or in pairs through several trajectories of medication and re-medication. In principle, clicking up the medicine scheme produces an updated overview of the patient's medicine. Yet, the task of getting an updated overview of the patients total medicine prescription is still subject to some uncertainty, because some information might not be entered in the medicine scheme, but figures in the physician notes only. Thus, although nurses check for discrepancies between medicine scheme and physician notes on occasions, the medicine scheme sometimes holds less or more information than it "ought to". But since the very complexity and entangle-

ment of medication trajectories has not been reduced significantly it is difficult to determine what is the "actual overall status" of the patient's medication. It is hard to tell what the medicine scheme ought to contain without engaging in a major audit of documents and inquiring of involved staff – a task that few actors have the time to carry out. Consequently, the staff acts pragmatically and designates the role of being "the actual overall status" to the medicine scheme. Thus, when for instance a patient asks for a copy of the medicine list, a copy is printed without further ado.

It sometimes happens that somebody challenges the medicine scheme in the role of being "the actual overall status". Consider the following story:

> The physician sits together with the nurse around the computer. They are preparing the ward round and look at the electronic medicine scheme of a patient, Mr. Arnesen. The nurse holds a patient-list and a treatment card of an inhalator. The nurse tells that today Mr. Arnesen has been up for a little walk, that the nursing staff has tried to test him for dementia, but didn't succeed, and that she has talked to the patient's wife about the home situation. The physician clicks up the laboratory figures of Mr. Arnesen and skims the page: "I has the feeling that he drinks at home", he says and continues: "…we take the inhalator from him". He clicks back to the medicine scheme, where he looks at the other prescriptions. Then he asks the nurse "how come there is two kinds of Panodil?" She doesn't answer and the physician deletes one of the two types. Then he discontinues some other drugs and looks at the patient-list, which says that Mr. Arnesen has a drip. He utters "Drip! He isn't supposed to have drip…he both drinks and eats!" Then he goes to see the patient.

In the story we are presented with a case, where the medicine scheme both holds too much and too little information: it lists two variants of the same medicinal product, but lacks a prescription of an intravenous line that the patient allegedly has. In this case "errors" are discovered through a routine preparation of the ward round: the medicine scheme proposes "the overall status" of the patient's medication, but this proposition is challenged by the physician and by the statements on the patient-list. Thus, a routine preparation of the ward round leads by coincidence to a revision and updating of the medicine scheme. However, er-

rors like these are not inevitably discovered, if the physician is not familiar with the case or is in a hurry for some reason. The medicine scheme's position as "the overall status" of the patient's medication is challenged either by coincidence or by hard work as in the case where somebody takes the time to gather and compare the various documents of medicine information. Interestingly, the interviewed staff does not address these pitfalls of the new electronic infrastructure explicitly. Or rather, the nurses talk about it in vague terms as arising from "the physicians' forgetfulness", which calls for the nurses to constantly monitor the physicians' enterings and dictations. It seems that the very existence of a preformatted medicine scheme, which can be accessed and printed whenever wanted, is accompanied by a widespread feeling among the staff that, now, all relevant information about the patient's medication are kept in one place.

In conclusion, the task of producing an overview of the patient's total medication is still marked by problems, because the medicine scheme does not always hold all relevant information and is not always properly revised.

Summing up

I have described how the medication process has been altered since the introduction of EPRs. The electronic medicine scheme has been delegated the role of key-document, or nodal point, of the patient's medications; and there has been a move from paper based physician notes and Kardex to electronic physician and nursing notes. The possibilities of making error are not reduced but redistributed. The medical answer is still translated through a series of materialities before finding its final medical form, and each of these translations implies risk of errors. Moreover, the EPR seems to occasion a change in the roles and relations among physicians, nurses, and patients, which are arguably negative. Applying more detail, I will conclude on the overall change in the following section.

Conclusion

Redistribution of errors

Medicine errors happen frequently in medical practice because the prescription has to travel a long way through the organizational network of physicians, books, tools, papers, nurses, drug cans, pillboxes, aides, patients, etc. Some of the widely accepted risks are that the prescription will develop in an unwanted way or will get lost. The expectation was that the introduction of EPRs would eliminate most of these problems. However, having now analyzed the medication trajectory before and after EPRs, I will conclude that this expectation cannot be substantiated. While some of the procedures, in which errors often occurred, are being rearranged or bypassed, new procedures have developed, in which other types of errors may easily occur.

Let me compare the two figures of the medication trajectory before and after the introduction of EPRs in order to single out the fundamental differences and similarities.

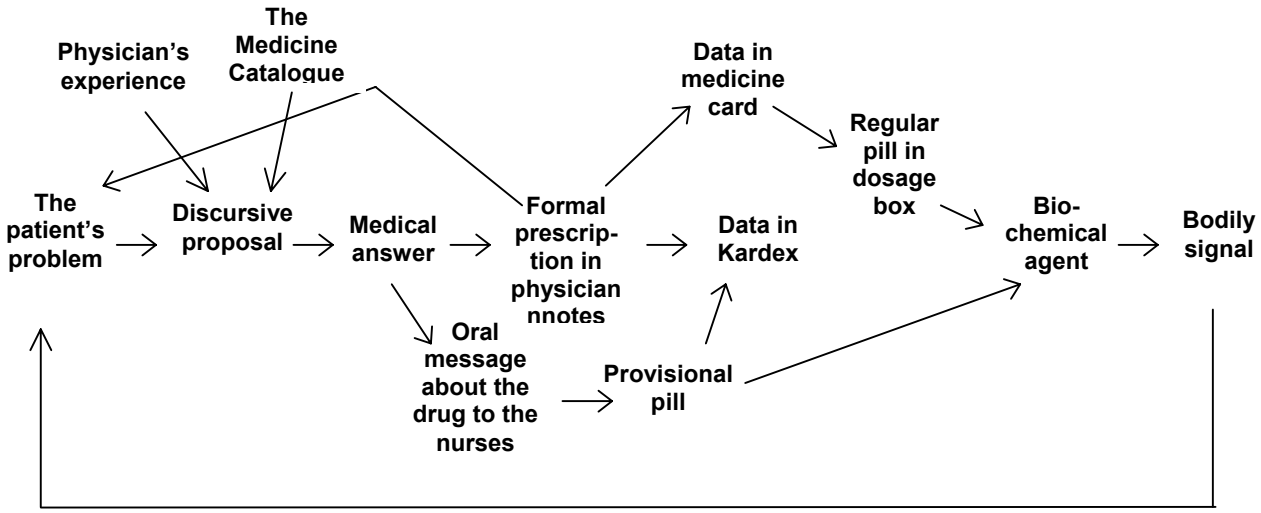


Figure 6.1: The previous trajectory of medication

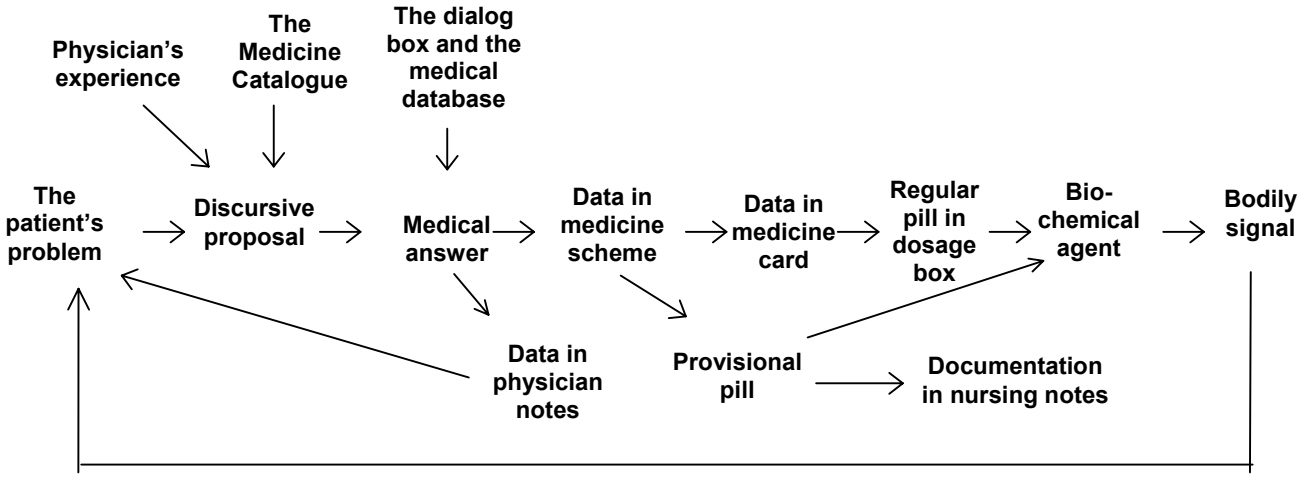


Figure 6.2: The trajectory of medication after EPRs.

In Figure 6.1, the translation of a medical answer moved through many steps, which all entailed some sort of risk that the prescription developed from the original shape. The translation from medical answer to the inscription of this answer in various artifacts was especially risky: the answer could develop from the moment it was communicated verbally to the nurse to the moment it was dictated as a physician note, and it could develop from the dictation to the transcribed physician note to the data in Kardex and the data on the medicine card. Besides the risk that the

patient might end up getting a wrong drug, a wrong dosage of drug, or never having any drug, the fact that drug information was kept separately in at least three different documents made it hard to obtain an overview of the patients medicine. What is more, the work needed to obtain this overview was often not possible to do, or it was done as invisible work. In this way errors could survive for a long time.

In Figure 6.2, it is clear that the number of steps involved in the medication trajectory has not been diminished, but their relations have been altered. All these steps entail some sort of risk. A major possibility of errors is that now the medical answer is both being translated into the medicine scheme and into the physician note. This bifurcation of the trajectory continues the problems of co-existing and competing documents, which also plagued the former trajectory. Although the doubling of medicine information works to distribute information on the patient's medicine among the relevant actors, it means that the components of the medical answer are not always circulated evenly among all the proper recipients: a medical answer may sometimes slip into the physician note only. What is more, even a small miswriting of the dosage in the medicine scheme means that a drug may be in the scheme but will not be printed out on the medicine card. Thus, although some "copying-errors" are eliminated (mishearing, miswriting, and misreading the original medical answer when translating the oral statement into a type- or handwritten one) other "copying-errors" have emerged (miswriting of dosage sends information to the wrong paper card). In addition, another kind of risk has been aggravated, namely that the Medicine Database works to structure the medical answer as a prescription based on sales names rather than on generic names of drugs, which may make it hard to substitute one drug for another. Ultimately, this means that a logic of product assortment come to prevail at the expense of a logic of treatment.

Thus, the problem of information uniformity and validity continue. This uncertainty gives rise to a range of countermoves, or articulation work[56] among the staff – especially among the nurses. When time al-

[56] By articulation work I draw on the definition offered by Lucy Suchman. In her wordings, articulation work is: "continuous efforts required in order to bring together discontinuous elements – of organizations, of professional practices, of technologies – into working configurations" (Suchman 1996).

lows, the nurses monitor the physician's enterings in the physician notes and compare the statements here with the statements of the medicine scheme, write nursing notes to support the monitoring of the medication process, and encourage the physicians to employ the nursing notes as containers of "reliable facts". Yet it is still hard and laborious to generate an overview of the patient's medicine, which continues the problem of re-medication: on what grounds are the medical interventions and the patient's condition compared and evaluated?

In short, the expectation was that recording the medical answer directly into a medicine scheme, which all occupational groups share, and from which all necessary paper documents can be printed, would dramatically reduce the occurrence of errors: "things are only entered once, which makes data the same everywhere". Yet, the above summing up shows that computerization has not led to any clear-cut reduction of errors. Even though some pitfalls are bypassed, other sources of errors are continued and whole new types of errors have emerged. On the way from medical answer to pills to evaluations of the medical intervention, data is not "the same everywhere".

Conflicting logics

Is it likely that this disappointing conclusion may be due to the fact that the new trajectory has not been sufficiently "implemented" in the organization? And is it likely that if more disciplining information technologies with alarms were designed, a great deal of the above risks would be eliminated? On the one hand, it seems reasonable to think that some problems could be made less serious or diminished by, for instance, having a program that can add the generic name of a drug to the prescription, or by introducing some kind of auditing routine in relation to the patient's medicine. On the other hand some problems seem hard to overcome, because they arise from conflicting concerns or logics. It is, for instance, a basic dilemma that in order to make data uniform and stable across sites, this information has to be concise and standardized (e.g. name, strength, and dosage of a drug). Yet in order to make this information useful in relation to various tasks (e.g. administering the drug and evaluating the effect of the drug) it must be accompanied by additional information (e.g. indication or medical history). This is one of the

reasons why physicians (and legislators) insist that medical prescriptions have to be repeated in the physician notes.

Also, the investment of time and resources continue as a dilemma in the new organizational arrangement, because it takes time to enter data in a proper way and because this time must be taken from other relevant tasks. Also the new arrangement does not solve basic, recurring problems concerning the trajectory of medication such as the problem of determining the patient's problem and making the patient comply with the medical intervention. Finally, the new way of performing medication does not deal with the very problem of framing the relation between human, sickness, and health as a question of biochemical processes and chemical substances.

Subtly changed roles and responsibilities

In the altered organizational network around the medication process physicians, nurses, and patients are offered somewhat new positions.

The physician is still a central actor in deciding the patient's problem and giving the medical answer. And he is enacted as the privileged "*inscripteur*" of this medical answer by the fact that the system requires a physician's password to enter data in the medicine scheme. However, this role as decision-maker and "inscripteur" is guided and even confined: the EPR only accepts a medical answer if it is defined by various categories and framed as a sales name of a drug. On the other hand, nothing forces the physician to actually inscribe the medical answer in the EPR. Thus, paradoxically, the physician at the same time is afforded a privileged, regulated and voluntary position in the new trajectory of medication. Some physicians experience this new position as somewhat unattractive, since to them the combination of responsibility and discipline moves the role towards that of the secretary, which does not hold high esteem and takes time from "proper physician tasks".

As for the nurses, they are afforded a role that is both more peripheral and more strongly integrated in the medication trajectory compared with the previous arrangement. On the one hand, nurses are enacted in the position of materializing the medical answer (printing medicine cards and measuring out pills): the traditional mediator role. Thereby, the role of nurses is confined to the "middle part of the trajectory" and the practicalities related to the logistic of medication. However, the easy

access to EPR also affords nurses the position of being highly informed witnesses of the medication. And the nurses utilize this position to cast themselves as more centrally involved agents in producing coherence in the medication trajectory and in the medical decision-making: as watch-dogs of the red thread in the medication process and as medical protagonists. Thus, nurses come to perform the traditional role of doing work, which is in danger of not being carried out at all: the invisible articulation work (Strauss 1997, Hughes 1971). But at the same time nurses are afforded new positions that lift this subordinated role. However, this new possibility does not seem to occasion any change in the dominance of the medical paradigm as such, but contributes to further enforce and streamline this agenda.

Finally, the patient is afforded a less involved position in the trajectory of medication. He or she is enacted in the traditional role of being the passive object of medical examinations, interrogations, and interventions. What is more, since the evaluation of drug effect is progressively tied to the computer – and hence happens backstage in relation to the patient – the patient's statements about the effects are less likely to be incorporated in this evaluation. Also, the patient's insight in his or her medicine-prescriptions tends to become restricted to the printed medicine card in the dosage box, or – if requested – as a printed version of the medicine scheme. As described in chapters 4 and 5 the physician notes and nursing notes are seldom shown to the patient. In this respect, the patient's possibilities of participating in the production of overview of his or her medicine (by comparing documents or questioning inferences across them) are downplayed. Hereby, the patient role is very much continued as a subsidiary character, whose only possibility to shape the medication process is to act non-compliant.

7

Adding computers to the infrastructure of test distribution: reshuffling work loads and temporalities

Introduction

The execution and reading of tests and technical examinations is centrally involved in medical practice. As an example when a patient is hospitalized his or her blood and urine are analyzed as a matter of routine, and many patients go through additional kinds of tests and technical examinations during their "career" as patients. The tests and technical examinations are delegated the task of enunciating, that is visualizing or signifying silent and inaccessible events taking place in the patient's body. Through complex processes of linking cells, technologies, laboratory technicians, standards etc., X-ray examinations picture the shape and extension of organs and the circulation of blood in vessels. And tests put figures on the presence of for instance cells, bacteria, minerals, and chemical substances, which then gains more visibility – or perhaps reality – as "test results". Back at the medical ward, these different results enter the patient record and can be juxtaposed and compared with other results and medical statements. They enter and form part of a textual universe of signs and symbols, which play a pivotal role in the construction of a temporality of events in the patients body; a medical history that is a crucial innovation of the modern, clinical gaze (Foucault 1972, Berg & Bowker 1996). Thus, test results and their incorporation in patient records act as constituent part of the whole *dispotif* performing medicine (Berg & Harterink forthcoming).

However, results from technical examinations and tests do not flow smoothly into this medical *dispotif*. Tests must be prescribed and ordered from the laboratory or special unit; the patient must be transported to special machines to let his or her body be manipulated in various ways, or specimens have to be taken from the patient's body by a laboratory technician or a nurse and distributed to a laboratory; the specimens or pictures must be analyzed by specialists armed with different techniques and subsidiary materials; and test results have to be depicted or formulated by various means. Finally, the result has to be distributed back to the ward, where the patient is – or perhaps more importantly, where the patient's record is. And each of these "subtasks" comprises several specific activities, logistics, links and loops.

The introduction of EPRs does not affect the overall logic behind the execution and inclusion of tests as actants supporting a medical dispotif. However, it does occasion a reshuffling of the way in which test results circulate and flow into the ward and textual universe around the patient-as-a-medical-case.

In the following, I shall describe the altered chain of test result distribution and address the way in which this rearrangement contributes to the performance of medical practice. I do not carry out an elaborate "before and after analysis" as in the previous chapters. Rather, this chapter is structured to focus upon the way an added electronic channel occasions subtle reorganizations of the specific routines of "encountering test results" among nurses, physicians, and secretaries. I show that even though the changes in the routines are minor, they challenge the organization of work and the established professional roles and responsibilities. Moreover, new temporalities arise, which introduce dilemmas concerning the way time should be spent, and how "risks of error" can be averted.

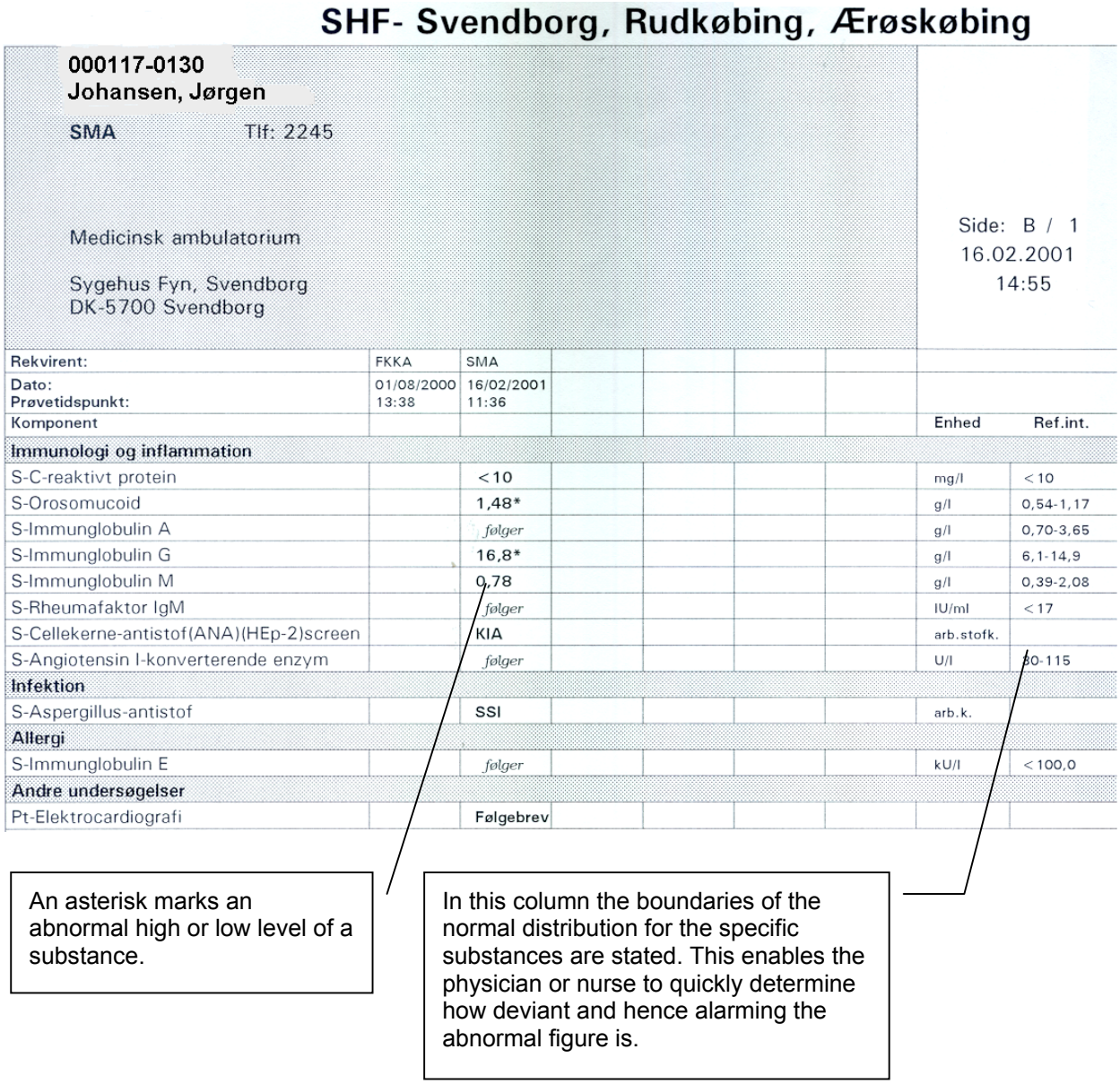
A changed chain of test result distribution

Within few hours after a patient is hospitalized, a physician will talk to the patient and examine his or her body. After this, the physician decides

what kinds of tests that are appropriate to throw more light on the case and perhaps confirm, support, or disconfirm hypotheses about the patient's disease. Further decision-making about what to do with the patient's disease must await the answers of these tests. Thus, the speed of processing tests and distributing the back to the ward is crucial for a quick, proper treatment of the patient.

