Transforming information into practical actions

A study of professional knowledge in the use of electronic patient records

THOMAS WINMAN
Abstract

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Today, technologies are being introduced into historically established settings, which change the conditions for work as well as for work-integrated learning. In health care, electronic patient records (EPRs) has been implemented during the last decades to serve as a tool for planning, decision making and evaluation of care work. The overall aim of the research presented in this thesis is to analyse the complex actions and interactions that occur when EPRs are used in health care practice. Analytically, such an interest is pursued employing a socio-cultural perspective on workplace studies, where the use of technology is studied in action. Through three separate studies, practical actions and practical use of EPRs have been examined and the empirical data draws on observations, video-recordings, audio-recordings and documents from a hospital ward in Sweden.

The result shows that technologies such as EPRs both offer and presuppose standardization of terminologies and information structures. This, however, does not mean that EPRs completely format and structure information, or that it is driven by its own logic. When staffs comply with a set of standards, transformations of those standards will gradually occur. Those transformations are collective achievements and since each professional involved act in a conscious and active manner, this affects the use of standards as well as the development of collective proficiency.

The results also demonstrate that meaning making in(through) the use of EPRs presupposes extensive knowledge of the indexicality of categories, something that originates in the participants’ shared institutional history. It is in the process of reliving, creating and exposing the meaning of information, that health care professionals actually bring information in EPRs to life. In further development of EPRs that exceeds institutional and even national boundaries it is important to see this development not as solely technical or organizational questions. To develop systems that enhance the possibilities for professionals in different institutions with different professional domains to make sense of standardized information may be a much more demanding task than it seems to be. Such boundary-crossing systems are nevertheless of great importance for the further development of health care practice.
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CHAPTER 1

INTRODUCTION

Documentation is a central element of most institutional activities in modern times. We cannot conceive of a well-functioning society without the extensive use of written documents. Health care is an interesting example of such an institution with an elaborate and well-developed tradition of documenting its activities (Berg, 1996). Historically, physicians, nurses and midwives have documented care activities both for their own memory and for communicating and mediating information to others. It is from such documenting practices that modern patient records emanate. However, during recent decades there has been a transition in health care from paper-based medical records to the use of computerized information systems for documentation.

The increasing computerization in health care, as well as in society in general, challenges many historically established institutional activities. In health care today, digital technologies are regularly used in ordinary care work and have changed the conditions for everyday activities such as medical treatment, monitoring and diagnostic work. In this thesis, I have studied the implementation of an electronic patient record (EPR) at a hospital ward where approximately 300 staff members use a common system. I followed nurses, physicians, occupational therapists and physiotherapists in their daily work on the ward. It quickly transpired that nurses had a central role in communication, the transfer of information between shifts and for coordinating activities. Therefore I chose to mainly focus on nurses’ in the collection of data.

Work-integrated learning (WIL) is often used as an umbrella term to describe interests in curricular, pedagogic and assessment practices, across a range of academic disciplines that integrate formal learning and workplace concerns. As a research area it focuses on learning and knowledge relating to work and, according to Thång (2004), aims to bridge between learning and the application of knowledge. Olsson (2004) sees WIL as a perspective from which we can scrutinize how knowledge is tested and applied in practice. It is worth underlining that the position between work and
education implied in WIL is not restricted to labour work placement. Instead, there are many different practices along a continuum from more theoretical to more practical forms that are of interest in WIL. However in relation to the workplace, the intention is often to scrutinize and reflect on experiences and to develop and refine conceptual understandings. These are combined and integrated in social interaction in institutions, work and virtual environments, academic studies and formal and informal learning.

Since the early 1970s, an increasing number of international studies in the area of WIL have focused on issues related to how professionals, organizations and regions (can) develop knowledge and skills. The conditions for WIL are both changing and challenged in interaction with social change where, among other things, technological development and increasing specialization often are key factors. This involves issues of how professional, institutional, historical and cultural boundaries are challenged and changed, and the interplay with understandings of what constitutes professional knowledge and skilled behaviour. But why is professional knowledge of interest in WIL in general and in this thesis in particular? One explanation can be provided by quoting Säljö (2000, p. 151) who says “Learning is about becoming involved in knowledge and skills and to be able to use them productively in the context of social practices and activity systems (my translation)”. As Säljö points out, there is a relation between experiences generated from involvement and participation, the development of knowledge and the capability to use such knowledge in a certain situation, within a certain activity. For the current study, this means that the social and cultural contexts in which learning occurs and where knowledge is expressed are important to take into account. Such an approach provides insights into institutional and organizational factors that control or influence professionals in their work. EPRs in use are central to the work-integrated learning on two interrelated levels. Firstly, EPRs are a part of the institutional infrastructure and constitute a resource for collective learning. Secondly, in everyday health care work individual actors constantly learn about patients and their immediate past history.

Computerized information systems in health care are, variously, called Electronic Medical Records, Health Records or Medical Patient Records. However in this thesis I use the term Electronic Patient Record. From the end of the 19th century, patient records have been one of the most vital elements in the provision of health care. They were introduced to facilitate
the communication of information between caregivers. Patient records have
ever since been an important way to collect, organize and document
information. As Timmermans and Berg (2003) and Ruland (2000) argue,
patient records have been, and still are, important resources when, for
instance, evaluating care, making decisions about care interventions and co-
ordinating care work. It is to this artefact health care providers historically
have turned to in search for information about past, planned and ongoing
treatments. The records can therefore be seen as a kind of collective
memory in health care.

In the last decades, the capacity of paper-based records as tools for handling
information has been questioned (Advisory Board Company, 2001; Institute
of Medicine, 1999). In an expanding and increasingly more complex health
care sector, information becomes ever more important. Extensive quantities
of basic data and professional assessments have to be recorded, evaluated
and transmitted between members of staff, wards and even hospitals.
Proponents (Tuan, 2009; Nilsson, 2002) argue that a transition to EPRs will
enable health care organizations to solve important problems encountered
when using paper-based records. These problems relate to inaccuracy,
illegibility, incompleteness, expensive storage, difficulties to retrieve required
information and fragmented patient information. Furthermore, advocates
argue that a transition to EPRs is a way to ensure patient safety since
handwritten notations will be replaced with computer entries, which reduces
the risk for misinterpretations.

The first digital systems for documenting and handling information in
health care were introduced as early as the 1960s. Today, such systems have
become common and it is now hard to imagine health care without EPRs
for the accumulation and exchange of clinical information. For example,
more than 90% of general practitioners in Sweden now use ICT-based
applications in their daily work (Rahimi, 2009).

Although EPRs are to a large extent structured in a similar way as paper-
based patient records, they also have characteristics that are different from
paper-based records. Digitalization makes it possible to integrate different
information systems. The degree of integration extends from the simplest
form, where paper records are scanned and stored digitally, to more
complex systems where patient records are linked to databases, e.g.
containing digital X-ray information. Another significant difference is the
accessibility to records and the information therein. Compared to paper-
based records, the information in EPRs is available independently of its location. Thereby it is also considerably easier to access and convey information across professional and institutional boundaries.