However, the speed of processing and distributing depends on the accomplishment of an interrelated array of tasks. This involves humans (the patient, physicians, nurses, secretaries, laboratory technicians and mail-carriers – just to name the most obvious), and non-humans (blood, test tubes, labels, order slips, letter trays, laboratory equipment, paper, pencil etc.). These entities all have to co-operate to perform a series of tasks: test ordering, processing of test sample, formulating the result, and distribution of the result. And when the test results finally arrive back at the ward, the results must be read, juxtaposed with other results and documents and gestalted into a more comprehensive notion of what is going on inside the patient's body, and finally, a medical answer must be formulated to the problem as it emerges.

The introduction of EPR has caused small but fundamental changes in the accomplishment of these subtasks, especially in the way results are distributed back to the ordering ward. Prior to the introduction of EPR in the hospital, the procedure of distributing, say, the result from a blood test was as follows. When the test had been processed, somebody in the laboratory printed the result on a piece of paper and sent it back to the ward via the internal mail system. Usually, the result from a test taken in the morning would be delivered to the ward office around three o'clock in the afternoon. The ward secretary would then sort the incoming mail in letter trays, one of them a "test result tray". Soon after, a nurse would look through the papers in the "test result tray" and gather the papers showing abnormal results. An asterisk marks if a number is abnormal as shown in the following figure:



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SMA Tlf: 2245

Medicinsk ambulatorium

Sygehus Fyn, Svendborg
DK-5700 Svendborg

Side: B / 1
16.02.2001
14:55

Rekvirent:	FKKA	SMA						
Dato: Prøvetidspunkt:	01/08/2000 13:38	16/02/2001 11:36						
Komponent							Enhed	Ref.int.
Immunologi og inflammation								
S-C-reaktivt protein		<10					mg/l	<10
S-Orosomucoid		1,48*					g/l	0,54-1,17
S-Immunglobulin A		følger					g/l	0,70-3,65
S-Immunglobulin G		16,8*					g/l	6,1-14,9
S-Immunglobulin M		0,78					g/l	0,39-2,08
S-Rheumafaktor IgM		følger					IU/ml	<17
S-Cellekerne-antistof(ANA)(HEp-2)screen		KIA					arb.stofk.	
S-Angiotensin I-konverterende enzym		følger					U/l	30-115
Infektion								
S-Aspergillus-antistof		SSI					arb.k.	
Allergi								
S-Immunglobulin E		følger					kU/l	<100,0
Andre undersøgelser								
Pt-Elektrocardiografi		Følgebrev						

An asterisk marks an abnormal high or low level of a substance.

In this column the boundaries of the normal distribution for the specific substances are stated. This enables the physician or nurse to quickly determine how deviant and hence alarming the abnormal figure is.

Figure 7.1: Segment from a blood test result showing the levels of different biochemical substances related to immunology and inflammation; infection; and allergy (name and identification number changed).

In the evening there are usually only one physician on duty and he comes by the ward around three to pick up the abnormal test results and perhaps do a round to the patients that need to be attended to during his evening duty. Thus, the nurse gives him the papers, and he considers the results to decide what to do about the patients in question.

This routine has now changed in that results are both distributed on paper by the internal mail system and as Edifacts (Electronic Data Interchange For Administration, Commerce and Transport) – i.e. as an elec-

tronic message. The procedure runs as this: the laboratory prints the results on paper and sends it to the ward. Here, a secretary or a nurse files the paper into the specific patient's "record-cover" – a plastic folder containing loose-leafs like referrals and electrocardiogram-curves. In addition to this, the laboratory sends the test result as an Edifact into the electronic record system, MediCare, where it is filed in two locations: into a folder called "laboratory figures" in the specific electronic patient record; and into an "Edifact-list" containing all incoming test results for the hospital. This Edifact-list is pictured in the following figure:

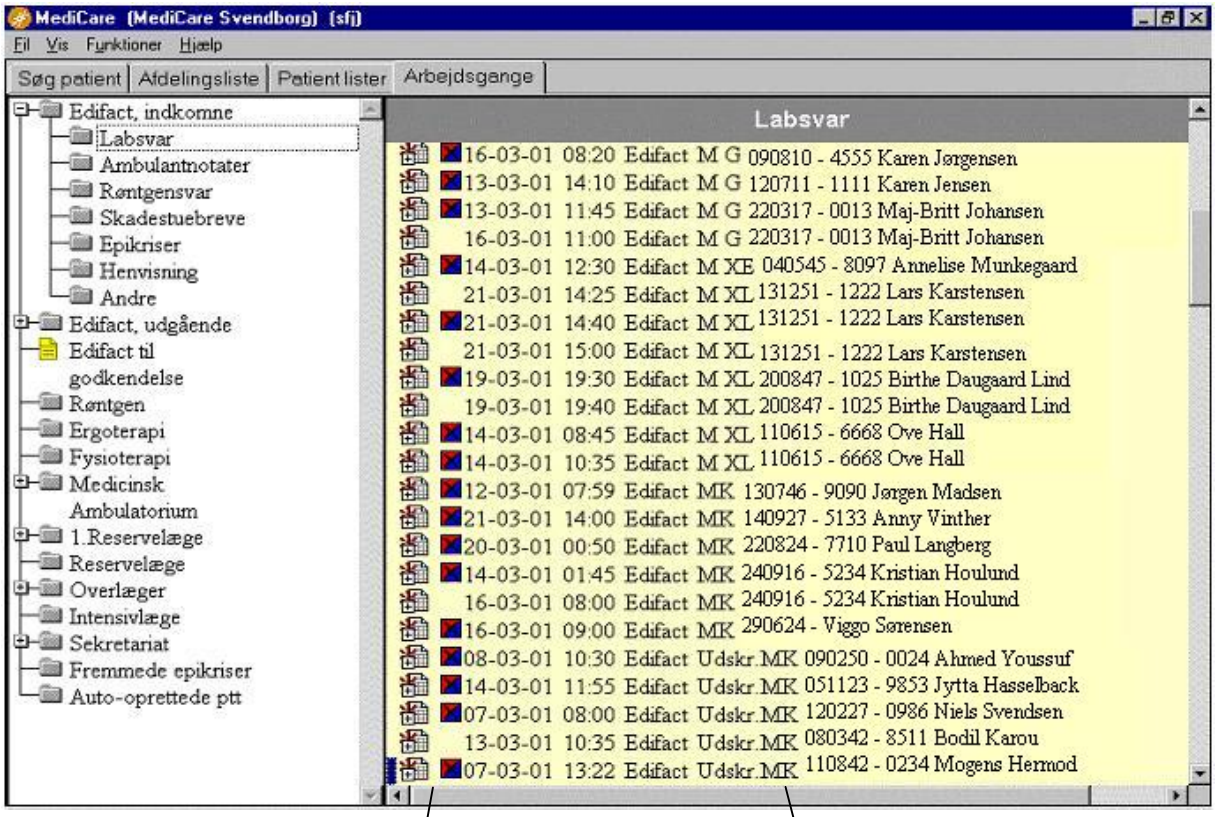

Figure 7. 2: The Edifact-list, where all incoming test results are stored temporarily (names and identification numbers are changed).

But a test is not just a test: it can be ordered as a "routine test", as an "expedite test", and as an "acute test". The difference between the three

alternatives concerns the speed of processing and distribution. A routine test is processed in rotation and distributed by mail once a day and by Edifact in lumps so that, typically, results are distributed electronically three-four times every 24 hours. The two others types of tests are processed before everything else and, furthermore, when the acute test is completed, the laboratory phones the ordering ward so that a nurse can come and pick up the result.

The original hope was that this parallel electronic track of distribution would reduce distribution time and make the test result available for many different users at the same time. This would necessitate a small change in roles and routines, mainly that the physicians now have to look up and check the routine results themselves instead of waiting for the nurse to sort them out. However, by looking more closely at the way daily business is carried out now, this seemingly simple case reveals itself to be more complicated. I will show this by juxtaposing the work practice of nurses, physician, and secretaries.

Workloads and dilemmas

Nurses

With the new arrangement, nurses no longer need to screen the test results routinely and distribute them to the physician, although they still do the sorting of paper-results into the record-folder and occasionally pick up results from acute tests at the laboratory. Nevertheless, they are not entirely comfortable with this situation "because physicians are forgetful" and may at times forget to check the Edifact-list for test results on their patients. Moreover, physicians move about in the hallways and wards of the hospital and do not keep an eye on the arrival of papers in the ward office, which could otherwise remind them of their patients' test result. Therefore, many nurses feel that they have to make sure that newly arrived results are actually noticed by the physicians. In the wordings of a nurse:

Nurse: "Previously, we sorted out the abnormal results. But now we still…we're a little uncertain…well, nurses are kind of pushy, so we are not always sure that things are actually carried out. And that is our experience. It is not just because we want to nurse and take care of the physicians. It is, like, doubtful whether they check in the computer-list: 'are there some results here that are abnormal?'"

Accordingly, nurses look through the paper results that arrive by mail, and occasionally, they look into their patients' electronic record or skim the Edifact-list in order to check if something has arrived. If this is the case, and they have not seen the physician checking himself, they remind him the next time he shows up: "have you read the results on Mrs. Hansen?" or inform him: "the leukocyte figures of Mr. Petersen do not look good".

Thus, the nurses still play a key role in producing awareness of new results, and yet, their actions are now regulated by a slightly different principle. Before the introduction of the EPR and the adding of the electronic distribution channel, the organizing principle of the nurses' actions regarding the distribution process was "have any abnormal results arrived or not?" Now, the governing distinction seems to be: "Is the physician aware or not?" The work task has moved from screening results and handing critical ones over to the physician, to include the task of monitoring and shaping the physician's awareness also. By the re-arranged routine, nurses are no longer responsible for the sorting and distribution of test results but are afforded a more marginal position as archivists. Interestingly, however, nurses continue to enact the old role. Allegedly, they do not have faith in physicians as reliable watches. Moreover, it seems as if the very physical nearness of nurses to the patients, the computers, and the letter-tray with potential bad news in it continuously enact the nurses as responsible backstops. Yet, it is also likely that another – supplementing – aspect contributes to this somewhat paradoxical outcome of the new arrangement. Thus, Everett Hughes mentions that:

> "There will probably always be in this (medical) system, as in others, some one whose role it is to make ultimate decisions with all the risk that goes with it and with all the protections necessary. This is the role

> of the physician. He has and jealously guards more authority than he can, in many cases, actually assume. There will probably always be in the system, complementary to this position, another of the right-hand man order; a position, which defers to the first but which, informally, often must exceed its authority in order to protect the interests of all concerned. The nurse occupies this position. When the doctor isn't there, she may do some necessary things, which requires his approval – and get the approval when he comes back. She is the right-hand man of the physician, even and perhaps especially when he isn't there. The nurse also sometimes fires furnaces and mends the plumbing, i.e., she does tasks of people below her or outside the role hierarchy of medicine. It hurts her, but she does it. Her place in the division of labor is essentially that of doing in a responsible way whatever necessary things are in danger of not being done at all" (Hughes 1971 p. 309, my addition in the parenthesis).

Hughes concludes that nurses traditionally are afforded the role of "doing in a responsible way whatever necessary things are in danger of not being done at all". The nurses' response to the new distribution routine is very much in line with this traditional outcome of the social drama in the hospital work system. Furthermore, as the observant reader may have noticed by my (a little caricatured[57]) use of the feminine when describing the nurses and the masculine when describing the physician, the nurses' response to the new arrangement could invite a traditional gender-reading. The women are carrying out the invisible work that makes men's successes possible. However, I want to suggest another reading also inspired by Hughes. Instead of seeing the continuance of a traditional work division as the nurses' conditional, gender-specific response to new challenges, it could be viewed as a strategic response related to issues of prestige and placing in the institutional hierarchy of the work place. Thus, Hughes addresses the prestige of a work task as an important feature to include, when tasks and responsibilities are reshuffled among occupational groups for example occasioned by introduction of new technology. Professional struggle is part of the drama unfolding

[57] All nurses on the medical ward are women, and approximately one third of the physicians are women. Accordingly, my consistent use of the feminine for nurses and the masculine for physician is only caricatured in relation to the physicians.

when new tools occasion new task. Accordingly, nurses might seek to drop certain tasks, hold on to, or capture other for the sake of moving up in the status hierarchy of the work place (ibid.). Seen in this light, the task of sorting and singling out the abnormal results – producing *critical* cases – somehow holds the status of setting the agenda, of dramatizing the patient case, and of creating organizational awareness and mobilization around the patient-as-a-case. And this role holds far more esteem than simply filing papers and administering pills. In general, it seems to be more attractive to communicate "up" than "down" in the organizational hierarchy: the nurses contact the physicians more often than the physicians contact the nurses – a supplementing aspect of the way prestige and status are parts of the redistribution of responsibilities.

In sum, when nurses do stick to their traditional role of singling out the abnormal results and notifying the physician it is perhaps not that paradoxical. Especially not if one takes into account their physical nearness to the papers and computers that hold the test results; the nurses' institutionalized role of gluing together the activities of other actors; and finally, the prestige that is associated with handling the dramatic versus handling the trivial.

Physicians

The physicians do not find the altered procedure unequivocally positive either. This is primarily due to the way the new procedure chops up the physicians' traditional work routine. Previously, if a physician was responsible for the evening round, he often had a daily routine where he came by the medical ward around three o'clock to receive the new results.

Now, test results can enter the EPR at all hours during the day, although they are often sent in lumps two-three times a day. This means that three o'clock is no longer a point in time that works to structure the physician's day on duty. Instead, the physicians now have to engage in a new, somewhat tricky kind of monitoring work. This consists in checking from time to time in the record-cover, the electronic patient records, or in the Edifact-list if new results have arrived. However, these different sources of new test results are distributed unevenly in the physicians

milieu and, furthermore, they are not equally reliable. Paper-copies lie in the record-covers in the ward office. These are the most reliable containers of the newest results, as there can sometimes be up to two hours delay in the Edifact-system, due to the way electronic messages are sent between servers in the district. But physicians are not always in the office when they need to look at results, so, either they have to walk down the stairs or through the hallways to the office and check in the record cover, or use the computer from where they are. Usually, they opt for the latter (because computers are appealing and stairs tiring) to see whether or not results have arrived. If they have not, they are left in the blind: have the results arrived as papers in the office, or are they still being processed in the lab? Other tasks become urgent, and the physician defers clarification or forgets and is then often reminded by the nurses when they come across each other in the office or in the hallways! Some physicians experience this new situation as a setback compared to the way test results were distributed before the EPR:

Physician: *"There is a tendency now that it takes too long time before the results come back from the lab*

Interviewer: *"You wait for the results?"*

Physician: *"Yes, I think this has deteriorated, but I can't put figures on it. (…) Earlier on, the results were in the letter-tray – about half past two-three o'clock. I would pick up the results and then do the round; feeling assured that there were no more important messages that day. Now, I find it more diffuse, never knowing when results drop in".*

In the quote, the physician states that the distribution of test has paradoxically become slower. However, he connects this slowness to the dismantling of the letter-tray as a physical container of new results. It is doubtful whether the laboratory has become slower in processing tests. But it seems that the very ramification of the infrastructure of test results produces the feeling that distribution takes longer, perhaps because it is no longer immediately obvious if and where results have arrived.

Other physicians do not find the new situation that problematic, stating that keeping abreast of events is not new to them, as they were used to check for new results independently of formal routines. To them,

the extension of hours in which results can arrive and the possibility that they can access results at any moment works to speed up the patient's case and as a possibility of giving the patient feedback when everything is fine:

> *Physician: "Sometimes, I check if the blood test of a patient is all right if I for instance have changed some medicine. And if everything is all right, well then I can actually go and tell the patient on the evening round. This would not happen earlier on. Because there was no tradition of doing that, and because the blood test would not always have arrived".*

However, this pro-EPR physician adds that sometimes, he too finds it difficult to know whether a result has actually arrived or is still being worked on in the laboratory:

> *Physician: "Well, the results don't always arrive immediately after they're made. And there isn't an alarm telling you when they do arrive, so I've to check now and then. And the nurses*

The physician points to the fact that sending the test result electronically can take many hours due the way the electronic infrastructure is set up[58] and this contributes to uncertainty throughout the organization about the fate of a test result. Moreover, he mentions that nurses also works as intermediaries in tracing the test results. Thus, while the introduction of EPRs loosens up some of the traditional medical routines and affords new ways of interacting with the medical documents and the patients, it also complicates – even confuses – the accomplishment of basic medical

[58] Results are sent via a private web-host, who charges every time the electronic gate is opened and closed. To save money the hospital pays only for opening/closing of the gate 3-4 times every 24-hours. Since the field study was carried out, this procedure has changed so that the hospital gets the result directly into the hospital server. Thus, results do now flow into the EPR as soon as they are sent from the laboratory. Interestingly, although this recent modification abolish some of the confusion arising from having two channels of test result distribution (an ordinary paper-mail system and an electronic system) it seems to further enhance the movement toward a more fluid and diffuse structuring of the physician's workday.

tasks based on deep-seated, practical ways of organizing that work. Whereas earlier, three o'clock was a central ordering principle for the physicians and nurses, they now have an ongoing dual concern: "have results arrived and where?" and "shall I take the time to search for it now or shall I wait till later?" In contrast to the old established routine, this is a principle of fluent awareness, always balancing what happens in the situation with what happens in the information infrastructure. One of the physicians experiences the new situation as giving rise to tension:

> *Physician:* *"When working at the computer you're often tempted to jump to something else [e.g. checking if new results have arrived and then perhaps engaging with these]. You couldn't do that earlier, because then we had those paper patient records and it was all about going through the papers one by one taking each patient record in turn. When the pile of records was done [by reading the physician notes and the enclosed patient figures in order to determine the status of the patient-as-a-case] you had finished the first part of that day's work. And then after noon came the second part of work where new test results were dealt with".*

The tension concerns the need for trading-off different considerations. On the one hand, the physician feels tempted to react on the information that catches his eye, as this may be exactly the information that throws new light on a difficult patient case, or the information that calls for immediate reaction to an aggressive disease. In both instances, the physician would be able to speed up the handling of particular patient cases. However, when following such impulses the physician diverts from the established routine, which ensures that all patient cases are dealt with. Thus, on the other hand the physician feels obliged to follow the beaten track and work his way through all patient cases. Then he must rely on the effectiveness of the organizational routine to catch up on the patient case later and incorporate new information at that point. Yet, it seems that the physician finds it a somewhat hard dilemma. According to Michael Guthrie physicians have an institutionalized inclination toward action as opposed to planning (Guthrie 1999). Thus, the very possibility of making headway with the patient-case often combats the consideration of doing things in a certain, preplanned way.

Besides the monitoring task, the physician must now also tidy-up the Edifact-list: when a test result is read and action taken, the physician is to delete the result from the list, thereby reserving the list for new, unread results. However, although this task does only entail one or two clicks on the mouse, the physicians tend to forget it (often because they are in the midst of dealing with the patient case) or they assume that the secretary will do it. As a result the Edifact-list is often very long and filled with "old results" that make it difficult for the reader to produce an overview and find new results for a specific patient. This has made physicians complain about two things: first, that they waste their time on things not proper for a physician – i.e. keeping the Edifact list tidy – and second, that since they are not very competent at such "secretarial work", things are getting messy and vital information jeopardized. It has been discussed if alarms could be delegated the task of notifying the staff when a new result arrives. It could for instance be made so that a red flag would appear against a patient's name on the patient-list when a new result arrived. But then "there would be red flags all the time" as one secretary says.