1.1 EPRs and the provision of care

The aspiration at the time of the introduction of EPRs was for them to become the hub from where all information that is necessary in care work emanates. But what roles they actually can, or should have, are complex questions. Nevertheless, their function in relation to care work can be illustrated by an imaginary and quite common scenario, which is outlined below:

Let us imagine a child who stumbles and sustains a head injury. If the injury seems to be serious it might be reasonable to visit a hospital to seek help. The first thing that happens at the emergency unit is that the child, or more correctly, the ‘case’, is documented in an EPR. This makes it possible for the health care staff to search for relevant historical information about the child and, simultaneously, document, supplement, and present information. If, for example, it is a skull injury and the health care staffs are insecure of the status, they can “do a CT” (Computed Tomography) to scan the child’s head. It provides a tremendous amount of information that is helpful for understanding the extent and the location of the injury. Depending on the CT results, or even before the CT scan is done, the child might be transferred to a nursing ward for further supervision.

To give the child proper care, the staff need appropriate and up-to-date information. If this is not at hand, they may not even know why the child is there or what treatment is needed. The EPR is a tool that supplies this necessary information. During the period of observation the child might be connected to computerized monitors for continuous control of brain activity, breathing and pulse. To obtain continuity, the staff members add all the new information that is produced during the observation into the EPR so that it is available for everybody involved, now and in the future. After the CT is done, the test result is linked to the EPR and the analysis of the test results will be documented in the EPR in order to ensure that all information is readily available. All in all, the information from different professions, different specialities and different examinations form the
basis for future assessments of the child’s injury and need for treatment. This assessment is also documented in the EPR, and even if the child is discharged, but returns one week later with severe head pains, it is not difficult to imagine that such information will be important.

Today, activities such as these are all standard procedures in health care work. As the example shows, several professions can be involved in the care work with a patient. The various professionals can be called in as specialists, as the radiologist in the example, and they are sometimes placed on another ward, for example an orthopaedic ward or an X-ray department. That means that different professions and knowledge domains, belonging to different wards, at times work together around a patient.

What the case also illustrates is how care work needs to be co-ordinated and organized around the case in question, but also in relation to other assignments the individual and the ward are involved in. This requires information about patients and care work to be accessible, even between different wards.

The different staff members working together in the example elucidate the complexities of the concerns at a hospital ward. They all have different knowledge domains and responsibilities, implying specific ways of understanding and defining problems. In summary, the example illustrates that EPRs play a central role when it comes to organizing and co-ordinating the professionals’ activities.

In order to co-ordinate care-work, information has to be transmitted between working shifts. This raises demands on information that, around the clock, is up-to-date, adequate, reliable and which can ‘follow’ the patient between different wards, staff members and/or different shifts. In such contexts EPRs are often used as tools for providing staff with direct access to timely information about patients’ status and ongoing treatments.

For information to be intelligible over time and across professional boundaries it presupposes both a common structure and terminology. As a result, standardization is seen as a necessity since the increasing amount of EPR users place greater demands on the co-ordination of information for different purposes. Extensive efforts have therefore been devoted to the implementation of standardized terminologies and information structures (Fischbach, 1991; Beyea, 1999; Bossen, 2002; Häyrinen, Saranto & Nykänen, 2007).
Thus, the expectation on the information in EPRs to be accessible and intelligible for different purposes presupposes new demands on how users should express themselves; in the EPR information has to be documented in standardized ways so that other professionals can find and understand it. But standardization also embraces performance, as it mediates, not how or what something should be, but what the result of the action is supposed and expected to be. But, as Timmermans and Berg (2003) argue, standardization also embraces procedures, as it highlights what is considered as relevant parts in care work and thereby also delineates the steps needed to be taken in different care situations. In other words EPRs are inherently intertwined with a wide range of issues that, in various ways, affect work practices. Even though standardization is not a goal in itself, but a means to an end, the introduction of EPRs provides a way of remoulding how to organize and carry out care. This, in turn, has implications for what becomes considered as professional knowledge.

Törnvall (2008) argues that to be a resource for the staff members, the information also needs to be adapted to the activities it is intended to support. Is for example the notation “Adam needs at least 1000 ml of fluid every day” a suggestion, a recommendation or an order? Another example of the relationship between interpretation of information and the activity where it is used is a written notation that says an old patient has been given fluid nutrition for a long time. The original meaning might have been to convey that the patient had a lack of capacity to eat and drink properly. But in a new situation three months later, when a nurse is about to take a blood test, the information of fluid nutrition might reveal a possible problem with thin blood vessels. Therefore, how documentation is to be taken and what meaning will be read out of the text concerns both the situation(s) wherefrom the text originates and where it is to be used (read). The same information can be used in different situations, which means, Törnvall (2008) argues, that information needs to be contextualized. This entails that staff members need to have knowledge about how to bridge between the documentation and the situation in which it is read. Sacket and Rosenberg (1996) argue that:

> External clinical evidence can inform, but can never replace, individual clinical expertise, and it is this expertise that decides whether the external evidence applies to the individual patient and at all, if so, how it should be integrated into a clinical decision. (p.71)
The quotation illustrates that information cannot stand alone and that it can never provide all the answers. Instead, making information intelligible is also a matter of the staff members’ professional knowledge. So, making information intelligible concerns the readers’ and the writers’ knowledge of and about care work, the setting(s) from where the text originates and where it is to be used (read).

1.2 Studying technologies in action

There are several studies (Törnvall, 2008; Varpio, 2007; Tuan, 2009) that suggest that a transition from paper-based patient records to EPRs changes the conditions for care in a number of ways. It is said that there are considerable differences in terms of accessibility, collection, transmission, retrieval and storage of information. The transition to EPRs also concerns the coordination of knowledge as it increases the possibilities to link information between professions and wards/clinics/institutions. Bowker and Star (2000) argue that even if, fast on the heels of the introduction of computerised technologies in workplaces, changes in how information may converge may follow, “conventions of use and understandings of the impact of these social organizations are slower to come” (p. 7).

One central aspect of care practices is what the introduction of EPRs implies concerning changed strategies and competences for information sharing, communication, co-ordination and organization of care activities in local health care settings. Or as emphasised by Heath and Luff (2000), when it comes to the use of EPRs in health care:

"The ways in which these tools and technologies, even basic information systems, are embedded in and depend upon practical activities within the workplace and the practices, procedures and reasoning of staff, remain largely unknown. (p. 4)"

The main issue drawn from the citation is in line with Wajcman (2006) who argues that “more workplace studies are needed that consider how tools, artefacts and technologies feature in work practices and their accomplishment” (p. 778). And, even though the citations are relatively old the main concern remains, we still need to know more about how EPRs enter into and transform the practices, procedures and reasoning of staff members in health care.
Orlikowski (2007) sees it as important to understand the material bases of knowledgeable action, and thus makes an attempt to discuss how, in practice, the material and the social are intertwined. This is in line with Leonardi and Barley (2010, p. 3) who argue that transcending the dualisms between the social and the material that exist within many studies requires a “pragmatic vision of sociomaterial reality, a concern for the dynamics of power, attention to the role that institutions play in shaping technological trajectories and an appreciation of how social dynamics can vary across levels of analysis”. If one follows this line of reasoning, the material and the social can be reconciled by conceptualizing them together instead of separately. And according to Orlikowski and Scott (2008), adopting such a sociomaterial stance can thereby create new insights into digital technologies and human activity, as old dualisms are transcended and fresh perspectives are applied.