In sum, in the rearranged network of test result distribution the role of the physician is in transition, because new work tasks have been added and new guiding principles for structuring the workday have emerged. These alterations seem to create tension in the physicians' workday – although the actions of nurses and secretaries mitigate the degree of this challenge. Interestingly, the introduction of new technology does not seem to result in a more fluent way of ordering daily work. Yes, the electronic distribution expands the time spectrum of result arrival, but this should not necessarily cause the three o'clock routine to change. However, the possibility to check more often for new test results via the electronic distribution channel seems to connect with the physician's partiality for entities that might push forward the medical problem solving.

Secretaries

The secretaries used to be responsible for sorting the incoming results and keeping them filed in the patient records. They still are, but now

they also engage in a new kind of monitoring work not unlike the nurses. Even though physicians are now formally responsible for checking the Edifact-list, and deleting old results, the secretaries check the Edifact-list routinely to see whether new results have arrived and how many old results that still appear on it. To avoid plain guesswork about the status of a result on the Edifact-list the secretary might check in the physician notes if action has been taken on a result and it can consequently be deleted from the Edifact-list. If, on the other hand, the secretary comes across results that she suspects have not been noticed, she sometimes reminds the physicians or the nurses to do so. Other times the secretary just deletes old results. This work is not part of the secretaries' formal responsibility, but nevertheless they regard it as necessary work: "if we weren't here, this new system would collapse". Thus, the secretaries hint that it is not simply a question of tidying up the Edifact-list but of keeping the electronic infrastructure sufficiently orderly to allow it to work smoothly and unequivocally. And this accomplishment is by no means simple but relies on complex processes of looking up, comparing, evaluating, and modifying status and content of information in many different sources. The work connected to the Edifact-list is but one of a multitude of other tasks of bureaucratic regimenting of the information infrastructure of the ward. In the word of Michel Crozier, who studied "white-collar employees":

> "When one examines the role clerks play, one is struck above all by the great diversity of their functions. Each detail is simple, but the articulation of the whole is extremely complex, so that only a rare few have an overall grasp of the general process" (Crozier, 1971: 84).

Originally, secretaries feared loosing their jobs to the computer when EPRs were introduced, but now they have stopped worrying about being made redundant. Rather than automating secretaries' work, the introduction of EPRs has occasioned a reshuffling of work tasks and workloads, where secretaries are continuously enacted as "natural" controllers and trouble-shooters regarding the jungle growth of the electronic infrastructure. Yet, this organizational position does not seem to emerge automatically from the introduction of EPRs. Rather, it has to do with the way in which physicians and nurses are concurrently enacted. Physi-

cians are not seeing themselves as obvious candidates to the job of tidying up the electronic infrastructure. And nurses direct their efforts toward that of monitoring the physician and the patient-as-a-case rather than attending the specific bookkeeping processes, e.g. the Edifact-list, per se (probably because this will not move nurses upwards in the hierarchy but rather move them away from their occupational raison d'être). Consequently, secretaries are offered the opportunity to mobilize action toward the Edifact-list and insert themselves as strategic agents producing bureaucratic order and medical awareness of informational chaos. Thereby, secretaries have made themselves indispensable to the distribution chain as the ones with "overall grasp" of handling files and folders in the medical network – occupying a domain. At present, secretaries seem thus to be thriving on chaos.

Discussion: temporality and risks

In the previous section I have described the prolonged chain of test result distribution; the different positions nurses, physicians, and secretaries are afforded; and the way they respond to these positions. Still, I want to sharpen the analysis of what happens to the general medical practice: in the following, I shall discuss the way in which the temporality and structure of medical work is affected. Moreover, I recapitulate the built-in dilemmas in this new configuration and address the types of risks that emerge from the altered organizational network.

Time as an actant

Earlier, results arrived at three o'clock – as described above. This hour was a significant actant in structuring the staff's daily work; an actant that divided work in big chunks: before and after three o'clock. Interestingly, this job is now abolished and a new relativistic principle works to divide and coordinate the work tasks among the hospital staff. Test results are sent as soon as laboratory technicians are ready and arrive in

the ward as soon as the electronic mail system and the human mail carriers are ready (except for acute tests that arrive as soon as the nurses ferret them out). Furthermore, physicians, nurses, and secretaries check whenever they are ready – which as described is contingent upon the importance and types of other task these persons are engaged with. This "as soon as they are ready" produces a whole new time, a time relative to the different actor's trajectories of work.

It would perhaps be more fitting to describe the altered temporality as a shift from common clock time, which worked to align the various actors' activities with each other, to several co-existing time-reckoning systems (Clark 1985), which emerge from the interplay between the specific actor and the way he or she is related to the patient and to the electronic infrastructure. Thus, the proximal network of the physician connected to the patient-as-a-case, the laboratory, the geographical dispersion of computers, and the electronic infrastructure produces a temporality of conventional work rhythm based on minutes and hours jarringly mixed with a temporality of sudden ruptures where agendas and work rhythm change within seconds. Whereas the proximal network of the nurse connected to the patient, the patient-as-a-case, the letter tray, the computers in the office, and the electronic infrastructure produce a temporality of news and a proactive work rhythm. Sometimes, these various temporalities and work rhythms vibrate in unison: tasks and actors amalgamate, and programs combine. At other times, though, the temporalities conflict and create tension among the actors and their programs of action. For instance, the sudden arrival of a test result indicating abnormal bodily biochemical condition in a patient will sometimes be subordinated to interactions with other more powerful entities such as emergency calls about another patient; whereas at other occasions it will beat weaker programs like the sound of a bell from a tiresome patient ringing for help.

Guiding distinctions and dilemmas

The emergence of different temporal patterns can also be seen as reflecting the introduction of new organizing principles – or guiding distinctions – for the daily routines of the staff. True, these changes are small

and concern mundane, undramatic activities, but still they bring about new or enhanced dilemmas, and perhaps even more important, they also produce new hazards.

For the physician a dilemma arises about how to spend his time. Should he dutifully check the Edifact-list at certain hours trying to catch up with the inscrutable ways of electronic messages in order to ensure a routine collecting of test results – but then also postponing the reading of early in-coming results with potential bad news? Or should he rely on checking on occasion, thereby allowing himself flexibility and the possibility for acute, focused effort, when necessary? Also for the nurse a dilemma arises: should she stick to formally agreed fields of responsibility and then witness results to be overseen? Or should she carry out the necessary work to ensure that things are accomplished, risking that this effort becomes invisible work not included in their contract of employment?

The electronic infrastructure does not impose these distinctions and dilemmas on the staff. Rather, the dilemmas arises because the altered chain of distribution offers new possibilities for performing medical work, and concomitantly brings about new tasks to be solved by somebody in the organizational network. At present, the physicians seem to tackle the new dilemmas in an undetermined way: sometimes they break the established routine, other times they do not. The nurses seem more inclined toward responding in a traditional manner, "doing what is necessary to keep the machine running". And as for the secretaries, they are hardly confronted with any dilemma, but do rather encounter a choice between "do or die" – between occupying the work that keep them indispensable for other actors' accomplishment of medical work and undermining the justification for their existence. Interestingly, the emerging dilemmas and distinctions thus seem somewhat different nature of the various actors. One dilemma concerns the logistics of the medical paradigm (the physicians); another dilemma concerns the placing in the institutional hierarchy (the nurses); and finally there is a distinction between inclusion and exclusion that concerns the very existence of an actor (the secretaries).

Risks

The adding of the electronic distribution channel to the existing distribution of paper documents has to some extent diminished the risk of test results disappearing randomly – which could happen before. However, risks are far from eliminated as such. Noteworthy, the lacking harmony between temporalities and the mutual adjustments and tactical maneuvers around the duplicity of possibilities and workloads in the new configuration subtly but surely create new types of risks regarding the way the patient-as-a-case is handled in the hospital network. Not least when the relations of staff, electronic test results, and paper results are less ramified as it is in other organizational units of the hospital. To exemplify this I will go back to the empirical data and describe how serious mistakes are produced in the new configuration of staff, documents, letter trays, computers, and conflicting work rhythms.

The outpatient clinic

The medical outpatient clinic is located in the basement of the hospital. Here, patients come for aftercare or regular control of, for example, diabetes. The clinic is manned with nurses that take care of special tasks such as dressing wounds; secretaries that takes care of booking appointments, putting out the patients' records and test results to all appointments, and sending letters to patients and other institutions such as primary care; and finally, physicians who are based in the Medical Ward but in turn have duty in the outpatient clinic. Thus, while the nurses and secretaries work permanently at the outpatient clinic, typically, the physicians come only once every two weeks. This means that the secretaries have to keep track of the patients' cases (e.g. if any new test have results arrived, and if they indicate bodily conditions that must be taken care off?) Test results are sent to the outpatient clinic both as electronic messages in the Edifact-list and as papers arriving by internal mail. If a secretary comes across one such test result, she will usually find the papers on the patient, book an appointment as soon as possible, and place the patient's papers in the pile of patient files for the specific day of duty. Then, the physician responsible for the specific day will fetch the pile – usually a couple of days in advance – and go through the papers to prepare himself for meeting the patients. Hence, the responsibility of noti-

cing new results and acting on them is distributed among the secretaries, the appointment book, the pile of patient files, and the physician. This distribution works to solve the problem that outpatients are not attached to one single physician as the physician on duty does not follow specific patients, but acts toward "the next in the appointment book". However, this working configuration also creates an Achilles' heel, as paper results do sometimes disappear, and nobody checks the outpatient's electronic records regularly. Consequently, a test result can hide in the electronic infrastructure, and this can be fatal to a quick response toward an aggressive disease.

I witnessed one such "mistake" the day I observed the secretaries at work in the outpatient clinic. The secretary was routinely gathering and sorting the papers on the patients for the consultation two days later. Suddenly, she came across a patient who has had an X-ray examination of her stomach, but although this examination was made 11 days ago, there was no paper about the result of the X-ray test. The secretary opened the Edifact-list on the computer to check if result had arrived. It had. And it said that the X-ray examination showed indicia of beginning appendicitis and colitis – bodily conditions that can be lethal without treatment! Because the paper version of the result was missing, nobody in the hospital noticed this grave news and took action towards the patient!

Discussion

The example is perhaps somewhat odd as the outpatient clinic do have a less complex and elaborate set of connections between the informational infrastructure and the occupational groups compared to the medical ward. Nevertheless, it points to the fact that the way staff, letter trays, documents and computers are related – the small and apparently trivial logistics of receiving, sorting, and marking test result – do have great importance for the way organizational awareness is produced and mistakes arise. Moreover, it points to the way statements such as "with the EPR no result can vanish", which is a slogan of the spokespersons for the introduction of EPRs, can be dazzling to the point of blinding us. Just because information *enters* the electronic infrastructure it is by no means a guarantee that it will not hide; that it will be enacted by the whole configuration of staff, artifacts, patients, and geographical spaces

as an important test result and not just bits and bytes piling up in the information space.

Conclusion

Test results form important parts of the enactment of medical practice on the medical ward. Yet, the way test results actually circulate – i.e. are sent, received, sorted, read, and stored – affects the way test results participate and the positions other actors are afforded. I have described how the adding of an electronic distribution channel to the existing one challenges the established routines among the staff. First, new tasks emerge in addition to the old ones and this gives occasion for a reshuffling of the workloads and responsibilities among the staff in the ward. In this reshuffling the occupational groups adopt different strategies such as negligence, depreciation, and containing of the new tasks and possibilities. Thus, although new roles are offered the traditional hierarchical relation among physicians, nurses, and secretaries are continued.

However, the electronic infrastructure changes the temporality of test result distribution, which challenges the traditional work rhythm of physicians and nurses. New dilemmas about the way information should flow into medical practice and how to spend time arise. Furthermore, new risks of mistakes emerge from the rearranged network of human and non-human actors. Allegedly, the new electronic infrastructure will prevent information from disappearing. However, this does not seem evident, as the very presence of information in the EPR by no means guarantees that it is enacted in a way where it gains status as an actant in medical work.

This subtle reconfiguration of tasks, roles, and temporalities does not seem to change the conduct of the patient-as-a-case in any clear-cut manner: grave results will perhaps flow more quickly into the domain of organizational awareness of the patient-case. On the other hand, more undramatic results might keep status as unnoticed for a longer time. Thus, it does not seem obvious that the new arrangement should be radi-

cally better than the old arrangement in ensuring that grave results always lead to immediate action. Finally, by the computerization of test result distribution the patient is once again offered the parenthetical position as the supplier of bodily fluids and the photographic object – and, of course, the end receiver of the medical decision about his or her body. The adding of an electronic distribution channel neither occasions a stronger involvement of patients as active and non-homogeneous agents, nor shifts these patients further off than previously; the patients as "requisite others" – as both "centers and peripheries" – are maintained.

8

Nodes of ordering in medical practice

Introduction

In this chapter, I shall turn back to the focal point of the thesis: technology and organizational change. Inspired by actor-network theory or "the sociology of translation", I argued in Chapter 2 that we should not make a priori distinctions between a "technical world" and an "organizational or social world" to investigate the consequences of new technology in organizations. However, I also mentioned that in relation to processes of (re)organizing, the ongoing (re)formation of organizations, actor-network theory is in embryo. Having now presented four empirical analyses of how the EPR forms part of a change in organizational practices in the medical ward, I shall discuss what kind of broader patterns that arise from this reorganization.

I shall address these broader patterns by pointing to common features across and interconnections between the four analyses and by introducing the concept of *nodes of ordering*, which refers to the way in which some actants suddenly become temporary centers of organizing. I have pieced together the concept from two different and yet kindred theoretical concepts, namely John Law's notion of "modes-of-ordering" and Ernesto Laclau's "nodal points". Whereas Law's concept refers to the "recurring patterns embodied within, witnessed by, generated in and reproduced as part of the ordering of human and non-human relations" (Law 1994: 83) – i.e. competing or interacting overall narratives or prin-

ciples – Laclau's concept refers to the mechanism through which practices of articulation partially fixate meaning in a discourse[59].

By combining these two concepts I wish to point to the way certain actants are enacted in roles of connecting and distributing other actants in a way that produces overall patterns of activity or logics in a complicated and pulsating organizational network. These nodes of ordering are not to be seen as fixed centers of coordination as these are described by Suchman (1997), but rather as mediators of knotworking, i.e. as co-constitutive elements of short-termed, partially improvised orchestration of collaborative performance between otherwise loosely connected actors (Engeström et al. 1999). A node-of-ordering is something that ties the actions of many actants together in a manner where these actions come to produce certain overall effects. But the point is that the node is not necessarily designed to work this way, but come to work this way as many actants enroll in multiple programs simultaneously. As such it is a node that emerges as an organizing principle for dispersed activities.

However, it is necessary to distinguish the term from two other concepts that have been employed to explain how very different local activities are connected across time and space. The first is the notion of "immutable mobiles" coined by Latour (1986), who used it for explaining how historical changes in science like the Copernican revolution were made possible. It refers to types of representations that can convey information over a large distance without themselves changing (e.g. the printed forms that allowed multiple observations about the positions of stars in the sky from all over the world to be collected and combined and

[59] Laclau defines nodal points the following way: "Any discourse is constituted as an attempt to dominate the field of discursivity, to arrest the flow of difference, to construct a center. We will call the privileged discursive points of this partial fixation, nodal points" (Laclau & Mouffe 1985: 112). Andersen adds that the term is a translation of Lacan's "*point de capiton*" (Andersen 1999: 91). In a brief introduction to Lacan, Ross explain how the term relates to Lacan's psychoanalysis: "For Lacan the link between signifier and signified is so precarious that whereas Saussure saw the whole system as more or less grounded (though the possibility of slippage constituted his great contribution to twentieth century linguistics), Lacan sees only occasional points of stability. These points of stability is referred to as *points de caption*, or "quilting points". They are points "by which the signifier stops the otherwise endless movement (*glissement*) of the signification (Ecrits 303) to produce the necessary illusion of fixed meaning (Evans 149)". (Ross 2002)

together with a row of other things suddenly create a new picture of the universe with the sun at the center surrounded by the Earth and other planets). Although some nodes of ordering also act to circulate information in an extensive network, it is rather their role as meeting points between multiple and highly diverse actants that makes them nodes.

This makes it necessary to distinguish the term from another one, namely the concept of "boundary objects" coined by Star & Griesemer (1989) in order to describe how scientists can cooperate without agreeing about the nature of objects: "Boundary objects are those scientific objects which both inhabit several communities of practice and satisfy the informational requirements of each of them. Boundary objects are thus objects, which are both plastic enough to adapt to local needs and constraints of the several parties employing them, yet robust enough to maintain a common identity across sites. They are weakly structured in common use, and become strongly structured in individual-site use"(Star 1994: 26). A node-of-ordering is also enrolled in highly different programs, but in contrast to a boundary object, which allows the local programs to stay untouched, the node-of-ordering confronts the local programs with each other and creates new effects. Combined with effects of other nodes of ordering these effects form the organization as a network with special characteristics. In this respect, the organization can be viewed as regularity in dispersion[60] (Foucault 1972).

Throughout the following pages, I shall point to actants (humans and non-humans) that have come to work as specific nodes of ordering in the medical ward – the way they come to play such roles, and the general effects, or regularities, that arises from these dispersed nodes of ordering. First, I shall discuss how interaction among the staff is increasingly mediated through writing. Second, I point out how four nodes of ordering are pivotal elements in an intensified coordination of a few selected aspects. Third, I discuss how medical practice seems to be enacted as an increasingly scientific discipline and how the roles of nurses, secretaries, and physicians concurrently become roles of monitoring, ar-

[60] This concept is coupled to Foucault's notion of a discursive formation. Although my focus is on small-scale networks rather than comprehensive, societal formations, I nevertheless think that important characteristics of an organization are also emerging as regularities in dispersed nodes of ordering.

ranging, and personifying the scientific medical practice – roles with inherent dilemmas regarding for example the allocation of time and awareness. Finally, I argue that errors in the sense of unwanted and harmful outcomes of medical practice have not been radically diminished, but have been redistributed.

Written interaction

All four empirical analyses tell how the work of the ward staff is progressively mediated and connected through writing: in relation to physician notes more people from different occupational groups than earlier are actively involved in building a textual universe around the patient-as-a-case. Regarding the reporting and updating routines of nurses there is a move toward more writing and reading and less oral, face-to-face communication. In relation to the medication process schemes and databases are progressively serving pivotal roles; and as for the distribution of test results much face-to-face exchange is gradually being replaced by individual checking in the electronic system or in paper documents.

The consequences of this increasing written interaction seem to point in several directions. In the following, I shall address these and put them into perspective by introducing theoretical voices on the subject of oral versus written communication.

Explicating the work and the patient

For a long time, medical work has entailed recordings of the patient and his or her medical history. Thus, Berg and Harterink have argued that the emergence of a patient-centered paper record – and the subsequent, slow move from leather bound ledgers to vertically stored loose files – formed a central part of the general *dispotif* through which scientific medicine and the patient as a modern individual was performed (Berg & Harterink, forthcoming). Entailed in this historical process was a movement from records kept by the physician to records kept by the hospital.

This was accompanied by the establishment of medical record officials, who, inspired by scientific management, were occupied with ensuring a proper filling in of the record; development of preformatted forms that should be filled out in relation to different examinations; and a whole array of new visualizing technologies like X-ray and endoscopes. Recently – compared to the history of the medical record – nurses have joined this bookkeeping practice mainly in order to document their work activities. Thus, for about the last three decades nurses have kept parallel recordings of the nursing-aspects of the patient.

With EPRs the basic structures and features of these various recordings continue. However, the access to and production process of the recordings have changed: a) the electronic patient record can be accessed and modified instantly and; b) notes and digits are progressively being entered using keyboards (as opposed to pencils) through pre-structured interfaces. Various effects seem to arise from these altered features:

Dispersion of recording routines

A note can be made as soon as a computer is available and is directly recorded in the central database, which in turn links the new entering to all other enterings. Shosana Zuboff has termed this double feature of electronic texts a "simultaneous centralization and decentralization", which means that electronic texts can infuse an entire organization, instead of being bundled in discrete objects like folders or pieces of paper (Zuboff 1988: 180). In relation to the EPR, the simultaneous centralization and decentralization makes it easier for the staff to access electronic documents, and in this context their writing and reading activities tend to be redistributed. First, recordings are made across the entire workday rather than concentrated on delimited moments. Thus, recording becomes a more integral part of the work. Second, the order of verbal and written communication changes: earlier, when a staff member has made a decision he or she notified others verbally and made a written note later; whereas now, it is custom to fill in a written note right after having made the decision and then inform others verbally, often with reference to the note. The question is how this reversal of order affects the overall communication pattern among the staff? Let me begin an answer by focusing on the micro-mechanics of writing on computers.

Editing and objectifying words and significance

When the keyboard and screen displace the dictaphone, the paper, and the pencil, the process of formulating a note becomes one of writing in a special format *and* of doing word-processing. In literature, the development of written communication has been much discussed (cf. Zuboff 1988, Goody 1977, 1987). Some widely accepted points are that by adding a visual-spatial dimension to the audio-temporal dimensions of oral language, written communication facilitated historically new intellectual capacities such as formal reasoning and scientific investigation (Goody 1987). Likewise, the register of written communication tends to differ from the oral by: "1) the greater use of abstract terms, 2) the greater choice of words, 3) the less personalized (and hence contextualized) usage, 4) the greater explicitness, 5) the greater elaboration (syntactical), 6) the greater formality, and 7) the greater reliance on dead language[61]" (Goody 1987, p. 264). These characteristics apply also to a majority of written notes in the EPR compared to the oral exchange, which seems much more characterized by the use of personal pronouns, doubt, questioning, and indetermination. Some argues that dominance of written or visual information means a simplification of the information exchange among practitioners detrimental to a balanced professional practice, as many of the particularities that are important for reflecting upon and accomplishing a task cannot be sufficiently expressed in standardized information technologies (Olesen 1997) – an argument that concerns the loss of granularity and polysemantics in (technologically mediated) writing.

On the other hand, others have argued that we should be careful to judge from the outside whether something is a simplification because even a very short note can contain much significance for the skilled reader (Heath & Luff 2000). Anyhow, what seems to be one clear-cut difference between oral and written communication is the fact that a written statement cannot be immediately disputed in the face of the enunciator. The statement, therefore, may get a more fixed and indispu-

[61] By 'dead language' Goody refers to language that are "used for written transactions alone, entailing a complete separation of the spoken and the written at a linguistic level" (Goody 1987: 20). In the EPR words like "urine ++" and "recipa" are figures that I never heard in speech.

table status and encourage a feeling of closure or finality in the reader (Ong 1988) or, one can say, it takes on the shape of a statement rather than a proposition (Latour forthcoming).

The introduction of EPRs, however, does not only affords a shift from orality to writing but also from writing on paper to writing in an electronic system. Handwriting is close to drawing[62]: the pen is an extension of the body and the hand's movement is personal with specific style and rhythm. This makes it easy to recognize the author, but sometimes also hard to read. The hand may hide parts of the paper and make it difficult to adjust the length of words to the space of the paper. Often it is not possible to edit or delete what was written without leaving traces thereof, i.e. crossing or overwriting the written. In contrast, entering notes by keyboard divides the gaze and the movements of the fingers. When punching the keys, signs emerge in a physical separate space, which are often experienced as a more distant, more estranged domain. The statements seem to be rendered "more objective" because they get the form of a printed and, hence, approved text. Sentences are automatically divided to fit the designated space and words can be removed or edited by the delete-key. Thus, despite of (or maybe because of) the objective status words get on a screen, this feature invites the reader to scrutinize the written, and to change or add phrases – it encourages *editing and processing* of the words (e.g. when physicians enter notes themselves they critically examine the text and, often, the text becomes shorter and less redundant; whereas, paradoxically, nurses' writings tend to become more elaborate and scientifically flavored).

Yet one feature distinguishes the making of notes in the EPR from writing in hand or dictating notes. This regards the recipients of notes. As earlier, many people may read a note and, hence, it cannot be formulated to a specific addressee. But with the EPR-system the number of potential readers multiplies and consequently the number of different

[62] In the comparison of pen and keyboard one can easily come to describe the first with terms, which hold connotations of warmth and humanness, and the latter in more machinist terms suggesting that it is a "colder" more alienating technology. I do not support such a priori categorization of old versus new technologies: both technologies can come to enact restricted as well as open-ended programs. What I am interested in the present case is to distinguish what kind of specific relationship the form with humans and a variety of other actants.

programs into which the note can be enrolled. Will the note be employed to increase knowledge about the patient and the organizational arrangements? Will it work as an informer of proper or wrong handling of a task? Or will it not be employed at all but be left unnoticed? The radicalization of the reader-anonymity introduces new kinds of risks or considerations for the writer. Authors are, therefore, often more careful with their enterings: some try to be as succinct as possible, others to give their wordings a more scientific touch, and others try to hint at a certain interpretation of the written between the lines. In sum, the very shift to electronic media contributes to the enactment of a recording process characterized by more editing and presentation of the matter in distinctive ways, which at the same time appears as more objective and uncontrollable; writings in the EPR become simultaneously more edited and detached than writings on paper.

Standardization and narrowing of content

Notes are not entered into a limitless electronic universe, but punched in through pre-designed interfaces. And this affects the "authoring" too. The space for writing is preformatted and often a note cannot be made without specifying its status or its membership of a specific category (e.g. the nurse has to choose whether her note is a "problem", an "action", or an "evaluation"). Moreover, codes are automatically attached so that the entry time and personal initial appears next to the note. Also, earlier, Kardex, medicine cards, and physician notes had features that explicitly or implicitly structured the writing, but with the EPR, the pattern-fitting or form-filling element of writing becomes more pronounced. Nursing notes, for example, are made to fit a tripartite problem-oriented structure and medicine prescriptions are made conform to sales product categories. Although it is still possible to enter physician notes quite freely, they enter into a network of documents, which has a strictly standardized opening page and fixed file-tree structure. By these features the writing process moves from being loosely structured to being more constricted or piloted.

The question is what this does to the content of the recordings and to the 'authoring'? Consulting literature that has addressed similar or closely related issues can inspire an answer to this question. Analyzing historical and contemporary cases of classification systems, Bowker &

Star argue that classification systems (such as the International Classification of Diseases, ICD, which is also the one used for coding diagnoses in the EPR-system in Svendborg) embody cultural values, act as historically developing infrastructures across large-scale collaborative networks, and entail endemic tensions between attempts at universal standardization and local circumstances of using them (Bowker & Star 1999). Goody has addressed the grapho-linguistic aspects of writing, which he considers as techniques for cognitive operations. First, there is the separated word, letter, or number. Second, there is the list – a single column or a row of, for example, linguistic or numerical entries. Third, there is the table and the closely related matrix. All these layouts differ from the spoken discourse by abstracting linguistic items from the sentences – thereby decontextualizing them (Goody 1987, p. 274). In the EPR all the above structuring devices are at work side by side or one at a time. Drawing up an EPR involves for instance entering single numbers such as diagnosis codes, making a list of earlier hospitalizations, and filling out tables of medical information (cave, reason for referral etc.). What is more, many of these grapho-linguistic features are further structured by the fact that they can only be filled out by choosing among a list of ready-made concepts or sentences (e.g. prescribing a drug entails selecting one of various indications). Only the dialog boxes for entering physician notes, "other" nursing notes, and notes on the patient-list offer the possibility of entering text freely, but here unwritten rules regulate how the notes should be structured, what kind of semantics that can be employed and how long the text can be. As already mentioned Goody posits that features like the above standards and structuring principles in the EPR contributes to enacting not only scientific reasoning, but also bureaucratic administration[63]. But he also stresses that lists and categories tend to be exclusive and set aside the flexibility of oral language, "which has a greater toleration of ambiguity and anomaly. He continues:

> "…the very absence of such toleration may raise interesting questions in the mind (and in the pen) of the person forced to choose between

[63] The significance of lists for the emergence of modern science and political hegemonies has also been addressed by for instance Foucault (1974).

> placing an item in one box rather than another. As is the case with other written procedures, the notion of 'contradiction' is sharpened" (Goody 1987: 275).

Bowker and Star discuss a similar problem in the case of filling out forms. Here, one often faces the problem that when having to choose among a list of possibilities none of the categories seem perfectly suitable. Sometimes a residual category is offered (e.g. "other"), which then becomes the only way to evade the violence of being forced into a classificatory straitjacket (Bowker & Star 1999). Yet, there is also a less dramatic way to handle this dilemma, which is often used at the medical ward: filling out a space in a dialog box by choosing the least improper category or simply skipping it. But of course this solution is only undramatic to the extent that it is not viewed from the eyes of a patient having to live with a diagnosis of for instance having a "depression", or with the lack of official information about sensations of strong pains. On the other hand, physicians and nurses often enter notes in a way that try to work around the rigid boundaries of the EPR-documents and, hence, the risk of making a too crude statement. One of these ways is to comment and supplement notes in one place of the EPR by entering notes other places in the EPR. Nevertheless, it seems apt to conclude that the replacement of dictaphone, pen and paper by screen, keyboard and preformatted interfaces moves the writing routines in the ward toward a more standardized, narrower defined recording practice. In this new network the authors are kept in tighter reins, and have to think up alternative ways and places to write what they find important.

Mixture of genres

Working around the formats and categories of the EPR-pages can also be a way to enact different and sometimes conflicting projects of communication in the altered network of technology, people, and semantics. Yates & Orlikowski have offered the concept of "genres of organizational communication", which seems useful for discussing this aspect. A genre of organizational communication is a "recognized type of communication (e.g. letters, memoranda, or meetings) characterized by structural, linguistic, and substantive conventions" (Yates & Orlikowski 1992: 300). Focusing on genres makes it possible to discuss the characteristics

and changes in types of organizational communication without confining this to specific media. In the medical ward, the EPR seems to be part of several genres of organizational communication. One genre is the *bulletin board*, i.e. a space for posting and becoming aware of news and information. Often, the EPR's patient-list works like such a display for messages and announcements about the patients; performing a sub genre side by side with other bulletin board actants such as notice boards in the office and the hallway, yellow Post It notes stuck on surfaces, labels and signs next to equipment and food, and pause screen messages. Another genre is the *"logbook*"; i.e. a continuous recording of the work carried out, primarily for the sake of documenting that standards for medical treatment and nursing are complied with and the appropriate work is being done (e.g. in case of complaints) – a kind of defensive recording practice. Many of the documents of the EPR hold notes that perform this genre: e.g. physician notes, nursing notes, the medicine scheme. A third genre is the *form* that works as qualification for the execution of other programs (e.g. the administration of a drug, or the transport of a patient to the X-ray department). Nearly all documents in the EPR hold statements that work this way. A fourth genre is the *card file*. This is the basic, bureaucratic building block that lists statements of something in a certain order, thereby defining it and making it possible to file and retrieve it. The front page of the EPR is almost archetypal of this genre, listing the patient's name and address, social security number, history of hospitalization, etc. A fifth genre is the *census*, i.e. a count of something, often for the sake of comparing it to other numbers or to take stock of a situation. The dosages and strengths of drugs on the medicine card, the laboratory figures with biochemical profile of blood tests, etc., and the diagnosis codes of diseases and nursing interventions all work to enact this genre. A sixth genre is the *memo*, which is an internal correspondence note (Yates & Orlikowski 1992). Especially the nursing notes and the patient-list hold statements that enact this genre, often in a collective mode with no explicit addressee.

As mentioned these genres are not confined to the EPR, rather they are enacted through networks of textual artifacts that supplement or replace the various elements of the EPR. The census-genre for instance also comprises counts of work hours on formal reporting schemes, tables of blood sugar levels for diabetes patients, orders to the kitchen about

diets, etc. Through the genres' broader organizational tasks are performed such as curing and caring patients, controlling and budgeting for the flow of resources, doing research in and development of specific issues, and responding on various kinds of requests such as official inquiries and patient complaints. And yet, at the moment when a note is entered in the EPR, the author may not have these programs fully lined up. Often, time, fatigue, and the mere imperative to fill out empty spaces affect the authoring process too. Accordingly, many of the broader organizational programs are more to be seen as the end products of the enterings in the EPR rather than the starting points.

Another aspect is that often the single statement feed into more genres at a time – with or without the author's knowledge – a point I shall soon elaborate. Earlier, the Kardex, the patient record, and the medicine card also performed more genres at a time. However, by the introduction of EPRs, the genres become more strongly interwoven and co-constructive. Drawing up a nursing problem entails for example both the entering of a nursing diagnosis (thereby enabling the census-genre), a problem-definition (feeding into the logbook-genre) and the formulation of some notes (that usually enact the memo-genre and the logbook-genre). But these co-existing genres might influence each other to a great extent. The census-genre can for instance work to reinforce the memo as a very (or less) important statement. And it works the opposite way too: before a note is entered, the author often skims other elements of the textual universe. The note is then formulated in relation to these parts – elaborating, commenting, modifying, or closing threads of discourse, weaving back and forth between genres. Writing a note is not only a matter of communication but also one of adding to networks of significance in a special way. Since new kinds of readers such as other occupational groups and the management can access the EPR, the notes may be enrolled in more networks and feed into more programs than before. The authoring programs, therefore, grow more complicated: notes are written in order to document activities, inform colleagues on coming duties about state of affairs, demonstrate accountability if complications should arise later on, and showing conscientiousness or status. These different and often mixed authoring strategies, combined with the growing probability that a note will be read in another way or as another genre than the originally intended, contribute to make writing a more complicated

matter. Co-existing genres were also part of the paper-based record, but since the EPR multiplies the numbers of readers and writers, and as it invites rapid comparison of documents, the genres become more radically interwoven.

However, although it can be difficult for the author to know exactly how his or her note will be read, it is not so that the note has no influence on the reader. The written form interacts with the reader's memory in a different way than words by mouth do. In the words of Goody:

> "Writing not only affects the type of recall but the ability to recall; the alphabet makes possible a powerful form of classification in crystallizing the possibilities of auditory ordering. So too the list, which increases the visibility and definiteness of classes, makes it easier for the individual to engage in chunking, and more particularly in the hierarchical ordering of information which is critical to much recall" (Goody 1977: 111).

Viewed in this light, the tendency to replace oral information with written or to let the first follow the latter is not simply a relocation of the same information. Rather, it works to perform certain types of recall and in effect, framings of the patients. What about the earlier question of how the reversal of communicative order affects the relations among the staff (first writing about the patient, then talking about him or her – or first reading then talking)? Against this backdrop, it seems most probable that the features of the EPR and the new forms of organizational communication it occasions, which tend to make written statements quite edited and framed, also to some degree will work to structure and filter the content of later face-to-face communication among staff. I will, however, have to present more arguments to substantiate and elaborate this statement.

Linking texts and people

Whereas some studies exist of the history of recording devices and practices in medicine (Foucault 1963/2000, Garfinkel 1967, Berg & Bowker 1997, Berg & Harterink forthcoming), there are only a few texts on the

way recordings are actually employed in medical decision-making (Heath & Luff 2000 and Berg 1999 as some of the few exceptions) or in relation to ward rounds. Although my own study is not centered specifically upon these issues, it is focused on the way reading form part of the duties of physician and nurses. The four empirical chapters all describe how physical circumstances and the process of reading patient records have changed by the introduction of EPRs: a) the reading is simultaneously more open-ended and more "moored" to office computers; and b) reading does increasingly cross genres and demarcation lines between occupations.

Simultaneously opening and "mooring" the reading

The introduction of EPRs changes the access to written information about the patient in a paradoxical manner. On the one side, it opens the way for more people to more documents. On the other side, it confines the reading process to specific places and spaces. Let me elaborate these aspects.

One obvious thing that related to the opening aspect is that now, all staff can read the patient records simultaneously. They only need a password and a vacant computer. Previously, in contrast, the various documents existed only in single copies that could be hard to procure. Moreover, it often took a legitimate motive to look in them. Now, physician, nurses, and other occupational groups read much more in "own" notes and in the notes of other occupational groups. The nurses in particular are much more familiar with the physicians' writings than before, and slowly, physicians have begun to read more in nursing notes as well. In general, the interconnected structure of the EPR invites less restricted, less determined ways of browsing documents because previously separated documents are linked together by the file-tree structure, patient records are linked by the patient-list structure (or can be procured instantly by the search-function), and wards are linked by general tab-structure. During a reading process the reader might for example jump from reading about one patient's medicine, via browsing the medical history of the patient, to looking up a former patient with similar diagnosis or checking whether new test results have arrived – the combinations are infinite. Thus, reading about the patient becomes more similar to surfing the Internet than leafing through a book. However, the basic hypertext-

composition principle where the author has linked text elements to other texts (Schwebs 1994) is absent. In contrast, the documents of the EPR are linked via the file-tree, which lists classes and subclasses of documents and the latest entry dates. This file-tree works as a navigation tool and source of inspiration to information search. Thus, the reader is offered a more autonomous position in his or her route through the documents, as there is no prescribed order of texts and no restriction of access except from unwritten ethics.

Whereas the Kardex, the paper-based medical record, and the medicine card all enacted slices or domains of the patient-as-a-case, the EPR enacts a more comprehensive version of the patient. Moreover, it enacts the organization as a multiplicity (a notion borrowed from Lanestedt 1994). In seconds, the reader can shift from highly specific issues such as a rise in a patient's temperature to the number of occupied beds in a neighboring ward; and enterings from nurses, physiotherapists, physicians, laboratory technicians and secretaries located far and near in the building connect and grow patterns of organizational activity that the reader can add to or reflect upon. Zuboff describes this multiple and interconnected character of information system documents in the companies she studied:

> "…the electronic text of an organization…is not discrete but comprehensive and systemic. It is a question, not of individual events converted to text, but of systems of events that are revealed comprehensively…. Thus, access to the electronic text meant access to far more than discrete memos or reports could ever provide: the organization's work is made visible in a new way" (Zuboff 1988: 179).

She also points to the way texts in information systems appears to the reader:

> "…the electronic text does not have an author in the conventional sense. It may be produced from many individual acts of "authorship"… or it may result from impersonal an autonomous processes…. The text that is produced can be more immediate and raw…. The impersonality and obscurity of authorship can elicit a sense of otherness in the reader. The text can seem more definitive and less vulnerable to

> criticism than a written document whose authorship is clear" (ibid.: 180).

The documents in the EPR fit this description to some extent. Here, the authorship is often blurred or invisible (e.g. as in the front page data), which can make the entering appear more objective; and the way data are entered (as classification codes and in preformatted tables) works to enhance a scientific character and objectiveness of the information. In this respect the reader meets the finished and coherent result of a fuzzy and sometimes conflict-ridden writing process not unlike the Janus-face of scientific practice as described by Latour (Latour 1987).

However, it is not necessarily so that the staff as readers accept such notes more readily than when the author is known. Often, the staff read notes with a fair share of skepticism due to daily examples of miswriting and mix-ups, and it is customary to double-check a statement comparing it with other documents. Moreover, signed documents often invite a meta-level reading, i.e. the written is interpreted in the light of the author's reputation, and this sometimes gives rise to a whole new kind of reading, the monitoring of colleagues, as I shall later discuss in greater detail. In effect, the new access to interconnected texts enables readers to become more informed writers too: reading often precedes writing, and the written refer to and comment upon existing notes.

However, as hinted there are also aspects of the work with EPRs that confine the reading process. First and foremost, the EPR has to be read on computer screens in the offices, which means that it cannot, for instance, be brought to the patient's bed and it cannot be spread out on a table in order to compare documents. Many of the physicians complain that this physical limitation affects their work in a negative way: they have to prepare themselves much more thoroughly before meeting the patient, and in general decisions cannot be made "on the spot", but entails a great deal of traffic between the office and the patient's bed. What is more, they feel that the impossibility of viewing more documents at the same time makes it harder to infer medical diagnoses or interventions across documents. A related phenomena has been observed by Heath & Luff, who writes:

> "By separating an entry into two files… doctors are no longer able to interweave information that would ordinarily be defeased across the two classes within a particular entry" (Heath & Luff 2000: 45).

However, the possibilities of inferring across documents are not necessarily as hampered as this quote suggests. Just as there are ways to work around the limitations of the EPR when phenomena have to be categorized, there are ways to work around the stubbornness of the screen. First, it is not all information that is in the computer: the record-cover holds additional information (e.g. X-ray pictures, cardiograms, hospitalization referrals), which can be taken out and read together with the screen document. Second, it is customary to make a print of the patient-list (that holds key words about patients on the ward). This list is often used in ward rounds, etc., as a memory aid and as a notepad – i.e. as a mediator between the documents moored in the office and the patient as a "customer" and an informant. The limits introduced by the reorganization of reading zones and physical space is to some extent mitigated by the cultivation of new movable artifacts.