Another dimension of this issue is put forward by Jensen and Kjærgaard (2010) who argues that the development of work practices and communication modes in relation to EPR systems differ across various wards and different professional groups with different tasks and responsibilities. These groups will most likely interact differently with the system, use it for different purposes, and process information different ways. So from that point of view EPRs cannot be understood as having a unilateral influence. Instead, as Orlikowski (1992) argues, technology (such as EPRs) cannot be seen as something solid; its role must be seen as socially and culturally constructed and something that, further on, tends to be institutionalized. According to Orlikowski (1992), it is not the technology but how the technology is used that affects the organisation and “Users can always choose not to utilize a technology, or choose to modify their engagement with it” (p.410). But in general one can say that it is through EPRs that members of staff get access to information necessary to handle ongoing care activities. In this respect, the assumption is that there is a relationship between technology and social activities. Or, as Heath and Luff (1996) put it:

As well as a resource for hints and ideas, the record also provides the doctor with factual versions of the patients’ medical biography, so that previous treatment programs, allergies and the like can be checked and confirmed by a brief glance at the record. For doctors therefore, the record provides a reliable source of information, which is adequate for the uses it serves in the day to day consultative activity. (p. 355)
Even though the study by Heath and Luff focuses on physicians this also concerns other collaborating professions. What the quotation highlights is the relationship between information in EPRs and staff members’ activities where EPRs provide a source of vital information. Even though EPRs can mediate information from different sources, it is the meaning making in situ that determines its use and influence in ongoing and planned care activities. Furthermore, such meaning making is a vital part of what can be considered as professional knowledge. One assumption of what is already said is that when new technologies such as EPRs are introduced, members of health care staff have to develop strategies and competences in relation to what is, or what will be, considered professional knowledge. This is a reasonable supposition that also corresponds to the historical development and use of EPRs, which will be further discussed in Chapter Two.

Even though we now are in a situation where EPRs are becoming more or less routine in health care, we still need to know more about how EPRs are used, or in what ways their use enters into and transforms everyday care practices. Consequently, a point of departure in this thesis is that that the introduction of EPRs has had a massive influence on how to organize work at a hospital, but also on staff members’ modes of expression and, more specifically, knowledge and methods of performing care work.

Over the past years there has been a growing corpus of studies concerned with work, technology and interaction in organizations. These studies have often addressed the social and interactional organization of workplace activities and have scrutinized how artefacts, ranging from paper documents through to complex interactive technological systems, feature in everyday work and collaboration (Heath & Luff, 2000).

The relation between the social and the material has been studied in, for example, Science, technology and society (STS) where scholars are interested in the relationships between scientific and technological innovations and society, and Human Computer Interaction (HCI), where scholars have an interest in developing applied findings for design. These questions have also been studied in fields such as Computer Supported Cooperative Work (CSCW), and Computer Supported Collaborative Learning (CSCL). Further, there is a growing interest in pedagogy concerning how we can understand the use of complex digital systems and organizational change.
The emergence of digital technologies in workplaces is leading to a growing need of knowledge about systems to support new forms of social actions and activities (Luff, Hindmarsh and Heath, 2000). Documents and documentation are examples of such artefacts and activities that often have been transformed by the introduction of digital technology. This thesis draws on workplace studies where the technology is scrutinized in action and, particularly, the ways in which documents are produced, read, and shared within the developing course of practical activities. I examine how staff members use EPRs in their ongoing practices and such a perspective can provide answers to the questions about what EPRs are used for, how they change conditions for care work, and what will be regarded as professional knowledge, all of which relate to the research area of work integrated learning. Viewing the use of technology as a process of usage enables a deeper understanding of the constitutive role of social practices in the use of EPRs in health care.

It is reasonable to presume that in practice, there are several activities concerning each patient, which on one hand leaves marks in the EPR. Simultaneously, those marks, on the other hand, affect the coming activities. That means that there is a transformation from work to information (in the EPRs) and from information to work, and each such transformation is a reification of professional knowledge. Learning and knowing has historically been understood as an ability to memorize. Today, however, it is more relevant, from a pedagogical perspective, to pay attention to how knowledge is transformed to information, and how information is transformed into knowledge. Or as Säljö (2000, p. 242, my translation) puts it: “how does one select, evaluate and organize information to make it relevant in different contexts? How does one create coherence between disparate pieces of information so that it becomes useful and productive in a social practice”? The knowledge then involves making information intelligible within structures and categories in EPRs.

From the discussion above, the theoretical and methodological perspective in this thesis is that EPRs cannot be isolated from the context in which, as technologies, they are used. This involves taking into account the social, cultural, institutional and historical context and, for this reason, I have chosen the sociocultural tradition as a theoretical base and which will be elaborated on further in Chapter Five.
1.3 Aims and research interests

The overall aim of this study is to contribute to the understanding of the importance of the complex activities, actions and interactions that occur when EPRs are used in a health care practice.

From this overall aim, three specific questions emerge that are outlined and addressed in the separate studies comprising this thesis. These questions are scrutinized in three activities that were identified during the fieldwork at the hospital ward.

The first study concerns the overall coordination of daily care work where EPRs are used. Focus is on the daily use of EPRs, where staff members read and share information about the patients’ health-status and need for care. Here staff members make new entries in the EPR to mark test results, provide information about, for example, anamnesis and interventions. As a part of this process the information helps to make relevant what to observe and what to do. That, in turn, affects what it is that has to be reported, organized and further documented in the EPR in daily work. The first research question thus deals with how EPRs intervene in and structure the production and use of information concerning patients’ problems in the context of rehabilitation.

The second study concerns the practical work of selecting and organizing structured information in EPRs in order to make sense of past and future health care activities at shift-reports. When there is a shift-change between staff at a ward those who entering the workplace meet to get a report of what has happened and to allocate tasks. Since none of the outgoing staff members are present, all of the information about patient-status, on-going and planned treatments and activities are made available via EPRs. In the report, issues like how, when and who should do what, are discussed in order to provide continuity and organise the care work. The second research question thus deals with what knowledge is inherent in processes of transforming vast amounts of information into the brief presentations that are relevant for staff members in their care of patients.

The third study concerns the issue of how EPRs function as a resource when information from different professionals needs to be taken into account in collective decision-making. This study is based upon team-rounds, which are weekly held meetings where representatives from all professional groups on the ward meet to evaluate, plan and make decisions about care activities. In
so doing, they regularly use EPRs both for extracting information and for writing down the outcome of the team-round. The third research question thus deals with the ways in which access to structured information from multiple professions effects agreements about patients’ future care.