Although the physician's reading and analyzing is more dispersed across time and place – and more time-uneconomical from his point of view– there is yet another feature that must be considered. This concerns the reorganization of space in the ward office. Most computers are placed in the ward offices and the staff has to go there to work with documents about the patient. Although the office has always been a meeting place for the staff, the co-location of readers and writers change the way people meet. Often, more people work simultaneously at the same document and may talk about it while reading or writing. Also, people group around the document on one screen and discuss the case while reading it (e.g. when preparing the ward round nurses and physicians often sit together or with each their computer, reviving and discussing the case together). Borrowing expressions from Tellioglu and Wagner (2001), the former *regionalization* of office space in zones of physicians' activities, zones of nurses' activities, and interactive zones where knowledge was pooled to solve complex problems, is replaced by a more seamless space, where staff together or side by side work with shared (i.e. visible, accessible, and interdependent) artifacts. The co-location of activities makes these activities available to each other's pe-

ripheral awareness, and if something catches the attention, it is possible to become co-located in digital space within seconds, in order to know about the case and perhaps make an alternative reading. In sum, reading and writing documents become more collective, negotiated, and co-constructive activities: the individualized, centered reading of the paper-based patient record data is replaced by a more collective and distributed practice, in which persons shift between reader and writer positions that constitute and intermingle with each other.

Crossing genres and demarcation lines

As mentioned, the staff is now reading more about the patients in other occupational groups' documents and in documents of other organizational units – the nurses in particular read much more in the physician notes than before the introduction of EPRs. One can say, that now the distribution of information evens up across occupational domains, or rather, that *medical* information is distributed more evenly. In effect, more persons feel better updated on the patients they deal with. Quite a few read about cases for which they are not responsible, but which they, for some reason, find interesting. This insight into a case often works as a legitimate reason to take part in discussions about the case (as for instance when a physician recommends medical interventions carried out by a colleague or suggests an alternative interpretation of an unclear case). Sometimes, this "curious reading" moves into a gray area, where it is debatable if the reader has a sufficiently legitimate motive for reading in the documents. It has, however, been difficult for the hospital management to design control mechanisms in order to prevent illegitimate readers without at the same time eliminating the possibilities of mutual learning as well as coping with situations where cases suddenly have to shift hands because of sickness, etc.

However, the easier access to documents invites also another kind of reading, which goes beyond mere learning and reasoning about patients and state of affairs. This reading concerns the organizational procedures and routines around the case, where the reader *checks* whether colleagues have entered the appropriate amount and quality of information and how they frame the patient-as-a-case: has the case been properly drawn up? Is information consistent across documents? Have errors been corrected? Thus, the easier access to documents also invites

monitoring each other's actions and framing of the cases. Sometimes, monitoring may even take the shape of supervision or surveillance, where the information in the EPR works as an occasion to comment, criticize, or even tell tales on the enterings of others. If something is wrong or inappropriate the reader often makes a comment to the responsible, no matter whether he or she is a fellow-worker or a colleague from another occupation. Thus, the increased interaction through written statements also seems to perform a whole new program of mutual monitoring and regulation – thereby changing also the organizational milieu in which new enterings are made. This phenomenon seems to be not simply a moral issue – e.g. suggesting that the staff of the medical wards is particularly inquisitive or officious. Consulting Goody again, the very change from oral to written communication enables the emergence of new kinds of relationships:

> "By making it possible to scan the communications of mankind over a much wider time span, literacy encouraged, at the very same time, criticism and commentary on the one hand and the orthodoxy of the book on the other." (Goody 1977: 37).

Furthermore, Goody argues, this criticism does not arise simply because it becomes possible to connect to a wider range of alternative statements and thus throw light and shade onto a specific issue; it is rather that:

> "…the form in which the alternatives is presented makes one aware of the differences, forces one to consider contradiction, makes one conscious of the 'rules' of argument, forces one to develop such 'logic'. And the form is determined by the literacy or written mode" (ibid.: 44).

Adding to these generative elements of the written mode is the fact that a multiplicity of documents is within reach of the readers. It is possible to scrutinize not only the internal logic of a document, but to juxtapose cases, count instances of specific events, analyze the voices of particular authors etc. And the circle of readers does not limit to staff in the medical ward and the patients. Also hospital management and researchers can access the textual universe of the EPR in order to make calculations of

organizational performance and study relationships between categories (cf. Yates 1989 for a study of how company management historically has controlled the operations of the organization through communication systems).

In the vast and ramified network of potential readers, notes can be employed to support completely different projects than the original. A note made originally as a message in a bulletin board genre to inform others about something, may later be read as a "logbook" note – i.e. as a 'fact' that can be compiled with other 'facts' and entered into statistics supporting one or the other political program of mobilizing or downsizing activities. Also, when other persons read the note, it can take on other degrees of uniformity and fixity than it had when it was made. A statement can be read as a proposition; and oppositely, a proposition – a tentative suggestion – can suddenly be read as a positive finding; reading is an active construction of meaning and not a passive decoding of content (Rosenblatt 1994, Gourlay 2001). A reading does not only cut and bend the written, but also construct linkages between isolated elements and develop new ways to understand the organizational activities and the patient-as-a-case. This generative or "informating" aspect of electronic textualization was one of the core contributions from Zuboff's study of information systems in companies:

> "Textualization can also be the occasion for the construction of new meaning…when meaning is uncoupled from its action context and carried away in symbols, a new playfulness becomes possible…[this is the] liberating aspects of symbolization" (Zuboff 1988: 180-181).

This generative aspect applies to reading processes in the medical ward. Browsing the electronic text-universe, hospital activities and patient aspects become visible in a way that may produce whole new types of ideas and projects (e.g. surfing through the documents on hospitalized geriatric patients the idea may arise that the handling of such patients could be organized better at one's own ward).

A striking feature of the EPR-system is that the vast textual universe and the radical expansion of the circle of readers makes it hard to follow the destinies of notes as they are linked with each other and with all kinds of political discourses. Ultimately, the couplings of texts and peo-

ple ramified by the introduction of EPRs complicate and blur the demarcation lines between writer and reader-positions, between occupational domains, and between areas of responsibility.

More coordination of less

Texts and rooms as nodes of ordering

The medical ward never sleeps or rests. Patients enter and leave, staff members come and go, and things have to be done 24 hours a day. Notably, there is no center of coordination, but a multitude of interrelated people and artifacts that work to carry out things across time and space.

Reading and writing about the patients and organizational arrangements intensify as staff can instantly access most documents about the patient. Information that was earlier exchanged by word of mouth is increasingly exchanged through texts. Thus, people are increasingly connected through the computer system in the offices. However, this does not mean that verbal interaction has no significance. First, many work tasks are accomplished in settings without computers, e.g. at patients' beds, in hallways, in flushing rooms, in depots, etc. Here, the staff talks with each other and with the patients. Second, the staff meets and works in the office in a slightly new way because physical and textual space is reorganized by the introduction of computers: increasingly, they talk about the contents of texts, about statuses of texts, about procedures of engaging with texts. Accordingly, perhaps it is not very correct to say that written interaction is replacing face-to-face interaction; the EPR also occasions new forms of verbal relations such as the collaborative reading of documents.

Yet it is striking that the new interaction patterns emerge through the reorganization of textual and physical space. In this reorganization, new nodes of ordering emerge, which supplement or replace old nodes. Five nodes seem to be particularly important as they connect a wide range of diverse actors and programs in and across time: the offices, the physician notes, the medicine cards and the patient-lists, and the Edifact-list.

In the following section, I will zoom in on these five nodes and discuss what kinds of ordering are enacted.

A) The physician notes hold information about the patient's course of disease and the medical interventions carried out. First and foremost they form a juridical document, but it is progressively being enacted as more than that. Nearly all the staff read in it as a regular part of their duty; they read it to encircle the patient-as-a-case, to determine the tasks to be carried out, to update themselves on the stage of the patient trajectory. The statements of the physician notes circulate in the verbal and written communication in the ward: they flow into nursing reports, into nursing diagnosis, into the patient-list, into discussions at the office, into appointments with other organizational units, and into conversations with the patient – co-constituting daily practices. And from these practices they return to the record as a new, accumulated, and negotiated version. As such the physician notes feed into what they merely seem to represent, playing an active part in the constitution of the patient's body and the hospital as an organization (Berg & Bowker 1997), divides the work, and coordinate the results of distributed practices (Berg 1999, Berg & Harterink forthcoming). Whereas the physician notes of the paper-based record also participated in the ordering of activities around the patients, the electronic physician notes become much more radically involved as *nodes* of ordering. Not only do they accumulate statements and work to structure the physicians' work with the patient; they also become part of new networks, whose actants connect to their statements. In this respect, they come to serve as nodes between hitherto separated or loosely coupled networks, nodes through which patients, tasks, and working relations become ordered as *medical* projects.

B) The patient-list holds key words about the patients on the ward. Originally it was not part of the EPR, but the staff asked for it as they were used to having some sort of list about the patients they could pull out during their duty. Knowing about patients and organizational arrangements are increasingly produced through writing, and most documents are tied to stationary computers, therefore the patient-list has emerged as a way to link between the textual universe of the EPR and the ever-changing settings of daily practice. It allows compromises to be made between vast but physically "adscripted" quantities of written informa-

tion and human short-term memory: nurses and physicians employ the patient-list as a memory-aid, a condensation of the patient-as-a-case; and as a scratch pad that makes short-hand documentation of practice possible without breaking the flow of work. The patient-list works to produce an overview of organizational tasks, which enables and structures on-the-spot negotiations among staff about the division of work and the order of things. However, the patient-list is a loaded artifact and topics enter in a prioritized order: medical information is given precedence, and other types of information are not entered until the patient is no longer a medically dramatic case. Thus, the patient-list becomes a significant ordering device that allows staff to work around rigid structures and conflicting programs in a way that still brings the medical program to the front.

C) The medicine card accumulates data about the patient's drugs and allows these data to be printed on cards. It replaces hand-copied rows of medicine documents with one accessible and transportable document that connects medical decisions to the work of nurses, medicine cabinets, pillboxes, and patients. However, as a node of ordering it is less potent than the two above-mentioned, as it competes with the physician notes about being the leading document. Moreover, the medicine card is structured around specific categories of medicine that do not necessarily fit the categories of the ward. Consequently, the medicine-card orders activities in the ward in a way that calls for additional work. Staff has to compare documents to determine the status of a prescription and to look up alternative forms of medicine if a drug is not procurable. But it has to be remembered that earlier, there were less potent artifacts – the hand-written notes on the back page of the paper record, the drug list of Kardex, and the hand written card in the pillbox. These artifacts were connected only through the nurses, who transcribed information from one artifact to the other. Only after this distribution was performed the artifacts became connected to other actors such as physicians', nurses', and patients'. In contrast, the electronic medicine scheme connects simultaneously to many different actors, who align their activities according to the information in it or they revise it. Thus, one can perhaps talk of shift in node of ordering regarding the medication of patients: from the nurses to the electronic medicine scheme.

D) The office is the "haunt" of the staff and a collaborative workspace. It has always been, but the introduction of computers reconfigures office space as a shared physical and informational zone, an agora, rather than being divided into invisible yet distinct occupational and individual zones. In the office the patient-as-a-case is co-constructed by nurses, secretaries, physicians, aides, patient records, x-ray pictures, and the phone as a link to the world outside the ward. Many interactions between staff is mediated and structured through the EPR, but in the office the crude semantic categories of the electronic documents are redebated and connected to fuzzy notions, questions, and organizational contingencies. Through conversations – brief or longer – the compact medical logic of the EPR-documents is simultaneously coordinated, supplemented, and problematized. In this way, the office works as a node-of-ordering, which strengthens the medical program by coordinating the activities of actors and actants more tightly, at the same time as it modifies the program by facilitating the articulation of other programs too.

E) *The Edifact-list* is the list, where all new test results enter. It is important to check new results quickly, since they will often suggest what should be done next to the patient's situation. When a new result enters, it is simultaneously send to the specific EPR, but since it is laborious to check regularly in all patient records, the Edifact-list has come to work as a bulletin board for urgent cases. Physicians, nurses, and secretaries check regularly in the Edifact-list, and work is defined and aligned in order to its rhythm. In this way, the Edifact-list has come to act as a node of ordering, which produces a certain temporality of the ward. Earlier, the internal mail system worked as a node-of-ordering, which divided the workday in large chunks – before and after the delivery of mail. Now, the Edifact-list work to produce a temporality characterized by a more diffuse division of the workday and by sudden ruptures because new results can arrive at any moment. This new temporality introduces new trade-offs for the staff members and in particular for the physicians: should they check often in order to be able to react quickly on new information, or should they continue the old routine of checking less often and work through patient cases in succession?

Nodes of ordering as distributed centers

The five nodes of ordering are not similar in terms of scale and in terms of the ordering they enact, and yet they share certain characteristics. First of all, they tie multiple actors and actants together and thus form small centers of relations. However, they cannot simply be understood as coordinators, at least not if coordination implies the existence of an overall plan or program that the node-of-ordering is enrolled in to help realize and that actively compel other actors to align with each other. Rather, the nodes of ordering have emerged as "bottom-up" outcomes of multiple actors' activities and different programs. E.g. the office is not designed to perform the role of a coordinator of actors around the medical program; it becomes a node-of-ordering as computers are located here, and the staff for this and other reasons come here a lot. Accordingly, it does not enact one program but several competing programs. Likewise, the nodes of ordering are neither simply accumulators of statements or activity, although some of them also have these characteristics. Rather they are gates of access to activities of other actors in other networks, thereby connecting partial networks and making them more proximal.

It is perhaps appropriate to view the nodes of ordering as temporary entities that by linking a huge number of "small" actants come to enact larger programs and create organizational patterns. In this respect, a node-of-ordering is more ambiguous and open than a program, but more a constituent entity than a mediator.

Scientific and bureaucratic logics

These four nodes of ordering are of course not solely responsible for the construction and organization of work at the medical ward. Without the fine-meshed network of humans, rooms, tools, management imperatives, etc., they would never order anything. However, I find it striking how many activities of the ward in which one or more of these four actants are directly or indirectly involved. It seems to be the case that whenever things cannot be ordered through these nodes they are left to be ordered more randomly or coincidentally – e.g. in occasional conversations in the flushing room or in hallways about a patient's children or concern

for the future. The four nodes of ordering were also present before the introduction of EPRs. However, by computerization a radically larger number of actors connect to them, and hence they become more important. Increasingly more activities in the ward are mediated through them, which also means that activities increasingly center on and enact medical aspects. Often, nurses read physician notes before their own notes; the widely used patient-list prioritizes medical information; the medicine card aligns activities to carry out medical decisions faithfully; and conversations in the office are increasingly occasioned by and focused on medical aspects. In the reconfiguration of texts, spaces, and humans, work in the medical ward is being more profoundly coordinated, synchronized, and collaborative but only around medical aspects. Other aspects of the patient being hospitalized as for instance sociopsychological aspects are not supported. What is more, a special variant of the medical paradigm seems to be enacted: a variant that cultivates science and bureaucracy as obligatory passage points in the handling of sick patients.

This trend has to do with the written form and the preformatted nature of documents. Most documents are designed to hold short, unequivocal information in order to line up the patient as a bureaucratic file and a medical project. As verbal interaction is downplayed – or at least progressively focused on the content and status of documents – this restricted information comes to dominate much interaction between nurses, secretaries, and physicians. It may even dominate the conversations with patients. Thus, social relations become more strongly mediated by the categories and semantics of science and bureaucracy (and regularly these two authorities conflict in the flow of daily work as pointed out by Engeström 1993).

Latour have argued that humans are increasingly less dependent on social skills when interacting with each other, because a multitude of non-humans work to regulate and channel the interaction – contrary to baboons (Latour 1996). If this thesis is right, interactions between people in the medical ward become less dependent on "pure" social skills in the interrelations: the textual universe of signification, which delineates time, tasks, and success criteria for the interaction, circumscribes even face-to-face encounterings. Simultaneously, wider societal aspects are intricately connected to the coupling of human interaction and written communication. Thus, Goody states:

> "… the growth of bureaucracy clearly depends to a considerable degree upon the ability to control 'secondary group' relationships by means of written communication…writing affects not only (…) the occupational skills but also the nature of the bureaucratic role itself. The relation with both ruler and ruled becomes more impersonal. Involving greater appeal to abstract 'rules' listed in written code and leading to a clear-cut separation between official duties and personal concerns" (Goody 1977: 15-16).

Accordingly, the production of vast interrelated networks of written information and the increasing interaction through these networks makes the organizational processes and relations apt for the performance of bureaucratic logics and narrower occupational foci.

Recapitulating the role of information systems

The consequences of information systems have been widely analyzed and debated throughout the last decades. The opinions seem to be divided into those who argue that the diversity of ways of experiencing and communicating become limited by the introduction of electronic media (e.g. Raulet 1991), and those who argue that electronic media open up whole new and creative ways of relating to each to other (cf. literature on e-learning, e-business, and virtual organizations).

On the role of the EPR – or the *"dossier représentatif"* as they term it, Schneider & Wagner have explicitly taken the latter stance. Although they stress that a range of problems and dilemmas has to be solved when constructing a common, cross-disciplinary record system, Schneider & Wagner posit that the system will then support collaborative work. It will do this by enlarging and enriching the area of shared information, providing actors with an overview of information distributed over space and time (both in the sense of total control and of an integrated view), supporting the negotiation of norms and rules, facilitating the coordination of effort, and helping to establish a certain degree of discipline and rigor. Yet, Schneider and Wagner recognize that some of these positive effects are only possible to the extent that actors from different organi-

zational units engage in processes of negotiating and agreeing upon how to construct shared representations of 'reality' (Schneider & Wagner 1993: 248).

When looking at the work processes at the medical ward in Svendborg, the above expectations are confirmed to some extent. And yet it seems that Schneider & Wagner miss the second part of the consequences, namely that enhanced coordination and collaboration happens around a narrow set of elements: around the patient as a medical case. Only coincidentally and rarely, the collective efforts are concerned with the patient's broader life-world. Actually, the improved coordination and collaboration might even be the *result* of the narrower focus enacted in the new organizational configuration. Thus, the consequences seem to fall somewhere in between dystopian and optimistic points of view.

Also, it seems necessary to reconsider Schneider and Wagner's assumption that agreeing on shared representations of reality is the crux of the matter[64]. In particular if understood as a human-driven and deliberate process. During the construction process of the EPR in Svendborg, representatives of the occupational groups were involved in the formulation of specific requirements to the EPR-system. Likewise, joint meetings for all staff about the introduction of EPRs were predominantly devoted to information about and evaluation of the technical functionalities of the system. During the time I followed the work in the ward, there were no meetings or seminars where the routines and task definitions were taken up. Thus, the overall task of the medical ward – the treatment and nursing of patients – was at best only indirectly addressed. The simultaneous focusing on and enhanced coordination of work in the ward as scientific-medical work seem to have emerged more subtly and incrementally. Seemingly, the development has no single locus of control and no uniform cognitive framework to rest upon. Rather it has emerged from the interrelations between a gradually more loaded information system (in the sense of holding the majority of patient documents as well as of systematically favoring certain kinds of data), the actions and mu-

[64] The objection that shared representation of reality (or shared values, basic assumptions, or cognitive schemes) is the prerequisite of organizational success can also be found in the critical literature on organizational learning (Orr 1993 & 1996, Weick & Westley 1996, Morsing 1998), and organizational culture (Martin 1992).

tual adjustments of the staff, and institutionalized foci on predominantly economical, bureaucratic, and scientific-medical dimensions. In this respect, the new organizational order did not arise through open negotiations among staff and management, in which shared, uniform, and explicit agreements on the nature of work and the flow of things came into existence. On the contrary, it emerged as a byproduct of multiple and multifarious negotiations involving staff, documents, standards, locales, and patients. In consequence, my empirical study supports literature, which consider the electronic patient record as part of a general *dispotif* in which the "hospital", the "patient", the "physician", "the nurse", and "the patient record" are simultaneously and interdependently enacted (Berg, Bowker, Foucault). It does not support literature, which views it as a tool that can be integrated more or less successfully or appropriately to support practice – a widespread assumption in the majority of mainstream literature on EPR-implementation.

Roles and responsibilities: rationalizing healthcare practice

In the discussion so far, I have focused on activities, artifacts, and organizational routines. I shall now center on the human actors that are inseparably parts of and bound up with the new working configuration and discuss what kind of positions, i.e. roles, relations, and responsibilities they are offered. First, I deal with the three occupational groups, which I followed during my observations, and which have played important parts of the empirical stories: the nurses, the physicians, and the secretaries (although I shall deal only in brief with the secretaries because of the special status of this occupational group). In relation to all three groups, I address first the changes in the group's work tasks, in their reading and writing activities, and their patterns of interaction. Then I address the significance of these changes for the occupational groups as professions. Second, I center on the patients. Throughout the empirical analyses, they have been treated as background figures and yet they are

the *sine qua non* of activities in the medical ward. However, I find it of utmost importance to shift analytical lens and make room for discussing the position that the patients are afforded in the new organizational set-up.