1.4 Outline of the thesis

This thesis is divided into two parts. Part One is organized in the following way:

**Chapter 1** Introduction, aim and research questions

**Chapter 2** The history of electronic patient records

In this chapter I will demonstrate how patient records are a part of an historically emerging tradition of organizing knowledge, work and learning activities. A particular focus is directed to what we can learn about our current practices, tools and routines by tracing their institutional history. Thus, I will show how patient records have developed from paper-based documents to electronic patient records.

**Chapter 3** Structure of electronic patient records

EPRs contain information deriving from different professional and organizational perspectives and are supposed to facilitate opportunities for the planning, evaluation and performance of health care work. That, however, presupposes that the information is structured and categorized in a way that makes it possible to relate it to and to use in practice. This forms the focal issue in this chapter.

**Chapter 4** Previous research on electronic patient records

In this chapter I provide a brief overview over previous research on EPRs.

**Chapter 5** Theoretical perspectives on researching electronic patient records in practice

In this chapter I will show how documentation is an institutionalized activity in which members of staff have to adjust and learn to handle categorization and classification in EPRs. In particular, I will describe how learning is understood and how this stems from the theoretical approach in this thesis.

**Chapter 6** Entering the hospital ward: Methodological considerations
In this chapter, questions concerning data collection as well as ethical and analytical issues are discussed. Here, I will guide the reader through the processes and thoughts during the fieldwork.

**Chapter 7 Summary of the studies**

Three analytical questions outlined in relation to the core activities identified in the fieldwork form the bases for three separate, but nevertheless closely connected studies. The purpose of this chapter is to provide brief summaries of each study.

**Chapter 8 Discussion**

In this final chapter, the concerns discussed are how standardized information is retrieved and utilized by the staff in different activities. The focus is directed to what knowledge is needed to transform documented information into relevant and useful knowledge, and how knowledge and findings from different activities are transformed and categorized within a standardized system. These concerns are further developed and discussed from the perspectives of meaning making, the creation of logics and indexicality.

Part Two includes three empirical studies as reported in the following three articles:


I had the main responsibility for the design and planning of all three studies, as well as responsibility for the empirical field work, data analyses and preparation of the manuscripts.
CHAPTER 2

THE HISTORY OF ELECTRONIC PATIENT RECORDS

In this chapter, the aim is to describe the history and emergence of electronic patient records, and the role of EPRs in changes in the organizing, coordination and communication in health care. The following historical account is divided into three sections: Historical development of documentation in health care, Patient records and standardization and From paper-based records to electronic patient records. The division is based on how patient records have evolved from being handwritten (more or less personal) notations of ongoing care, to become computerized artefacts for documentation, communication and information sharing. The focus is on how electronic patient records, as part of knowledge production, has evolved within, and at the same time are connected to, the development of the health care sector in Europe and North America.

Electronic patient records are preceded by a historical documentary practice in health care that is intertwined with the development of science, education and organization of health care. The history of patient records must be understood in light of the kind of problems and dilemmas that these records were intended to solve. At the core of this process lies the issue of how actors in health care have been held responsible and accountable for certain actions, both within and between professions, as well as in relation to other stakeholders outside health care professions.

2.1. Historical development of documentation in health care

Documentation of care can be traced hundreds of years back in time. Up until the early 20th century, records were the physician’s private documents, often more or less taking the form of personal stories that described the physician’s working day. Most doctors documented their work in some form or another. Because of the way their field of work was organized, the records were more likely to be considered as personal work notes that were
structured chronologically and retrospectively. However, such records functioned both as diaries and as help for the doctors to remember vital aspects of their own ongoing work. This way of documenting care was sufficient as long as the care work was organized around the doctors themselves, i.e. that every patient only had one doctor.

**Challenges and changes in health care**

Even though medical care is one of the most established institutional practices in Europe, or indeed in the world, the conditions have changed dramatically over the last 100 years (Timmermans & Berg 2003, p. 30-31). Until the beginning of the 20th century, most hospitals in Europe and North America were for poor people who could not be taken care of by their families and who could not afford to pay the local doctor. It was not uncommon for the hospitals to be run by religious organizations and hospitals also cared for the poor and the elderly, as well as the mentally ill. More well-off members of society would have a family doctor who often worked alone, possibly with the help of a nurse. Similarly, hospitals were organized so that all doctors had their own patients (Howell, 1996).

As part of the development of a welfare state in Europe and North America, the communal responsibilities towards the citizens changed. A system for pensions developed, holidays and vacations emerged as entirely new phenomena, and the need and demand for the right to medical care that treated everyone equally became more and more prominent. In response to, or as a part of, the change in society, the character of hospitals in the western world changed at the beginning of the 20th century. At this time (1900-1920) the status of hospitals in Europe and North America began to shift from being shelters for poor and marginalized citizens into being institutions providing medical care. The organization of care gradually shifted from family doctors, who performed a range of house-calls to sufficiently affluent citizens, into the emergence of general hospitals that became centres of medical care catering to the general population (Howell, 1996).

While one significant change was that hospitals now became responsible for a larger number of patients, the more important change was the way in which patient care was organized. The doctors no longer had “their own” patients and the work was now organized in teams around the patients. The difference may not seem significant, but it meant that the organization,
training, work methods and documentation needed to be drastically changed (Berg 2004). Previously, when documentation was more or less private notes, it had been centred around the doctor, whereas it now needed to be centred around the patient, i.e. the documentation needed to be intelligible for all staff members that were involved in the care for each patient. Jakobsson and Lütsén (2009) describe that in the teams working around the patients, various types of knowledge were needed. This implied an increased specialization that in extension led to, for example, nurses getting more independent tasks and therefore becoming more autonomous in their work.

Between 1910 and 1940, other professions emerged, e.g. physiotherapists, occupational therapists, radiologists and anaesthesiologists, with specific, complementary knowledge domains and responsibilities. Even though these to some extent had been present before, the reorganization within the hospitals made the need for specialized competences more prominent. This in turn meant increasing demands for a more heterogeneous and clearly standardized education that could guarantee that the staff possessed adequate knowledge and proficiency.

For the hospital staff, the changes in the organization of health care meant that the conditions for work were changed as well. To have professional knowledge now meant having the ability to partake in a team where each participating profession had a specific expertise and responsibility. But in order to inform and understand each other the previously “private” documentation needed to become a common source of information about patients and care (Howell, 1996).

**Education of professionals**

These changes placed demands on professional education – the medical schools – to provide more homogenous levels of attainment in the education of professionals. Even though the parties involved realized the need for a well-educated medical corps, they were divided in regard to which type of knowledge and competence a doctor would need to be seen as competent. In the period 1900 to 1920, medical educators in both northern America and Europe had to devise new ways of organizing and carrying out medical training to meet the new demands for skills and knowledge among staff in the health care sector (Berg & Winthereik, 2004). When trying to organize medical education it soon became apparent that the
differences between hospitals in terms of resources such as equipment, premises and access to educated staff were substantial (Stevens 1989).

From an educational perspective this meant that there was no consensus as to the type of education a doctor required and there were substantial differences in relation to content, direction and standards between the different schools. Questions about what subjects were needed, which direction to take and what to include in the education were not commonly agreed. This made it difficult for educational providers to offer a uniform, adequate education and prepare students for their professional work (Stevens, 1989). To address this problem the medical educators urged the hospitals to examine, evaluate and document how they were working, what knowledge the various professions needed in their work, and what kind of technical equipment they were working with (Timmermans, 2003).