Nursing and nurses

Nurses are involved in more activities than any other occupational group in the ward: they receive and discharge patients; they attend to the patient; they carry out the physicians' orders; and they order food, linen, drugs, etc. By and large, nurse work is the organizational putty of the medical ward. Writing and reading documents about this work are integral parts of the nursing duty. And it is in relation to these routines that the EPR has its most direct influence. As described these routines are in transition. First, nurses have gained access to documents that were hard to reach earlier. Second, nurses' own notes become more structured and are available to more people. These changes seem to broaden and confine the scope of nurses' information work although it happens in a complicated and equivocal way:

a) Nurses read more about the patient in documents and are better informed about medical aspects of the patient.
b) Nurses are more inclined to interfere in medical discussions
c) Nurses' own notes prioritize medical information and classifiable nursing information to the detriment of more vague or unstructured information
d) Patients' access to participating in the note-making process is being limited.
e) Oral interaction between nurses is downplayed, and occasions for collective learning and focused professional discussions among the nurses are reduced.

Broadly, these trends seem to enhance coordination, but around a narrower set of elements. Likewise, documentation is enhanced in a way that simultaneously confines the way nurses' work is represented. Documenting the activities of nurses is a core strategy in the effort to professionalize nursing: accumulation of nursing data serves to make nurse work visible and facilitate nursing research (Bowker & Star 1999, Schneider & Wagner 1993). The electronic patient record powers this program through the electronic nursing notes, since data now can be entered in a uniform way – due to a standardized graphical and semantic design of the nursing note sheets – and parallel processed with other data. However, the new design and the application of formal nursing diagnoses promote a problem-orientation of nursing notes, where "problems" tend to be equated with clearly definable medical or physical problems. Thus, the documentation of nursing activities is transformed into being a production of highly structured and technically inspired narratives about patient problems and nurses' actions towards these problems, rather than being a gathering of loosely coupled statements about patients and nursing activities.

As documentation moves toward pattern-fitting rather than broad descriptions of practice, one might ask how this serves the nursing profession. On the one hand, the profession seems to get more cogency. The professional strategy of rendering nursing visible and accountable seems to be strengthened, as workloads can be specified on activities, hours, and organizational units to counter management budget cuts, or argue for extra resources. On the other hand, since only easily classifiable elements of the work are reported and since documenting is sometimes given lower priority than the flow of work, large parts of nursing remain invisible. As pointed out by Bowker & Star, this is often desirable since being too visible can make it difficult to protect local autonomy, protect against too much scrutiny by accountants, and ensure that "information does in fact get recorded on the spot" (Bowker & Star 1999, p. 269). However, the visible part may gradually come to define nursing. As Schneider & Wagner writes, the categories of nursing plans may have a regulative effect besides being tools for documenting:

> "The care plans in use carry ambiguous messages. They have been primarily designed to 'normalize' routine nursing activities (rather

> than to highlight nurses' specialized skills). Their clear contractual character makes them useful for purposes of quality insurance and control. Nurses' focus on their 'rôle propre' is further made difficult by authority relationships, requiring ad hoc availability and flexibility in meeting shifting demands (e.g. to take over 'non-nursing duties' such as cleaning errands, office work and to support the diagnostic process)" (Schneider & Wagner 1993: 250).

Wagner elaborates this duplicity of nursing plans elsewhere:

> "Nurses might gain greater recognition for their work and more control over the definition of patients' problems while finding out that their practice is increasingly shaped by the necessity to comply with regulators' and employers' definitions of 'billable categories'" (Wagner cited in Bowker & Star 1999: 272).

I argue that this duplicity between recognition and regulation is of growing relevance to nurses' work in the medical ward. Not least since other dimensions of nurse work seem to be in transition too, although nursing is a multifaceted practice covering many aspects with which the introduction of EPRs has very little to do. Nevertheless, very basic dimensions of nursing such as nurses' relations to patients, to physicians, and to each other are affected through the whole rearrangement of the relations between humans and non-humans occasioned by the EPRs. Let me address these aspects:

First of all, the mutual relations between nurses have undergone a change towards less direct face-to-face interaction and more interaction through written means. As described, this gives nurses fewer opportunities to collectively discuss aspects of nursing and tell war-stories. In effect, it seems to make nursing a more individualized activity in terms of face-to-face time with colleagues. This tendency counters the image of hospital nursing as a highly collaborative enterprise – compared to the way nurses have been working historically (Melosh, 1982) and still work in many other areas of nursing such as home care and school nurses.

Vis-à-vis the physicians, nurses seem to obtain a more leveled position – being more knowledgeable about the medical aspects and apt to navigate and understand the medical discourses in general. Interestingly, this new possibility seems to give rise to two somewhat paradoxical

ways of relating to the physicians: On the one hand, nurses make more comments and reproofs to the physicians, thus inverting the commonly supposed balance of power[65]. On the other hand, nurses make a special effort to align their work to the physicians' and to make good whenever the physicians forget to do something or do it in a sloppy fashion. Thus, although the introduction of EPRs improves the possibilities for nurses to put up their stock compared to the physicians, it does not seem to fundamentally shake the historical and mythical relationship between nurses and physicians where nurses are traditionally cast in a subordinated and servicing role – doing whatever is in danger of not being done at all as Hughes has formulated it (Hughes 1971).

As for the patients, the patient-nurse relations are not clearly altered. Although face-to-face interactions with patients have not changed on a large scale, it seems reasonable, nevertheless, to think that the increased problem-orientation pushes the nurses' interaction with the patients towards exposing and eliminating problems, which can be categorized within a nursing classification system – a nursing classification system that deals primarily with physical or medical aspects of patients and nursing activities. When nursing progressively implies the construction and employment of statements from a narrowly defined semantic universe (in terms of scope and detailing), other hitherto prominent politics of nursing, such as a holistic care and patient-involvement loose ground. Furthermore, some parts of nurse work – and especially their information work – moves backstage in relation to the patient, which means that the nurses' participation in the production process of the patient-as-a-case is black-boxed and the nurses' definitory power consolidated vis-à-vis the patient. Goffman has pointed to the significance of how work is dramatized. He refers to a study by Lentz, which describes how medical nurses have a problem that surgical nurses do not have. Whereas the work of surgical nurses is highly visible and recognizable (e.g. changing bandages), the work of medical nurses is more invisible and prone to be misunderstood (e.g. when a medical nurse visits a patient to observe his or her tone of skin or breathing, and others interpret this as waste of the

[65] Evidence that the nurse-physician relationship is more complicated, equivocal, and reciprocal than usually assumed is for example put forward in Allen (1997) and Tjora (2000).

nurse's time 'because she just seems to be chatting!' (Goffman 1959: 41)). The displacement of information work to the "backstage area" of the medical ward, the office, might enhance this problem, because now it is even more difficult for patients or relatives to see what the nurses are actually doing (i.e. stating) about the patient.

The question is whether nurses actually intend or subscribe to this development. First of all, it is important to remember that nurses are not a homogeneous group regarding the way they perceive and enact their job. For instance, Melosh argues, nurses have historically been divided between seeing nursing as a profession or a vocation (Melosh 1982). And Latimer argues that nursing history has involved a struggle between those who have promoted the discourse of nursing as a morally located activity (accentuating the value of specific skills such as motherly care and psychosocial support) and those who emphasized technical expertise and autonomy of practice as established professional characteristics (building alliances to science, enacting a scientific, well-documented nursing practice) (Latimer 1999). Discourses like these are also competing at the medical wards in Svendborg. Thus, the fact that representatives of local nurses themselves have initiated the construction of the nursing classification system and pushed forward the design of the EPR in order to enhance a problem-oriented documentation of nursing can be seen as representing the interests of one part of the nurses only, namely the wing that try to perform nursing as a profession by borrowing from medical and technical discourses[66].

By the introduction of EPR, nurse work undergoes subtle but potentially important transformations. Summing up, both coordination and documentation of nursing are enhanced. At the same time, however, only medical or scientific-like nursing issues are rendered visible, whereas aspects such as the well being of patients and nurses themselves are underexposed. Thus, the development seems to be a two-edged

[66] The enthusiasm of these local nurses in building a classification system and establishing a nursing part of the EPR might also be seen as part of personal career strategies – moving from nursing into the fields of project management and health care informatics – which perhaps entail sacrificing illustrious nursing principles – a point made by Leigh Star (personal communication).

sword: on the one side, nurses put up their stock as a profession; on the other side, holistic and collegial aspects are downplayed.

Medicine and physicians

If nurses are the most widely involved group, physicians are most in charge at the ward – at least formally. In contrast to nurses, physicians are not affiliated with one specific ward, but work in all medical wards. Thus, their collegial relations are more alternating, and in general physicians work more individually. Being responsible for medical decision-making in relation to sick patients, the reading and formulation of notes about the patient are integral parts of physicians' work. By the introduction of EPRs, these routines change. First, a large part of patient documents are instantly accessible for the physician but now also for other occupational groups. Second, physicians have to enter medical prescriptions themselves and have also the possibility of entering other notes directly into the EPR. These changes seem to broaden the scope of physicians' information exchange and redefine some aspects of the physician role:

a) Physicians read more in records they are not directly responsible for.
b) The number of discussants on the patient-as-a-case expands (to include physician-colleagues and other occupational groups such as nurses).
c) The flow of the physicians' work becomes more unstructured and changing.
d) The physicians become writers of prescriptions (as distinct from being speakers) and incipient writers of physician notes, which in turn expands the physician role to include editing and proofreading of medical statements.

These changes point in several directions: toward enhanced collaboration in medical work; toward erosion of physicians' professional domi-

nance; and toward redefinition and reorganization of the physician duty. Thus, old debates within sociology of professions are made topical at the same time as whole new aspects of physician work are highlighted. Let me elaborate this.

The sociology of profession has traditionally dealt with the question of what a profession is, how an occupation becomes a profession, and the threats to a profession. Among the cases studied, the medical profession has attracted extraordinary attention, because in many respects, it is seen as the quintessence of an established profession (cf. Hughes 1971, Strauss 1975) and has undergone extensive and important transformations (Light 2000, McKinlay 1988). The writings of Eliot Freidson are classical on the notion that the medical profession is a *dominant* profession. His main tenet is that medicine is a truly autonomous occupation, as it has the authority to direct and evaluate the work of others without in turn being subject to formal direction and evaluation by them (Freidson 1970). Freidson asserts that autonomy of a profession is granted and supported if society is persuaded to make the imputation that the profession has an extensive collectivity and service orientation (Ibid.). Thus, a profession is ultimately dependent on the trust of others. As Everett Hughes once stated, the motto of professions is *credat emptor* (let the client trust) as opposed to the principle of business, *caveat emptor* (let the buyer beware) (Hughes 1971). This also has to do with the fact that a profession lays claim on a certain body of knowledge:

> "Professionals profess. They profess to know better than others the nature of certain matters, and to know better than their clients what ails them or their affairs. This is the essence of the professional idea and the professional claim" (Hughes 1971: 375).

Also, the monopoly of knowledge is an integral part of the enactment of a profession as a collectivity (through establishment of educational requirements, peer review etc.).

The above-mentioned features of a profession point also to its menaces, and various scholars have challenged the professional-dominance perspective arguing that core features are being undermined. One strand of critique argues that the medical profession undergoes a *proletarization*, as the workplaces of physicians are increasingly corporatized

(McKinlay 1988). Basically, that proposition rests on Marxist theory of history, emphasizing the inevitability of workers in capitalist societies to gradually become stripped of control over their work (Wolinsky 1988). Accordingly, physicians will move from holding an elevated position to gradually becoming objects of bureaucracy, i.e. increasingly becoming subject to rules and other hierarchical structures that are not of their own making and, hence, divested of their control over professional rights.

Another strand of critique, the *deprofessionalization* perspective, argues that core prerogatives of the medical profession are being undermined, which in turn, hypothetically, leads to growing distrust of society and erosion of a prestigious societal position (Haug 1973, 1988). To begin with, the monopoly of knowledge has been eroded by the increased use of automated retrieval systems, such as computerized algorithms for symptom assessments. Second, access to medical education has opened up, which makes the public less likely to view medical knowledge as mysterious. Third, increasing specialization of medicine makes doctors more dependent on each other and on nonphysician experts such as engineers thereby reducing both individual and professional autonomy. Fourth, the growth of consumer self-help groups increases the supervision and critique of medical practice. Finally, "the altruistic image has not weathered well the recent storms over the rising cost of health care" (Wolinsky 1988: 38). However, Freidson has answered both strands of criticism. Regarding erosion of the knowledge monopoly he writes:

> "The professions…continue to possess a monopoly over at least some important segment of formal knowledge that does not shrink over time, even though both competitors and rising levels of lay knowledge may nibble at its edges…. Similarly, while the power of computer technology in storing codified knowledge cannot be ignored, it is the members of each profession who determine what is to be stored and how it is to be done, and who are equipped to interpret and employ what is retrieved effectively. With a continual knowledge gap, potentially access to stored data is meaningless" (Freidson 1984 in Wolinsky 1988).

And regarding the proletarization of physicians he writes:

> "[Although these changes] might be interpreted as bureaucratization in Weber's ideal-typical sense…[they] do not affect the position of the profession as a corporate body in the social as well as institutional division of labor so much as they affect the internal organization of the profession, in the relations among physicians" (Freidson 1985 in Wolinsky 1988).

In sum, Freidson's main arguments for the continuity of professional dominance are that the relative position of physicians vis-à-vis other occupations regarding the monopoly of knowledge are maintained, and that changing features of the medical profession are challenging the autonomy of individual physicians but not the autonomy of the profession. Yet whereas this debate mainly concerns the status of the physicians vis-à-vis other professions, it has also been argued that the picture of the medical profession as a unity is problematic. Not least the growing number and types of specializations contribute to fragment the medical professions (Borum 2000, Scott et al. 2000).

How does my study of EPRs relate to this classic debate? On the one hand numerous aspects of my study suggest that the status of the physician as a personal authority is challenged (vis-à-vis his colleagues, vis-à-vis the nurses, and vis-à-vis the patients): progressively, more and more actants participate in medical practice besides the physician, whose role as protagonist is proportionally modified. Also some physicians find the work of filling out forms and the rules to comply with disturbing for the accomplishment of "real tasks". This view of bureaucracy as hampering the practice of physicians and sapping their autonomy has been described elsewhere, too. For instance doctors historically:

> "…complained about the proliferation of preformatted forms, in which they only had to fill in a few words or even just select a term from a pre-given list. Such forms, they noted, shifted responsibility for the content of clinical work from the individual doctor to the 'system', which developed and accorded the forms" (Berg & Harterink forthcoming: 9).

On the other hand, the medical profession (i.e. the formal allocation of rights and responsibilities) seems neither challenged nor strengthened in

the reconfiguration of work in the medical ward. This paradoxical development seems to create awkward tension for the individual physician who is held legally responsible for the medical interventions, but sees his practical autonomy sapped. Interestingly, however – and this is a whole new issue compared to the classic debate – medicine as a general paradigm is clearly enhanced as a growing number of humans and non-humans takes part in its enactment, thereby adding to its stability. What is more, it is medicine in a scientific and bureaucratic version, in which the physician simultaneously is cast as a mere *participant* and *liable protagonist* (and curiously, bureaucracy seems to secure the latter position, as the physician alone is allowed to prescribe drugs etc., just as he is held responsible in case of malpractice).

The classic debate misses this latter aspect, which among other things may have to do with the fact that medicine and the medical profession is considered "the same" regardless of its dominance or autonomy[67]. However, as Marc Berg has shown in his analysis of the historical development of medical information technologies, medicine has moved from being configured predominantly as an art form to becoming a more and more scientific or "rational" practice, although he argues: "there was no single, unilinear process in which a previously "unscientific" practice became "scientific" (Berg 1997: 11). One of Berg's points is that medical work becomes increasingly rationalized through the enmeshment of decision-support techniques like expert systems and protocols. Concomitantly, control becomes increasingly distributed. Thus, it seems necessary to add the point to the debate within sociology of professions that historical transformations are not simply strengthening or eroding power structures, but *transforming* the very nature of the powerful profession[68],

[67] Actually, David Coburn is quoted in Light 2000 for stating that Freidson's continued insistence on the profession's dominance is "fatally weakened by his slide from a defense of the notion of medical dominance (control over others) to a defense of the more restricted idea of medical autonomy (freedom from control by others)" (Light 2000: 203). My own study seems to suggest that both aspects of the medical professions undergo transformation from being capacities of the profession to becoming capacities of medicine as an overall paradigm.

[68] This is also the point of Scott et al 2000 and Borum 2000. However, they mainly focus on the signs indicating that the profession is becoming fragmented, rather than discussing what this fragmentation means for the practitioners, the collegial relations, and the medical practice.

its domain, and its practitioners. This point is useful for understanding the apparent "paradox of medical advances and professional decline" as it is called in Light and Levine (1988: 11).

On basis of my study I will argue that the interesting transformation does not happen at the level of the medical profession, but in the reconfiguration of relations between the individual and the organizational, socio-technical collective. The physician is offered a less central position as work tasks are co-constructed through the lenses of the EPR, as the work day of the physician becomes bound up with the temporality of the electronic infrastructure, and as the accomplishment of tasks becomes increasingly dependent on the work of nurses and secretaries. In this context, the physician faces new dilemmas related to the allocation of his or her time. At the same time, the physician's domain is increasingly narrowed down to the co-construction of the patient as a bio-chemical and bureaucratic case, where the "real work" happens in connection to electronic databases and paper documents and entails entering, juxtaposing, evaluating, and monitoring more or less unequivocal, and often quantitative information about the patient's body. In turn, medicine as a fundamentally scientific-medical and bureaucratic practice is enacted more strongly than ever as distinct from science as an art and as distinct from a "holistic medicine" (Engeström 1993: 91). Medicine is simultaneously becoming a more collective and a narrower endeavor.

Office work and the secretary

The secretary carries out work that is among the least visible and noticed, and yet it is crucial for coherence and accountability of activities on the medical ward. By the introduction of EPRs, the most important thing regarding this work and the position of the secretary is the fact that both continue to be indispensable, albeit for different reasons. Let me briefly elaborate this statement.

First and foremost, tasks disappear (e.g. printing out physician notes and placing them in the paper-record) and emerge (e.g. drawing up a disposable record-folder) by the computerization of EPRs. Although it was feared that EPRs would leave secretaries redundant, the electronic infrastructure seems to demand just as much articulation work as the paper-

based record. Second, tasks shift hands from the secretaries to other occupational groups (e.g. physicians enter medical prescriptions themselves) at the same time as secretaries become increasingly involved with information search and sorting. In this renegotiation of domains secretaries seem to perform still less routine work as simple transcription tasks are replaced by navigating databases and building up the patient-as-a-case by gathering and structuring available documents. And yet, the most surprising effect in the reconfigured network of staff, documents, patients, and locales seem to be the fact that the introduction of EPRs redistributes and "informates" tasks and relations rather than automates them.

The patient

Until now this thesis has dealt with the flow and organization of work in the medical ward and the way EPRs partake in this. I have centered on the micro-dynamics of the staffs' information work (where the patient predominantly figures as a *case*), because here the EPR most directly alters tasks and relations, and because this inconspicuous backstage work is often overlooked in sociological studies of medicine and of health and illness despite its crucial significance for the handling of patients. However, the patient is in many ways the most important figure of the network: he or she is the *raison d'être* for the medical ward – at least in principle; and importantly, he or she is usually weak, needs help and is often anxious – a vulnerable position that ultimately relies on the competencies and scrupulousness of others. It is, therefore, about time to concentrate analytic attention on the way patients and their lives are affected by the introduction of EPRs and the consequent reconfiguration of organizational roles, responsibilities, and routines.

First and foremost, the computerization of the patient records means that diverse files are coupled together and made accessible to more readers. Second, patient cases become more narrowly defined, albeit better coordinated among staff. Third, the information work of staff becomes more and more concentrated within the office. The question is how these developments affect the way the patient is defined and dealt with, and the patient's possibilities of action? I will argue that in the present cir-

cumstances in the medical ward, the patient is more and more stringently framed as a medical case and at the same time offered a less initiated and more exposed position:

a) The patient-as-a-case is now lined up in a more comprehensive and coherent way.
b) The staff encountering the patient or relatives is better informed about medical aspects of the patient.
c) The patient witnesses less and less often the individual or collaborative information work of staff.
d) The patient does less often view or partake in the making of his or her own record (rarely in parts, almost never in its entirety).

As argued throughout this thesis, the patient becomes progressively delineated as a scientific medical case: the EPR lists the bodily characteristics of the patient, just as it lists his or her history of hospitalization; it settles the illness through diagnosis codes and tabulates physical and biochemical complications; it defines the action program through ordination and drug lists; and it delineates and foreshadows the patient's present and future identity in dates, ward-abbreviations, and referrals. Of course, this does not mean that the patient ceases to exist as an individual and many-sided person, but in the textual universe of the ward this complexity and abundance of detail only has a negligible space.