**Technical and medical changes**

Between 1910 and 1930, the expansion of hospitals in North America and Europe led to an increasing need for technical and medical equipment. That opened up a market for the newly established medical-technical industry (Howell, 1996, p. 228). This industry was closely connected to different kinds of technical and biomedical developments. For example, new drugs such as penicillin and technical innovations (x-rays, sterilized instruments and electrically lighted operation rooms) changed the conditions for treatments and thereby had a massive impact on health care. The technical achievements in health care brought demands from the medical-technical industry to more systematically gain access to information about when, how and for what purposes the new technologies should be used in health care (Beckerman, 2006).

**Evaluations and examinations**

The need for the hospitals to examine and evaluate their own work came more or less simultaneously from both educators and the medical-technical industry. To do that within an organization is very demanding and to do so in a number of organizations proved to be nearly impossible since they were so different from each other. What was difficult was to make the evaluations and examinations worthwhile for the different stakeholders. Different actors in the hospitals focused on different things in different studies and, moreover, they expressed themselves in different terms. The same occurred when comparing examinations from different hospitals. For example, a
specific treatment could, in one hospital, be described in terms of the way the work was organized. Another hospital might place greater emphasis on access to technical equipment, while a third might describe the treatment in terms of when and on what premises the treatment was commenced (Timmermans & Berg, 2003, p. 50).

2.1.1. New ways of using patient records

In the beginning of the 20th century there was no shared understanding regarding how, and from what perspective, health care should be evaluated and further developed. This made it difficult to draw any general conclusion in terms of quality from the changes the health care was going through. This was seen as unacceptable and in conflict with the efforts of governments to provide an equality care for all citizens.

Timmermans and Berg (2003) argue that hospitals themselves identified a need to transform the individual care knowledge of professionals into collegial knowledge commonly shared between the professionals. No matter which doctor the patients met or at what hospital they received care, they should have the right to the same quality of care. In this situation, patient records were seen as an important resource for improving the quality of care.

It was at this time (1920-1930) that the educational institutions and technical medical researchers proposed that the notes taken by the doctors on an individual level should be reformatted into common patient records (Timmermans & Berg, 2003, p. 53). These records should then be further developed to become a more general and all-embracing tool for gathering information (Timmermans & Berg, 2003, p. 84, 91). They were intended to function as adequate tools for collecting the information that the hospitals, the medical schools and the medical-technical industry needed for developing their professional knowledge and their work. For all of these reasons, the records needed to include not only information about the patient’s medical conditions, but also information about planned and ongoing treatments (Stevens, 1989).

The patient record was also seen as an important means for the hospitals themselves to evaluate and develop their own organizations. The new working conditions in hospitals accentuated the need for them to set up guidelines for how to organize, coordinate and carry out care. This also
stressed the needs to find ways of transferring information within and between different care-providing teams.

However, the comparison of health care work within and between organizations presumed that the records had a common structure readily recognised by those professionals inputting information, as well as those using the records. So, records had to be transformed from “personal doctor stories” to more standardized and commonly structured records (Montgomery Hunter, 1991, p. 6, 56). This transformation of patient records evidenced a conscious desire to bring information from different perspectives and places together in a structured way.

In the records, information about each patient needed to be adequate and correct. It also needed to be available and understandable to other professionals. So there was an underlying need for making information visible to all participants concerned. Moreover, information needed to be searchable and structured in a way that staff, management, educators as well as people in the medical and technical industry could relate and adapt to (Timmermans & Berg, 2003). Accessibility to information concerned both how and where to store the records as well as demands on making the content intelligible.

To keep and structure records in a way that was recognisable to users as well as those inputting information presented a major challenge and structured records now one of the most powerful tools in health care. An increasing volume of medical records that were homogeneously structured made it easier to transfer information between colleagues. The development of medical records thus contributed greatly to the accumulation of knowledge where information from different sources could be studied and understood in the light of various ways of performing and organizing work (Berg, 2004).

Hospitals and societies soon saw records as a tool to achieve something beyond the retrospective use of documentation (Berg & Winthereik, 2004, p. 533). The large amount of information that was accessible through records made it possible to conduct large-scale prospective survey studies. Thus using written information to anticipate the progress and spread of diseases and injuries was, and still is, connected to an institutional professional knowledge maintained by patient records. Consequently, those early records were fundamental for the development of medical science since they could capture progress and methods in a way that had never
previously been compiled and registered. As Huffman and Price put it (1972, p. 17), referring to an editorial from 1919 about patient records:

records, therefore, are the prime essential in any program of hospital standardization… records are the visible evidence of what the hospital is accomplishing… and to not maintain records properly is like running a factory without a record of the product.

In the 1920-1930s patient records became understood as important for reasons other than those initially conceived. Timmermans and Berg (2003) explain that, seen from a perspective of public health and epidemiology, information from patient records soon became an invaluable source of structured information. Different medical breakthroughs could be evaluated and translated into general practice advice. Pharmaceutical research that was primarily conducted at the universities could be conducted systematically, side by side with chemistry and biology, as well as with the health and medical care, where the problems were discovered and where the medicine was to be used.

One example of a medical breakthrough that was translated into general practice advice is how, in surveying the aggregated knowledge contained in records, it became possible to interpret different symptoms, and thereby also diagnose diseases such as tuberculosis. Another example is how the spread and cause of various diseases now could, from demographic and epidemiological perspectives, be detected. Polio is such a disease that hit Swedish society hard. Between 1905 and 1962 some 51 000 people contracted polio, resulting in some 600 deaths. Ignorance of polio was high and, according to Axelsson (2004), a widespread belief at the turn of the century was that polio was a result of the increasing stress of modern life. However, as a result of a series of studies where patient records constituted an important source of information, scientist concluded that Polio spread through contaminated wastewater flowing into rivers and lakes where people bathed and collected water for domestic use.

Other findings from studies in public health and epidemiology that have changed our daily lives are, for example, the connection between the quality of water and ill-health and the relationship between sterilized surgical instruments and the risk of infection. Further, working conditions and the importance of access to various forms of help and support could also be mentioned. All of these breakthroughs contributed to a political debate concerning the need to regulate work conditions and enabling people to
place demands on society. In a way, it can therefore be said both that patient and medical documentation is based on both administrative and professional interests, and that it has played a part in the growth and development of modern society.

Maintaining records on the provision of care was regarded by all stakeholders involved in the care sector as a means of controlling situations over which no single professional possessed a general overall view at any particular point in time. In the 1930-40s, the care professions and the administration of hospitals could soon see how an increasing standardization of patient records not only made it easier to compare and evaluate methods, but also to do research on medical work. As Berg and Winthereik (2004) contend, this increasing standardization turned out to be a way for the professions themselves to connect medical work to the rigorous methods of science. Moreover, the information that patient records offered was of great importance for medical researchers and the medical technical industry, both for testing and assessing new methods and solutions, but also, as Nilsson (2002) argues, for discovering in what ways quality in health care could be improved.

As Varpio (2007) has claimed, the extensive access to information from patient records contributed to the fact that medical progress could, alongside results from research in biology, chemistry and medicine, be properly evaluated. In Sweden for instance, such analyses of aggregated information from patient records were used in the 1940-1950s to develop general policies (allmänna råd) and directives from the National (Swedish) Board of Health and Welfare and Swedish Medical Products Agency (Läkemedelsverket) in the. The national guidelines for the treatment and documentation of stroke care provide a good example. Stroke is a trauma which was once seen as irremediable, and for which the only help offered was, more or less, long-term medical care with minimal chances of improvement. However, by evaluating different care interventions and searching for regular patterns in the patients’ living conditions, stroke-care, stroke-rehabilitation and preventive work were all steadily improved. Stroke is also an example of how medical research has developed new care methods by utilizing structured information from patient records from a number of health care providers nationwide (Socialstyrelsen[The National Board of Health and Welfare], 2009).
In summary, several stakeholders supported the development of commonly structured patient-centred medical records. Hospitals’ need for knowledge about how to perform and organize care was aligned with the needs of both the educational institutions and the medical-technical industry. In such a context, commonly structured medical records were seen as an important resource for making comparisons and thereby aggregating information.

As a resource patient records have been used to meet a wide range of needs brought about by the transformation of health care. An important factor in the development of modern health care has been the access to information, and the opportunities that such access provide for extracting and aggregating data for multiple purposes. In this sense, the patient records with their transparency between staff, care units and institutions has become a powerful tool. The increasing standardization of structures and terminologies in the records opened up for uses beyond concrete patient work. It became possible to combine and analyse information from different sources and to easier obtain an overview over methods, treatments and diagnoses. The access to information also increased the possibility to cooperate within and between different care providing institutions, as well as governments, to develop general policies and directives.

2.2. Patient records and standardization

The first attempts to standardize patient records appeared in the first decade of the twentieth century and they had a structure quite similar to questionnaires. The structure of medical records divides complex aspects of pathological entities, patient data and care work into different categories and sub-categories (Fig. 1). Personal data is sub-categorized as name, date of birth and family, and allergy is divided into sub-categories such as food, pollen, insect bite and medication.
It is reasonable to argue that the structure of medical records is closely connected with how to understand problems in health care which, in turn, is connected with how care work is performed. Patient records were and still are a resource for developing and identifying positions and relationships between different topics, such as for example recovery processes and medical treatments. For example, a question about oversensitivity also highlights what information is vital and, consequently, provides an indication as to what care activities have to be carried out, how they should be carried out, and how to avoid certain products or environments that might trigger oversensitivity.

Over time, patient records came to have a coordinating function between the knowledge domains of professionals and this contributed to increased and locally-shared forms of knowledge. As the information in the records were evaluated, recorded and transferred between staff and between different working shifts, they contributed to coordinating a chain of care activities between different professionals (Bossen, 2002, p. 178). The development of structured records simultaneously made clear the need and usability of medical language (Berg, 2004). Otherwise different physicians and nurses would run the risk of using more or less private terms for the
same occurrence or aspect of care, which would reduce the transparency of the record (Patel, Kushniruk, Yang & Yale, 2002, p. 9).

The need for a uniform terminology and structure increases, if different professions and different departments and clinics, define concepts in different ways according to the needs and context they find themselves in. In fact, several studies (e.g. Karlsson 2001, Nilsson 2002) show that the absence of a uniform terminology limits the use of records in decision-making processes.

In general, one can say that using the same term for different phenomena increases the risk of misunderstandings. ‘Blood clot’ is an example of a term that was commonly used both in everyday speech and in notations in early patient records and which turned out to have too wide and imprecise a meaning. With the introduction of a more standardized terminology, ‘blood clot’ was replaced with the more precise medical terms *emboli*, *trombos* and *tromboembolism*. The development of standardized terminology is also connected with medical research and new findings. In the middle of the 20th century “kräfta” was replaced with *cancer* in medical settings in Sweden, although “kräfta” still existed as a lay term. No matter which term was used it denoted a tumour or growth. However, cancer has now become an umbrella for *carcinomas* (tissue derived tumours) and *sarcomas* (cell derived tumours) since research now distinguishes different types on the basis of on their spread, the complications they entail for the patient, and the different methods of treatment.

To have a common terminology that enabled the transfer of information did not seem, judging by contemporary articles, to be much of a problem for the medical corps. The strongest objection that was expressed was connected to the fear that standardization threatened the autonomy of the individual doctor (Timmermans & Berg, 2003). However for a long time the medical corps had a standardized terminology based on Latin, which made the process of standardization easier. The challenge was to put the terminology into a context that was about creating transparency and making information related to the patient and medical care available to others.

To sum up, the standardisation of the terminology in and the structure of patient records has evolved from the early 20th century. It has increased the transparency of information maintained in patient records from different knowledge domains such as neurology, rehabilitation and medication. This
transparency has been evaluated and aggregated to arrive at new understandings of preventive medicine, diagnostics and treatment methods. Those understandings have dramatically changed the organization of care, how to use medical equipment, the professional need for knowledge and methods of collaboration.

2.3. From paper-based to electronic patient records

With the increasing specialisation in health care it followed that the physical location of the paper-based record became problematic as each profession usually kept their own records in their own archives during a period of patient care (Berg, 1996). Whenever needed, for example during rounds, the records were taken out of the archive (see Figure 2, below) and brought by the person using it. So, when paper records were used, they were only available for one person at time. This scenario is still true today for those working with paper-based records. If someone else wanted to read or document something at the same time, it was first necessary to locate the record. And, when it was found, a wait might still be involved, depending on the needs of other colleagues.

![Figure 2, Hospital archive of paper based patient records.](image)

Nilsson (2002) argues that the fact that records had to be physically moved from place to place had at least two major consequences. First, staff had to spend large amounts of time registering where the records were located (or ought to be located), and, secondly, whenever the record was ‘in transit’ the information itself would equally be ‘in transit’. Thus there could be a
problem with the gaining access to the information documented in the record. This in turn had negative consequences for the possibilities to plan, and/or assess the effects of care activities. In order to maintain necessary continuity, staff members, both between and within different professional groups, needed access to information in order to adjust and coordinate their activities, and their understanding of these activities.

At the end of the 1960s, the demands for better access to patient records increased. To circumvent the negative consequences that the lack of accessibility to patient records caused, computerized systems were put forward as a solution. EPRs were increasingly seen as a solution to the prevailing problems of constrained accessibility, as they are accessible to everyone connected to the server. But the first computers in health care in Sweden were only used for handling administrative tasks in hospital wards (Ehnfors, Ehrenberg, & Thorell-Ekstrand, 2000). At that time, the early 1960s, the only information that could be shown and used for medical use was the length of periods of patients’ care. Later on, laboratory results and information from technical equipment could also be digitally stored and monitored. From the late 1960s through to the 1980s records began to be computerized as a solution to the lack of accessibility associated with paper-based records. From the 1990s to the 2000s, most patient records were computerized, although there were still local differences between different systems and ways of using EPRs.