Being hospitalized means that the patient is often tied to his or her bed, and it is here that almost all interactions with the staff take place and some of the information about the patient-as-a-case is generated and co-constructed. However, much information about the patient flows into the record – and hence into the discursive universe of the staff – without any physical contact between patient and staff (from general practitioner, other organizational units, databases, the work of colleagues etc.). Thus, the patient often meets staff that is already informed of the patient-as-a-case. On the one hand, this preparation can be viewed as expedient for the organizational accomplishment of tasks and it might be pleasant for the patient, who does not have to tell everything once again and can ask about the stock of his or her case. On the other hand, the narrow

medical focus of the EPR may work to preconceive the staff's understanding of the patient, which in turn may reduce further exploration of the state of affairs and confine the scope of conversation. Since the patient seldom reads in the EPR, the relation between him or her and the staff becomes more asymmetrical: more staff knows more about the patient-as-a-medical-case whereas the patient knows less and may find it difficult to know exactly what to say to expand or question the framing of his or her case. Naturally, most staff tries to talk open-mindedly with the patient and often hear additional or alternative versions of the information in the EPR, which is then translated back into the record thereby modifying its content. Yet the occasions for the patient to negotiate the textual framing of his or her case are diminished, as the actual record almost never participates in the face-to-face encounters between the patient and staff. What is more, the information work of staff happens less and less often in front of the patient and more and more often in the office – it moves backstage. In consequence, the ongoing framing and reframing of the patient-as-a-medical-case is harder to monitor and challenge for the patient.

Another aspect of the displacement of information work to the office is that the patient meets the staff one after another and less often together – the interaction between staff moves backstage for the patient. Nurses have traditionally acted as a mediator between the physician and the patient in ward rounds and the like: translating the physician's medical decisions to a language that the patient understands; translating the patient's worries and sensations into a language that the physician understands, sometimes acting as "ombudsmen" in conflicts between the patient and the physician; and in general doing comfort work and sentimental work, i.e. talking to and soothing the patient during examinations and operations (Strauss et al 1997). Now nurses less often mediate the physician-patient encounters, but negotiate the patient's case in the office without the patient. On the other hand, the patient-physician contact may become more open and direct when the paper-based patient record is not present to structure the physician's conversation with the patient. But when the encounter between patient and staff becomes more stripped, the patient is left to his or her own devices and the temper, busyness, and conversational powers of the individual physician or nurse.

The physician-patient relationship and the mediating role of nurses have been extensively studied and discussed (Atkinson 1995). In this literature, interaction patterns and problems are often explained in terms of professional and personal characteristics and conflicts. Yet it is my point that such patterns and problems are just as much effects of the working configuration of humans, locales, documents, and technologies. Thus, the introduction of EPRs gives rise to a reconfiguration of tasks and activities, where the office becomes a central meeting point for the ongoing construction and negotiation of the patient-as-a-medical-case. Oppositely, the patient as a living person placed in a bed becomes a less central node of ordering; important lines of activity do less and less often involve him or her as an heterogeneous bio-psycho-social *human* that may complicate and question the arch of organizational work, but see him or her more and more as a uniform bio-chemical *case* that renders the work and its benchmarks well-defined, delimited, and undisputed.

Also, the centralization of information about the patient in the EPR and its availability to, generally speaking, all of the staff in the hospital introduces a paradoxical safety/insecurity for the patient. The patient electronic record is seldom mislaid or lost, which of course increases the probability that the patient's disease and the medical interventions are in fact remembered and experience is accumulated. However, the wide access to patient information can also be used in a way that makes the patient feel spied on, pried into, and exposed to programs of control. This risk of misuse of patient data is a recurrent issue in the ward and there are experiments going on with "shielding" of the EPRs of well-known patients such as politicians and celebrities – i.e. giving access to only a few staff members. However, it is difficult to reserve access to the EPR without at the same time diminishing the possibility of handling cases smoothly across organizational boundaries.

In fact it is difficult to weigh the pros and cons of the matter. If the computerization of patient records leads to a more coordinated and efficient treatment of the patients' illnesses, the patients seemingly have to pay the price of a more "public" albeit indisputable and narrow handling of their life-situation. And even in this better coordinated network, there is no guarantee that the patients will in fact get the decided examinations

and treatments – "errors" do still occur. The following and final section of this discussion chapter deals with this topic.

Redistribution of errors

As this thesis is drawing to a close, one last issue needs to be discussed since it touches upon one of the core expectations from the introduction of EPRs, namely the improvement of quality through reduction of errors in the handling of patients. The term "error" refers in ordinary parlance to a failure in procedure, which leads to unintended and potentially harmful consequences for the patient. In the dominant discourse, such errors are conventionally seen as stemming from "technical" or "human factors" or from combinations of these, and it is hoped that the centralization of data in the EPR and retrenchment of laborious and tangled work procedures (such as the transport of data from one document to a row of other documents) will lead to an infrastructure that is less prone to both technical and human failures.

However, on the basis of my study I will argue that errors are not significantly reduced for two reasons. The first concerns the fact that although the probability of certain types of error is diminished, other types of error has emerged or occurs more frequently. I shall elaborate each argument in turn. The second reason is more theoretical, namely that errors are unavoidable and often unpredictable in a complicated organizational network of humans and non-humans like the medical ward.

Reshuffling the geography of errors

The introduction of EPRs has direct consequences for the way in which documents are produced and distributed, and as shown it has indirectly given rise to a reshuffling of occupational roles and responsibilities. In this rearrangement, certain tasks are simplified on an organizational level entailing a shorter row of procedures with fewer actants involved (e.g. the entering of medicine in which the secretary and Kardex drugs

list are made superfluous). This simplification seems to diminish the probability of certain failures such as copying-errors. However, other tasks are still complicated and entail sometimes even more work than before (e.g. producing an overview of the patient's medicine, which still entails comparing many documents in order to gather dispersed information and check for inconsistencies; or the task of producing awareness of new test results, which still involves multiple actors and furthermore introduces growing uncertainty about the proper way to check for new results). Errors are likely to occur somewhere in these chains of actions and actors, and what is more, errors are often hard to discover because it takes much auditing work to locate inconsistencies and imperfections across documents and the conversations of staff. Further adding to the troubles is the fact that such auditing work is carried out only on occasion (and often as invisible work by the nurses) and not on a regular basis. Apparently, the EPR-system is entrusted the main responsibility for producing a red thread in the organizational line of work.

On the other hand, one could argue that much trouble stems from the fact that there is double bookkeeping of a lot of information (not only medicine, but also the prescription of special examinations and treatments such as X-ray or elastic stockings), and unclear definition of responsibilities among the staff. To some extent this may be true. However, it is important to remember that seemingly irrational or inefficient arrangements often work to settle incompatible programs or to alleviate unintended consequences of having to represent fuzzy phenomena via crude categories. Entering medicine data in both medicine scheme and physician notes is, for example, necessary since only physician notes count as legally binding documents, why the prescription of drugs must be proved here. Furthermore, physicians find it much easier to read in one document containing all information than constantly changing back and forth between different documents to relate data to one another. Would it then be an idea to create an automatic updating link between medicine information in physician notes and medicine scheme? Not as physician notes are structured at the moment where notes are entered successively to prove the course of events. It seems impossible to construct a document, which simultaneously documents the history of medical reasoning and intervention and serves as center for the coordination of organizational effort. As Perrow has argued: "systems cannot be both

decentralized and central at the same time; they are organizational *Pushmepullyous*, straight out of Dr. Doolittle stories, trying to go in opposite directions at once" (Perrow 1984: 10). Even the simplest routine involves tradeoffs, which might neither be solved nor diminished by streamlining the informational infrastructure because the work tasks and considerations are multiple and sometimes conflicting. As an example, consider the entering of medicine in the EPR. Should the physician wait to communicate his decisions about drugs to the nurses until he has finished the whole case and entered all decisions in both medicine scheme and physician notes? Or should he – for the sake of reducing delays – enter some of the prescriptions to prepare the nurse on the status of the case, and then go on chewing more on the data and deciding what to do more? At first, this dilemma may sound artificial or the answer obvious. However, my empirical analyses are full of similar everyday tradeoffs, where the possibilities of action all seem to involve some probability of delaying or even "derail" the line of organizational work.

But there are other aspects of centralizing information in the EPR and dispersing them over a large network, out of which "errors" may occur. As mentioned above, the structures of the EPR work to produce information, which is relatively crude and narrow in scope. Hereby, the organizational focus is sharpened on medical aspects of the patient-as-a-case, and more actants participate in defining and monitoring the particularities of the case and ensure that consistent and medically proper inferences are made. Thus, responsibility is distributed whereas earlier it was fully the physicians' domain. However, information may sometimes be read more crude and unequivocal than it was intended at the moment of entering; information can shift genres when employed in a specific situation. Suddenly, a vague hint at some aspect of the patient-case is read as "the fact" because it supports another statement elsewhere in the record. During my observations I came across a patient – an old lady with headache – who complained about strong headache, but whose X-ray pictures did not show any tumor that would explain the pains. Some of the nursing notes in the EPR told about the patient's complaints but other notes hinted that the old lady was (too) keen on demanding painkillers. Within a few days she was discharged because the headache was interpreted as hypochondria. Some weeks later she was re-hospitalized because of suicidal attempt – the pains had been excruciating for the pa-

tient. During this second stay a large tumor was discovered in the lower part of the brainstem and she was transferred to the neurological department of a larger hospital Of course, this is an exceptional case and probably there are other reasons for the error than the notes in the EPR. The point I want to make, however, is that it is impossible to ensure that information in the EPR is sufficiently unambiguous to exclude distortion or just sliding construction of meaning. In everyday jargon the limitations of EPRs for appropriate and careful treatment of patients are sometimes spoken about as "bullshit in, bullshit out". However, as argued throughout this thesis, problems are not confined to the entering of information, but to the whole organizational arrangement in which statements about the patients circulates.

Until now I have only discussed the immediate dilemmas of entering data and the failures they may bring about in relation to the writing and reading in the EPR. And yet, I will argue that it is of utmost importance to consider also the kind of errors that has to do with the narrowing of organizational focus to predominantly medical aspects. It is a paradox that the informational infrastructure primarily supports medical information (and that the patient is enacted as a medical case) at a time where more and more patients are being hospitalized for sufferings that are only partially dependent on biochemical processes of the patients' bodies. As pointed out by Strauss et al. (1997) more and more patients suffer from chronic diseases, for which there is no cure but only temporarily relieve. What is more, alcohol abuse, malnutrition, and smoking are involved in many hospitalizations – not to mention problems of loneliness and psychological malaise. However, the EPR and the related organizational arrangements are not capable of handling information that could address these dimensions of the patients' life-situations. Instead patients are enacted as medical cases, in which the complexities of the patients' problems are at best dimly lighted. Although this aspect of medical work may not exactly be an "error" in the way this term is ordinarily used, it is indeed a clear limitation of the organization.

Errors as normal phenomena in medical work

Conventionally errors are seen as rising from either human or technical failures. And consequently efforts are directed towards diminishing these failures by enjoining scrupulousness upon the staff and adding fail-guarding mechanisms to the technology. However, as Charles Perrow and John Law have argued from each their positions as organization theorist and sociologist of technology respectively, many sociotechnical systems of today are so complex and intricately coupled that it is hard to locate the culprit(s) of errors, and furthermore, that the very effort to make the systems safe – to make them fail-proof – can lead directly to grave and incomprehensible accidents.

In his book "Normal Accidents", Perrow lays out a theory of complex systems that accounts for accidents like the one on Three Mile Island. His main tenet is that as organizational systems grow progressively more complicated (i.e. more complex interactions between system elements) and tightly coupled (i.e. little slack in system activities) the likelihood that accidents will be of greater seriousness when they happen increases, or as he says: the risks will be higher:

> "Nothing is perfect, neither designs, equipment, procedures, operators, supplies, or the environment. Because we know this, we load our complex systems with safety devices in the form of buffers, redundancies, circuit breakers, alarms, bells, and whistles. Small failures go on continuously in the system since nothing is perfect, but the safety devices and the cunning of designers, and the wit and experience of the operating personnel, cope with them. Occasionally, however, two or more failures, none of them devastating in themselves in isolation, come together in unexpected ways and defeat the safety devices – the definition of a "normal accident" or system accident. If the system is also tightly coupled, these failures can cascade faster than any safety device or operator can cope with them, or they can be incomprehensible to those responsible for doing the coping. If the accident brings down a significant part of the system, and the system has catastrophic potential, we will have a catastrophe. That, in brief, is Normal Accident Theory" (Perrow 1984: 356-357).

By ‘accidents’ Perrow refers to major disasters, that is overall system breakdowns or failures of great extension and seriousness. My focus is on smaller, less far-reaching “errors” in the patient trajectory. I find, however, the basic point of the high-riskiness of complex, tightly coupled organizational configurations worth applying to the case of EPRs at the medical ward. The organization and management of a patient trajectory is indeed a complicated and highly distributed accomplishment, in which the interaction of small failures can have unpleasant and even deadly consequences for the patient. The hospital and its subunits have been conceptualized in organizational literature as a complex, but loosely coupled organizational structure (cf. Mintzberg 1979, who categorizes hospitals as professional bureaucracies). The functional differentiation of work is high, but due to the unpredictable character of the subject matter or “product” (patients come with diverse and often unclear symptoms) and to a certain degree of uncertainty regarding the proper way to treat patients, it is not possible to fully standardize the flow of work within and across units. A certain amount of slack and redundancy is required to allow for situational reorganizations and some degree of discretion.

I relation to this classic structural way of viewing the medical ward, my study of the introduction of EPRs suggests that the amount of slack is reduced. By the closer coordination between shifts and occupational groups, plus the simultaneous centralization and distribution of information about the patients, the organizational network is tied even closer together. In accordance with Perrow, such binding together of organizational activity sequences inevitably increases the risk that small failures, such as miswritings of drugs or over-interpretation of vague suggestions, are allowed to travel fast in an unpredictable and incomprehensible way. There is too little time and/or space between actions in one corner of the organization to actions in other corners to allow small errors to be noticed and corrected or simply remain small. Most of the time, of course, the stronger coordination and the centralization of shared information will secure a quite unequivocal and uniform organizational understanding of the patient-as-a-case and, thereby, diminish the kind of errors where no one knows exactly what the patient suffers from and keeps on asking him or her or simply act on rumors. On the other hand, as the patient is progressively “side-tracked” as an active constituent of his or her

file, and as this file multiplies in hundreds of situated screen versions behind his or her back, the probability of errors such as the one where a patient complaints from pains in the right leg and gets the left one amputated because that is what the record says, is not necessarily reduced by the introduction of EPRs. It is likely that reduction of slack and redundancy in medical work increases the risk of errors being discovered too late or having even greater consequences when they happen.

This brings me back to the discussion about double bookkeeping in the EPR-system. Advocates of a more streamlined patient record system might argue with the descriptions presented in this thesis that double bookkeeping is a source of error that should be replaced by one central database. Yet such an "optimization" would leave the medical ward paralyzed in an instance of system breakdown (which if not often, does happen). In this situation it is actually quite important that information are stored other places such as printed files and medicine cards. What is more, it is often hard to point out the information, which is "redundant" or "superfluous". As Heath and Luff has pointed out many possibilities of errors arise from the attempt to tidy up or polish records (Heath & Luff 2000: 54). Likewise, the supersession of oral communication by written communication for "coordination purposes" may, in the eyes of system planners[69], reduce slack and improve quality (i.e. eliminate small-talk, which is unnecessary and even disturbing). But in fact the move toward written communication may also increase the dependency on the system, on the reliability of the EPR, which, as just argued, is neither failsafe nor particularly broad spectred. Loose couplings between organizational actors are not necessarily an evil:

[69] This popular view can also be found between the lines in scientific literature about computer-supported cooperative work such as Schneider & Wagner 1992. In relation to the construction processes of useful and meaningful information systems their article is thought provoking and detailed. Though when it comes to the consequences of the EPR, Schneider & Wagner puts much weight on the illuminative and "unobtrusive" controlling aspects of the EPR, which promote collaboration, discipline, and rigor. The drawbacks of these aspects are not mentioned. Thereby the article leaves the impression that the tighter coordination and rigor in practice, which are strengthened through information systems, are usually for the common good.

> "Loosely coupled systems tend to have ambiguous or perhaps flexible performance standards, and they may, as in the case of the school have little consumer monitoring, so the absence of intended connection can remain unobserved. You might be tempted to call it a very inefficient system, or even a rip-off of state or federal funds, and call for "tight coupling". This would make the remedial program work as everyone outside the system thought it should work. But it would be a mistake to call it inefficient. The system is quite efficient for accomplishing many things that many participants desire…. Loose coupling, then, allows certain parts of the system to express themselves according to their own logic or interests. Tight coupling restricts this. Loose coupling, however, is not the same as disorganization, unless we mean lack of centralized control by that term…. The degree of organization is independent of the degree of coupling" (Perrow 1984: 91).

In a study of a railway-disaster, John Law draws similar conclusions. He argues that the general response to the occurrence of errors and disasters is that systems should be failsafe, and that there should be an overall control of the system – a strong center. "It is the assertion of the need to create a proper set of relations, and keep them stable" (Law 2000: 7). However, there are limitations to both approaches. First, Law shows that a procedure intended to increase safety on the train actually led directly to catastrophe. Second, Law points to the fact that the call for strong centers raises analogous difficulties, because diversity and incoherence (e.g. multiplicity of interests and definitions of the good) is the rule rather than the exception of organizations, and is not very realistic to overcome. Instead Law proposes a counterview on organizations and systems:

> "The counter-view is that the world simply does not fit this way of representing and managing it – or at best does so only partially. Furthermore, though this is not easy to say in the aftermath of catastrophe, the partial disorder of these not very coherent arrangements does just fine a good deal if not all of the time…. And to make perfection in one place (assuming such a thing were possible) would be to risk much greater imperfection in other locations…. Entropy is chronic" (Law 2000: 11).

One could argue that I stretch the points of Perrow and Law by transferring them from studies of nuclear plants and trains to the fuzzy everyday practices at a medical ward. However, dilemmas in socio-technical systems can be found in medical work too, and throughout this thesis I have pointed out many of these: the dilemma between too much versus too little control, the dilemma between centralization and decentralization, and the dilemma between close coordination and contraction of subject-matter.

Once again, I must regret the negligible space that patients are allotted. I took a deliberate choice when refraining from following patients in the ward but observing and interviewing the staff only. This I do not regret, because patients would have entered my field-notes much more markedly if they did play some sort of role in medical work except from being its objects. But it is regrettable that this is the case – that patients do not seem to be delegated or insist on playing more prominent parts of the whole medical machinery. Because what seems to be one way to mediate or compromise between the above-listed problems and dilemmas would be to have better informed patients who themselves could take part in the ongoing framing of, reporting of, and dealing with the problems because of which they are hospitalized. In relation to the risk of getting a wrong or just a poor treatment, it could be an idea to give the patients (or relatives) access to his or her files because he or she could play an important monitoring and checking role. In this respect, the tighter coupling of actors and activities at the medical ward seems to open up the need for rethinking the patient-hospital relationship. Where the patient traditionally is seen as the *credat emptor* he or she should now be fully cast in the position of *caveat emptor*; when the organizational arrangement draw tight, "the clients should beware".

With these words, I shall round off this discussion chapter. I started with the very concrete changes of the shift from paper and pen to screen and keyboard – from oral to written communication. From there I pointed at the ways in which this enables a closer coordination of fewer aspects of medical work, and how the roles of nurses, secretaries, physicians, and patients are reshuffled in the process. Finally, I have discussed how some typical errors are reduced while others keep on emerging in this organizational rearrangement. Returning to the initial metaphor of the chapter, the new nodes of ordering, it seems to be the case that the

new “eddies” in the flow of activities in the ward are creating new modes of ordering, but also new modes of failures or disordering. In that respect “nodes of ordering” also hold the connotation of being nodes of compromises.

9

Conclusion

Computers are no longer futuristic exotica. In our homes, work places, and public spaces computers connect us to each other and to the world we live in, and in many ways we are no longer thinking about why or how we use them – they have receded into the background as natural parts of our lives. In this light, the introduction of electronic patient records in hospitals is no special case. However, there are some special circumstances, which makes it interesting to follow this introduction. As described in the introductory chapter, the hospital field is attracting much public attention, because it is viewed as a cornerstone of the welfare state, but at the same time it is considered to be a colossus with feet of clay. Electronic patient records have been put forward as a crucial element in the development of a more efficient and high quality health care sector. The reasoning goes that EPRs will speed up and improve the development and processing of information, and thus provide the foundations for more flexible work flows, fewer errors, and optimal treatment and care of the patient. In this respect, the expectations from EPRs resume the visions that accompanied and still are accompanying many computerization initiatives: connected computers that form a virtual highway where information travels fast across physical and temporal boundaries and into informated environments, where data can be procured within seconds to support human decision-making. This thesis has been an occasion to reconsider these basic assumptions. And interestingly (but perhaps not that surprisingly) it shows that there are good reasons to take up a non-committal attitude towards them.