Electronic patient records, as well as paper-based records, are supposed to contain information that is of importance both for care and administrative purposes. Care professionals enter information into the EPRs about, for example, the patient’s personal data. This includes dates of birth/registration, the patient’s health problems, symptoms, previous health problems and the current condition, as well as ongoing and planned treatments, test-results, and the requirements for everyday living (see Figure 3). Thus, even when the patient records are digitalized, there are similarities in the structure and classification of information in comparison to paper-based records. It is probably safe to assume that these similarities contributed to the transition from paper-based patient records to the use of EPRs.

However, Pascoe et al. (2008) have found that it has become increasingly common that the EPRs contain and provide access to written patient information not only from different types of care professional, but also
from different wards, clinics and even care institutions. In addition to text-based information, EPRs also contain other kinds of information such as digital x-ray images, ECGs and EEGs. Figure 3 below shows an EPR that provide access to different care episodes, medical lists and referrals.

![EPR interface](image)

**Figure 3. Example of an EPR interface (author translated).** The large area in the centre is divided into two parts with a column of standardized categories on the left side and areas for notations on the right side. To the left one can choose care activities, care episodes and at the top one can chose profession.

As seen in Figure 3, patient records are based on categories such as Care Measures and Problems. The structures between categories and topics point to their relation to each other. The interface in Figure 3 is an example of a patient record that is “standardized and commonly structured” (Montgomery Hunter, 1991, p. 6, 56). To a great extent categories and topics, such as Care Measures and Problems, as well as Planned and Ongoing Treatments, originate from dilemmas, responsibilities and knowledge that staff members historically have met and manoeuvred in
their work (Florin, 2009). Consequently, categories and structures that patient records are based upon reflect the terminology that is already used in the various professions.

To sum up, this chapter has mapped the changes in the provision of health care from the beginning of the 20th century. Those changes, leading up to health care of today are closely related to the introduction and use of patient records. Changes in ways of organizing work and coordinating activities have enabled staff members to communicate in different ways such as, for example, between shifts, between colleagues and even between different care episodes. In fact, the patient record was, and still is a significant dimension in health care provision and plays an active role in the development of care work.

Moreover, it is clearly evident that there are great expectations associated with the introduction of EPRs in health care settings. EPRs are supposed to function as a tool for the coordination and organization of health care work, to function as a bridge for transferring information between staff, professions and institutions, as well as over time, interests, discourses and situations. In the next chapter a more detailed understanding of the nature of the EPR and the things that care professionals have to adapt to and manage, will be presented.
CHAPTER 3

THE STRUCTURE OF ELECTRONIC PATIENT RECORDS

Staff members in health care spend considerable time on activities such as documenting, archiving, retrieving, distributing, and reporting information. EPRs are thereby not only a bureaucratic tool for documentation, but as Nikula (2001) and Ruland (2000) argue, a tool for making sense of care situations and for gaining a comprehensive understanding of both what constitutes a problem and how to address it. As a means of deepening the understanding of the EPR as a tool used by care professionals in their daily work, I will in this chapter describe the internal structure of the EPR.

In terms of its use to communicate and transfer vital aspects of care work between professionals, professions and organizations, the amount of information stored in an EPR is enormous. It is not uncommon to have ten to twelve pages of text-based information about one patient in an EPR. That, however, does not mean that all of the information is equally relevant in every situation in care work. Nevertheless members of staff must be able to find exactly the information that is relevant at the moment when it is needed.

The expectations are that information contained in the EPR could, if it is accessible and intelligible, play a crucial role in understanding a situation. The greater the expectations and demands are to facilitate the multiple use of information, the more important it is that the underlying structure accurately reflects the nature of such information in different situations (Hanseth, Monteiro & Hatling, 1996). At the same time, just as the record needs to be well structured, it also needs to be open enough to incorporate aspects that are impossible to predict and that can only be discovered in different contexts.

All of the information in EPRs is stored in some kind of structured representation. Actually, structure is essential if a system is to be active in organizing information for the care professionals, as well as to support a valid aggregation of data. Therefore one can say that an ambition for health
care is to have an architecture for structured information which both represents the process of clinical care and is adequate for the other uses of the information collected.

If the intention is that a transition from paper based records to EPRs is to facilitate browsing as well as automated compilations of data, a prerequisite is that computerized records need structured data. Even clinical information like “19-07-97 serum glucose = 110 mg/dl”, cannot be handled as a string in EPRs; different aspects of quality or advanced processing need the presence of precise data to be handled. In fact, a requirement for computers to handle data is structures that are regulated by standards. Those structures and standards can vary from system to system but, in general, are shaped by ideas on how clinical information should be organized which, in turn, affects how work is understood.

A general structure for EPRs has been developed by The European Committee for Standardization of Health Informatics (CEN). In June 1999 they approved a sector-wide standard, the Communication of Electronic Health Care Record. In this standard there are four general aspects:

**Architecture** This defines how features of recorded components are nested—e.g. different modules and data items. A major aspect of architecture handles the exchange of clinical documents between heterogeneous software systems.

**Domain term list** On the one hand this includes tables that characterize the record components and, on the other, it includes concepts and categories in the record.

**Distribution rules** These rules regulate access to each record component. The distribution rules regulate who is authorized to read and write in different parts of the system, mostly on a personal, professional or organisational level.

**Messages** This defines how clinical information and related data are supposed to be communicated.

On a system level, those four aspects of structure need to be taken into consideration when building or implementing EPRs in an organisation. How those aspects are handled also have major implications for the very concrete use of EPRs.
**Records**

A record can be described as organized in what Rossi Mori and Consorti (1999) refer to as nested complexes, i.e. different documents that contain different kinds of information. These documents convey information and may in turn contain structured and/or unstructured clinical data (e.g. free text or images not directly processed semantically).

The documents may be divided into sections and some sections may be organized into (i) **purpose related clusters**, (ii) **clinical statements**, or (iii) **main categories**, i.e. a list of homogeneous processable units, each representing a clinical situation, for example symptoms, laboratory results or a list of planned activities.

The main categories can be arranged in different ways for different purposes. This means that they can be individually handled according to task-dependent criteria, e.g. to form a base for making decisions about treatments. There are also **subcategories** that, often, are structurally arranged to facilitate interpretation according to the original context. To achieve this, a main category must be constructed from two explicit parts:

- the **clinical concept**, which relates to abstract record-independent features, i.e. the nature of the situation (e.g. x-ray procedure or anamnesis) and its essential details (e.g. body part, approach, extent, instruments),

and,

- the **status concept**, which relates to factual circumstances in a particular patient record, e.g. information about the subject of information (e.g. “patient” or “relative”) or the actual status (e.g. an activity may be “done” or “planned”, a finding may be a “goal” or “the result of observation”).