By following practices at two medical wards, it became clear that the EPR is now integral part of many work tasks. After one year, nurses, physicians, and secretaries no longer question the replacement of paper-based records with EPRs, although they have many suggestions for how

to improve the EPR-system. Focusing on four topics – or organizational routines – the "authoring" and reading of physician notes, the updating and reporting routines of nurses, the medication trajectory, and the distribution of test results, I showed that written interaction is growing between the staff, that new nodes of ordering have emerged, and that the overall effect is stronger coordination of activities across occupational boundaries and shifts albeit almost exclusively around medical aspects. In this enhanced coordination some sources of errors are diminished, but other sources have emerged, which makes it hard to conclude that the risks of making errors have radically declined. Moreover, it became clear that the roles of physicians, nurses, and patients undergo subtle yet important transformations: physicians become less autonomous and their work rhythm is challenged; nurses become more involved in medical decision-making – an involvement that tends to be undocumented despite more structured nursing notes, and they tend to work more individualistic; and patients become less involved as readers and co-producers of their own cases. Finally, secretaries remain key-actors in the on-going tidying-up of the information-system.

How to use such findings? What are their practical implications? One way to think about the implications of my study is to compare the findings with the original expectations from introducing EPRs: how do the findings meet these? In broad outline, the visions were that EPRs would: a) secure a single registration of data, which reduces the number of errors; and b) make patient data more accessible, which enhance the intra-organizational communication, streamline work flow, and in turn improve efficiency, quality, and patient centering of healthcare. Let me summarize the findings in a way that relates to these visions in a "*pro et contra*-manner":

Advantages of EPRs in medical practice:

- The patient records are not lost
- Physicians and nurses have simultaneous access to patient data, which makes more staff familiar with the patients' diseases and the medical interventions to be carried out. Also

there are more open dialogue among the occupational groups about the patient data and the proper ways to document these

- Some types of medication errors are diminished
- More structured documentation of nursing
- More coordination among occupational groups around medical aspects of the patient

Weaknesses of EPRs in practice

- The patient record is almost impossible to bring along on ward rounds, which makes it more laborious for the physicians to make medical decisions during the ward round
- It is harder for the patient to access his or her own data and to influence these
- Increased risk of illegitimate readers of patient data
- New types of errors occur around medication and test results
- Increased expenditure of time on written coordination and documentation will give lower priority to conversations and social contact between staff and in relation to patients
- Non-medical aspects of the patient such as psychosocial and ethical aspects are downplayed

In conclusion it might be fair to say that the expectations are not unequivocally fulfilled. And most likely they never will be, as one of the real important findings from the study is that there are built-in dilemmas in the employment of EPRs and the organization of activities. In order to ensure, for instance, that data is entered uniformly and unequivocally certain procedures must be observed. However, often these procedures make the accomplishment of other tasks difficult, which is why procedures are often bent.

But is this not simply a matter of lacking fit between the technology and the organization it enters? I will argue that this is not the case. In the opening of the thesis, I questioned the idea that technology exists sepa-

rated from the social organization, and hence, that the first can be designed to fit the other or vice versa. I argued that technology enters an organizational network in which both the technology and the other elements of the network are subtly or radically altered. Rearranging or replacing some elements will not "optimize" the links of the system, but introduce new kinds of relations, translations of unexpected elements, and new dilemmas to be dealt with. The empirical analyses have supported this basic point: The EPR is not a stable, uniform actor, but enters highly different practice connections, in which it sometimes acts as a word-processing tool, other times as a database, and other times again as an agenda for the work day. Likewise, the staff members of the ward – the nurses, physicians, secretaries, etc. – are not clearly defined, homogenous role incumbents, but people engaged with a multiplicity of things. Sometimes their actions resemble formal definitions of organizational tasks, but more often they are creative, curious, spontaneous actions, which follow the logic of the situation rather than the logic of formal work definitions. Across these highly heterogeneous and multifaceted practices new patterns have emerged at the ward: e.g. an increased focus on scientific-medical aspects and a redistribution of errors. The crucial point, however, is that these effects are neither caused by the EPR nor by the staff but arises from the way these two types of actants co-constitute each other and a wide range of other human and non-human actors and form new nodes of ordering.

This is not to say that we should resign ourselves to the unpredictable nature of organizational change and abandon our visions. Having expectation is great to the extent they become occasions for engaging with the world and trying things out. In this connection, there is every reason to point to the opportunities, which seem to emerge with the introduction of EPRs, but which are not utilized or possible for the present. For instance, the ward round might be restructured, so that the patient could be involved as co-reader and co-creator of record data. Also areas of responsibility might be redefined so that physicians become responsible for the form and consistency of own notes. And there might be established cross-disciplinary meetings where patient-cases were discussed on the basis of shared record data.

Yet it is a problem if expectations are never met with experiences, but are allowed to dominate the future planning, in particular when the

resources employed to fulfill the expectations are short, and when the experiments may have serious consequences for other. In this respect, there is also a growing concern that the experiences should be systematically gathered and compared in order to evaluate the experiments. However, experiences are tricky phenomena: How do we systematically gather experiences, whose experiences are we interested in, and in relation to what? In this connection, my study questions evaluation models, which operate with a before-and-after comparison of parameters. By for instance, defining "errors" as discrepancies between prescribed medication and the information in medicine scheme and physician notes it can for instance be found that the discrepancies are reduced from 33% to 14 % after the introduction of EPRs (Rasmussen 1999). Besides the fact that such evaluations do not explain how certain types of error are diminished, they can lead to the problematic conclusion that errors *as such* are diminished. However, as the study of the medical ward shows, even though some types of errors might be more seldom, other types of errors may become more common, and whole new types of errors emerge. The point is not that it is hard to isolate the effects of EPRs from other effects. The point is that the parameters we compare before and after the change process are perhaps no longer the (only) important ones. As the above list of advantages and weaknesses suggests, we are not facing more or less coordination, more or less information, or more or less errors; rather there is more of a special kind of coordination, more of a certain type of information, and a redistribution of errors.

In order to produce knowledge about the effects of new information technology, I will argue that the methodology of my study is a more fruitful one than evaluation models that operate with comparison of fixed parameters. By following work practices, talking to practitioners, and collecting central artifacts it becomes possible to map the network of activities that form organizational practices and discuss the consequences of these practices. The following list of questions might inspire this discussion:

What kinds of things are done?
What kinds of things are not done?
Who is doing what?
Who gains from the new arrangement?

Who suffers from the new arrangement?

At first sight, this alternative method may seem too laborious and too hard to squeeze unambiguous results out of. Yet if the aim is to understand the effects of new technology it is far more informative than the comparison of selected parameters: not only does it reveal other types of consequences than the ones we suspected or hoped for. What is more, it also produces more precise information about where to intervene if we want other types of effects to be more likely (e.g. how nurses, physicians, and patients can act if they want to make other things happen). In this respect, a deep study of the particular activities and organizational routines might also be a useful supplement to the "workflow analyses", which many consider a necessary tool to design more useful technologies. Workflow analyses focus on mapping the different procedures contained in various central activities. Usually, they are only employed to generate information about the way in which tasks are accomplished *before* the introduction of new technology. Thus, they seem to be based on the premise that technology does not alter the tasks and relations but simply supports them. Having studied EPRs, staff, and patients at work in the medical ward it should be clear that we should expect other things than that – that we should expect to be surprised and to meet new kinds of challenges.

How does my study relate to the general public debate about electronic patient records and hospitals? Let me shortly recapitulate the state of affairs. In Denmark the hospital has been and is in an exposed position, being criticized of inefficiency and poor quality, facing a constantly growing demand, and meeting a shortage of both nurses and physicians. EPRs have been introduced as a magic bullet that, allegedly, is able to reengineer the infrastructure of the hospital so that efficiency and quality will increase. These expectations are not questioned, instead the public debate centers on three kinds of issues: on technical issues such as how to create information standards and technical platforms, which can facilitate interorganizational exchange of electronic patient records; on security issues such as how to prevent patient data from being misused; and on implementation issues such as how to teach the staff to use EPRs and overcome resistance to change.

On the basis of the study in this thesis it seems important to stress a fourth issue that ought to be included in the broader public debate: the intraorganizational consequences of EPRs in medical practice. Although the study is based on a specific technology in a specific organizational setting, there is every reason to believe that at least some of the consequences will be found in other settings too. Also the majority of the built-in dilemmas in medical practice at Svendborg Hospital (such as the trade-off between flow of work and documentation, between quick reaction and scrupulous handling of all cases, and between overview and specificity of data) seem to be general dilemmas. In this regard, we cannot expect that all of our requirements of an information system can be fulfilled; neither should we expect that healthcare can be organized in a way, where high efficiency and broad-spectred quality go hand in hand. Rather, it calls for a political discussion about how to prioritize! What kind of healthcare do we want: a highly "scientific" and well-coordinated system, or a more informal and patient-centered system? How should we spend the resources: creating a national information-network in which a few types of patient data can circulate, or creating local information infrastructures, where staff members know much about many aspects of the patient?

I am not suggesting that one way of prioritizing is preferable to another. However, I am arguing that we should not take for granted that EPR-systems –once they are implemented and connected – will solve basic problems of the hospitals. Rather, they will solve some problems, leave other problems unsolved and introduce completely new problems. The national policy should not simply be based on the expectation that technology is for the better (or for the worse); neither should it refrain from experimenting with new technologies even if these technologies are not fully developed or cannot fit other systems at once. However, it should put much more focus on the aftermath of new technology and invite inquiry into and reflection about the inner workings of hospitals. This is not a question of defining in advance exactly what parameters or variables that must be taken into account. Rather it is a question of having keen eyes for complicated relations, on-going controversies, and hidden dilemmas.

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Resume af afhandlingen

Elektronisk patientjournaler er igennem de seneste 10 år blevet et stadig varmere emne i den offentlige debat. Sygehuset som organisation er omblæst. Det kritiseres for ineffektivitet, lav kvalitet og voksende ventelister på behandling. Samtidig er der mangel på både læger og sygeplejersker. EPJ er blevet introduceret som svar på mange af sygehusets udfordringer. Det antages, at når EPJ indføres på hospitalerne vil den strømline og forbedre informationshåndteringen, mindske antallet af fejl, give mulighed for at effektivisere arbejdsgange og højne kvaliteten af patientbehandlingen. Kun fra ganske få kanter blive disse forventninger draget i tvivl, og den offentlige debat fokuserer hovedsagelig på tre ting: på tekniske spørgsmål såsom hvordan man får skabt informations standarder og tekniske platforme, som kan muliggøre udveksling af patient data på tværs af hospitalerne; på sikkerhedsspørgsmål såsom hvordan man kan forhindre misbrug af patientdata; og på implementeringsspørgsmål såsom hvordan personalet skal uddannes til at brug IT, og hvordan man overvinder modstand mod forandring. Afhandlingens udgangspunkt er imidlertid, at den store offentlige investering i EPJ bør følges af viden og ikke blot antagelser om, hvordan EPJ påvirker medicinsk praksis.

Afhandlingen bygger på en undersøgelse af arbejdet på Medicinsk Storafsnit Svendborg Sygehus, hvor en tværfaglig EPJ har været del af dagligdagen siden 1999. Ved at følge lægers, sygeplejerskers og sekretærers daglige arbejde undersøges det i afhandlingen, hvordan EPJ optræder som del af dette arbejde, og hvordan medicinsk praksis har ændret sig fra tidligere. To spørgsmål løber som røde tråde gennem afhandlingens kapitler: ”hvordan udføres medicinsk praksis med EPJ?” og ”hvilke konsekvenser har dette for hvem?”. Indledningsvist bliver disse spørgsmål dog behandlet via et mere generelt spørgsmål om, hvordan vi kan forstå teknologi og organisatorisk forandring. Afhandlingen er opbygget på følgende vis:

Kapitel 2 begyndes med en diskussion af, hvorledes organisationsteorier traditionelt forstår relationen mellem teknologi og organisatorisk forandring. Der argumenteres for, at der er en udbredt tendens til at behandle teknologi som en variabel, som øver indflydelse på organisatoriske dimensioner og f.eks. gør det nødvendigt for disse at tilpasse sig teknologien. Dybest set opfattes teknologien som værende adskilt fra den sociale organisering. Denne grundlæggende antagelse kommer imidlertid til at indsnævre forandring til at være et spørgsmål om konkurrence mellem to separate verdner – den tekniske og den sociale – hvilket i sidste ende gør os dårligere i stand til at se, hvordan det tekniske og det sociale er fundamentalt sammenfiltrede, forandrer hinanden og tilsammen producerer uventede effekter. En alternativ teoretisk tilgang præsenteres: aktør-netværks-teorien. Den gør en dyd ud af ikke at rubricere verdnen forud for den videnskabelige undersøgelse, men i stedet stille en metodologi til rådighed, hvormed man kan udforske, hvordan det sociale og det tekniske sam-produceres. Da der imidlertid også kan rejses en række spørgsmål til denne tilgangsvinkel (f.eks. at den ikke forholder sig eksplicit til organisationer og har en tendens til at overse svage aktører) foreslås det, at den anvendes som afprøvende forskningsstrategi, hvor dens metodologiske principper ikke betragtes som dogmer, men som heuristikker, der ikke må spærre for en analyse af det organisatoriske.

I *kapitel 3*, uddybes forskningsstrategien. Undersøgelsen defineres som værende inde for et konstruktionistisk videnskabsparadigme. Dette indebærer blandt andet, at ethvert fænomen opfattes som produkt af mangfoldige netværksrelationer, og at forskningspraksissen også deltager i og selv formes af denne produktion. Videnskab er i denne forstand ikke et middel til at afdække universelle ”sandheder”, men til at generere beskrivelser af lokale netværk, som kan sammenholdes med andre beskrivelser. I den forbindelse bør de traditionelle videnskabelige kriterier om ”validitet ” og ”reliabilitet”, som tilhører en opfattelse af videnskab som repræsentation, erstattes af to andre kriterier, nemlig ”meningsfuldhed” og ”brugbarhed”. Det uddybes, hvordan disse to kriterier er blevet forsøgt efterlevet igennem forskningsprojektets forskellige aktiviteter: i involveringen med undersøgelsesstedet, i co-konstruktionen af data, og i sammenskrivningen af dataanalyserne.

Kapitel 4 er det første af i alt fire empiriske kapitler. Det handler om, hvordan lægenotater (kontinuationer) "forfattes" og læses som del af det medicinske arbejde. Det beskrives, hvordan det organisatoriske netværk af mennesker og ikke-mennesker, som deltager i forfattelsen og læsningen af disse noter, omarrangeres og udvides ved introduktionen af EPJ, og hvordan konsekvensen er ændrede roller og relationer mellem læger og sygeplejersker i retning af større symmetri og interaktion. Overordnede set fører det udvidede netværk til en styrkelse af det videnskabligt-medicinske paradigme omkring patientens sag.

Kapitel 5 omhandler sygeplejerskernes "opdaterings"- og rapporteringsrutiner. Det beskrives, hvordan EPJ deltager i disse rutiner, og der argumenteres for, at EPJ foranlediger en bevægelse mod mere skriftlig interaktion på bekostning af ansigt-til-ansigt interaktion. EPJ'en bidrager også til at skærpe et dilemma mellem dokumentation af sygeplejen og koordination på tværs af vagter og faglige territorier. Desuden er der tendens til at sygeplejen glider fra at være et "holistisk" fag til at blive mere medicinsk orienteret.

Kapitel 6 undersøger medicineringsprocessen, dvs. de forskellige arbejdsgange fra at patienten defineres som havende et medicinsk problem via ordinationen af et medicinsk præparat, der kan løse eller lindre dette problem, til det øjeblik hvor patienten indtager præparatet. Det vises, hvordan en del kendte fejlkilder består, selvom EPJ introduceres, og hvordan helt nye risici opstår. Desuden argumenteres for, at hverken lægers, sygeplejerskers eller patienters roller i denne proces ændrer sig markant: lægen tildeles stadig en hovedrolle i medicineringsprocessen, selvom han/hun bliver guidet i formuleringen af ordinationen; sygeplejersken forsætter med at udføre usynligt arbejde for at producere en rød tråd i medicineringsprocessen; og patienten bliver en endnu mere passiv modtager af diagnoser og præparater. Ydermere, bliver det videnskabeligt-medicinske rationale, der kendetegner medicineringsprocessen, stærkere koblet til markedet for medicinske produkter.

I *kapitel 7* fokuseres på, hvordan prøvesvar distribueres efter introduktion af EPJ. Resultater sendes både elektronisk og på papir, hvilket giver anledning til en ændring af lægers, sygeplejerskers og sekretærers roller og ansvar. Alligevel synes det traditionelle hierarki imellem faggrupperne at blive fastholdt. Men nye tidslige strukturer og arbejdsrytmer opstår, og gamle organiseringsprincipper for lægens arbejdsdag ud-

fordres. De nye tidslige strukturer gør det også sværere for faggrupperne at justere deres arbejde i forhold til hinanden, hvilket introducerer nye risici for patienten.

I *kapitel 8* sammenstilles de fire empiriske analyser, og deres forbindelser og fællestræk diskuteres. Begrebet "ordningspunkter" introduceres, hvilket refererer til den måde, hvorpå menneskelige og ikke-menneskelige aktører pludselig spiller roller som midlertidige organiseringscentre. Derefter diskuteres, hvordan EPJ medvirker til at gamle ordningspunkter erstattes af nye. De nye ordningspunkter opstår, eftersom interaktionen mellem personalet i stigende omfang foregår gennem skrift, og de giver anledning til en stærkere koordinering af hospitalsafdelingens aktiviteter. Imidlertid sker denne øgede koordinering omkring et mere snævert syn på patienten, nemlig som en bureaukratisk og medicinsk sag. Det diskuteres, hvilke roller læger, sygeplejersker, sekretærer og patienter kommer til at spille i det nye organisatoriske arrangement, og disse roller perspektiveres i forhold til mere generelle diskussioner om læge- og sygeplejeprofessionernes fremtid. Afslutningsvist diskuteres sandsynligheden for fejl i det nye versus det gamle organisatoriske netværk, og der argumenteres for, at EPJ ikke vil kunne garantere en "sikker organisering" eller en "fejlfri medicinsk praksis", fordi der er modstridende hensyn og indbyggede dilemmaer angående håndteringen af patientdata og angående arbejdsdelingen og koordineringen af arbejdet på tværs af vagter.

Til sidst, *i kapitel 9,* rekapituleres afhandlingens udgangspunkt og dens hovedspørgsmål, og det diskuteres hvad forskningsprocessen har tilvejebragt. Der argumenteres for, at undersøgelsen af EPJ "på arbejde" har kastet nyt lys over en række af forventningerne til EPJ. Snarere end at be- eller afkræfte disse forventninger præciserer undersøgelsen, på hvilken måde og i hvilken udstrækning forventningerne bliver indfriet, og at dette sker på bekostning af andre aspekter af sundhedsfaglig praksis. Undersøgelsen rejser tvivl om værdien af evalueringsmodeller, som opererer med før- og eftermålinger af specifikke parametre eller variable med henblik på at bevise effekter. Når en ny teknologi introduceres i en organisation forandres teknologi, mennesker, handleprogrammer, kriterier osv. subtilt eller radikalt. De nye fænomener, der opstår ud af dette, bliver ikke fanget af en sådan måling. Sammenligning af udvalgte parametre bliver i bedste fald upræcist og i værste fald decideret mis-

visende, fordi parametrene selv undergår forandring i processen. Effekter skal snarere søges kortlagt ved at følge teknologi på arbejde i de organisatoriske praksisser og diskutere hvilke konsekvenser disse praksisser har for definitionen af opgaver, for definitionen af roller og risici, og for fordelingen af rettigheder og pligter. I denne forbindelse bør vægten lægges på metodologi i oprulningen af konkrete effekter, snarere end på teoretiske forudantagelser. Aktør-netværksteori er en frugtbar indgangsvinkel til at studere teknologi i organisationer, og begrebet om ordningspunkter udvider vokabulariet for beskrivelser af, hvordan generelle effekter opstår fra mangfoldige lokale aktiviteter.

Afslutningsvist, diskuteres hvilke implikationer undersøgelsen har for politikdannelsen på sundhedsområdet. Det fremføres, at debatten om introduktion af EPJ i danske sygehuse bør suppleres med en opmærksomhed på de organisatoriske konsekvenser af den ny teknologi, og at der er brug for en prioritering af, hvilken slags medicinsk praksis vi ønsker os. EPJ kan ikke samtidig opfylde krav om sammenhæng mellem organisatoriske enheder, patient-centrering, rummeligt menneskesyn og reduktion af fejl.