The **architecture** and **distribution** rules of EPRs are important since members of staff regularly need different information depending on the local context and situation, and the specific task (at hand). This presumes that modules with different professionals’ patient records and modules such as x-ray and laboratory are integrated into the EPR and supply the staff with detailed information (Socialstyrelsen, 2006:107). Goodwin, Pope, Mort and Smith (2005) argue that the complexities of EPRs as systems – and the needs for a structure and uniform terminology – increase as EPRs are supposed to be integrated and used with several different complementary modules. On the other hand, if there are no complementary modules integrated within the
EPRs, the records can more or less serve as a simple means for staff to gain a general overview of a patient and the ongoing treatment, but not for more comprehensive or advanced tasks (Karlsson, 2001; Vimarlund, 1999).

Another prerequisite for using EPRs in decision-making processes and for planning is that it is possible to find relevant and correct information, which refers back to the term list. This means, as Beyea (1999) argues, that it has to be possible to search for information in the EPR based on a number of specific terms (a noun or compound word used in a specific context or classifications, such as, for example, the dividing up of objects into classes). A related theoretical concept is categories, which will be further elaborated in Chapter Five.

There have been several attempts, even before computerization, to standardize and structure the terminology, such as the NIC (National Intervention Classification) that was developed in the USA. Another system is the American-British developed Snomed CT (Systematized Nomenclature of Medicine, Clinical Terms), which is an international system of terminology that contains more than 350,000 different terms and classifications that have been translated into Swedish. This is a system that the Swedish government want to introduce in the entire health care and social welfare sector. The government hopes that this system will ensure secure and proper communication and information-sharing between wards, clinics and social welfare institutions (SOSFS, 2008:14). In the long term, it is even supposed to facilitate communication between different international health care providers. However, as Karlsson (2001) and Nilsson (2002) point out, if different users define terms differently, each particular use of a concept will be dependent on the context in which the patient is situated. In the long run this could be the cause of misunderstandings.

According to Fischbach (1991) there are basically three different ways of structuring information in patient records, depending on how the information is supposed to be used. The most traditional system (based on how paper-based records usually were/are structured) is source-oriented. In this system all documentation emanates from one profession (every profession has its own record) and it is written in a chronological order. In a system that is problem-oriented, the problem or underlying need for care determines how to organize the documentation. The third system type is known as process-oriented, where every patient is described based on a number of categories such as, health status, goals, measures, and evaluations.
However, as Finchbach (1991) points out, the structure in records can be combined in different ways. It is therefore difficult or even misleading to talk in the terms of organizing information in just one of these ways. It is often possible to build in several functions, which can be structured in different ways.

The VIPS system (Well-being, Integrity, Prevention and Safety), which was in use at the hospital that served as the empirical case in this thesis, functions as a good example of a system that electronically handles information in an attempt to uphold all three orientations, i.e. source, process and problem orientations. Whilst the process part is important for organizing work, the problem part is important for organizing information based on health problems or needs, and the source part is important for knowing from whose perspective a notation is to be read. It is based on a set of main categories with subordinated categories, as shown in Figure 4, below. The intent, through clear and consistent categories (keywords), is to increase the availability of information and to provide for an overview of the patient record’s content (Ehnfors, Ehrenberg, & Thorell-Ekstrand, 2000).
At the top of the figure a flow-chart of a VIPS model is provided. Below are the categories that are linked to every care intervention (Ehnfors, Ehrenberg, & Thorell-Ekstrand, 2000).

The figure above illustrates the relationship between work procedures and structures, and the terminology in patient records based on the VIPS system. The VIPS system was designed in Sweden and, according to Ehnfors, Ehrenberg and Thorell-Ekstrand (2000), was basically developed as a resource for registered nurses to structure documentation. It has gradually evolved to include other professions as well and to facilitate communication in and between professions by means of EPRs. The structure of patient records is, in this empirical case, common for all of the involved professions. The different professional modules (such as e.g. the nurse’s module) are in VIPS divided into superior classifications with subordinated categories that are adjusted to fit each specific profession.

EPRs are constructed from a wide range of complementary devices/modules such as, for example, the management of text, laboratory readings, referrals, results of examinations, x-rays etc. The main module however, is the patient record, which is divided into sub-modules with one module for each profession. It is in this sub-module that care, interventions etc. are documented. Furthermore, whilst each staff member is able to read the patient record of the others, they are not allowed to make entries in them. When entering the EPR (the system used in the current study), the care professionals will have to either chose records from all the professions or selectivity chose from the list presented on the screen (see Figure 5).
Figure 5. The interface of the screen when entering an EPR (in Swedish). This example derives from the system used in this study. Here health care professionals choose which of the discrete professional modules they want to access. Here all professions are selected.

Common for most of the structures that EPRs are based on, is that they are organized in main categories, sub categories and subordinated categories. The categories organise information in the system, as well as functioning as a tool for finding information about particular topics. The categories in the VIPS-system are related to patient’s biomedical problems and needs, as well as the interventions needed for treatment.

The structure in VIPS with sub- and subordinated categories, sorted under main categories that are need- and problem-based, is a way of organizing information of importance from, for example, diagnoses and/or observations. All main categories for the nurses have the prefix caring (omvårdnad in Swedish), which is a way of easily distinguishing the nurses’ patient record from, for example, the physicians’, which, in this case, has the prefix medical. In this way different professional fields or knowledge domains are separated by, amongst other things, the use of a prefix.

The information in the EPRs observed in this thesis, consists, to a large extent, of free text divided in different sub-categories and subordinated categories under main categories. As an example (see Figure 6) a nurse has
logged-in to the EPR, chosen the main category ‘planning’, the sub-category ‘taking of tests’ and has then opened up a window where, for example, she can/is supposed to specify the kind of test result she wants to know more about. There is also open space for free text underneath where the nurse can describe the reason for taking the test, the outcome or what is believed to be important.

Figure 6. An example on how main- and subcategories and areas for free text appear on the screen.

The area for free text normally contains information describing, for example, the cause of contact or actual health condition. However it can, and often does, contain information directed more towards actions such as planned care activities, the goals of planned care activities and/or suggestions for treatments. These areas for free text thus leave it open for the staff to describe problems and interventions in an unconstrained manner.

According to Ehrenberg, Ehnfors and Smedby (2001) the structure of text and the identification of what to pay attention to in those areas for free text
are still very much characterized by the chronological daily notations that used to form the original paper-based record. The fact that health care professionals still use the daily notations can, as argued by Törnvall (2008), be seen as a way to escape the constraints imposed by a pre-structured category system. However, if EPRs are supposed to function as a centre of coordination of knowledge, the text in daily notations must be source, process and problem oriented. Nevertheless, even if the free text in daily notations presents almost unlimited expressive possibilities, the opportunities for computer processing this information are restricted, since it is not presented as precise data, categorized or written like a string.

Some information cannot just be written down; it needs to be sent to a particular individual, profession or place. Referrals and test-results are examples of such information, and how it is sent and regulated by the ways in which messages are structured. When health professionals are involved in the coordination of care activities, they will primarily open and read the record from their own profession, thus corresponding to regulation rules. However it is also possible to open and read other colleagues’ records to frame the problem from a different perspective or to gain a more comprehensive view (see Figure 4). Information emanating from different professionals can also be juxtaposed as a means of arriving at a common interpretation. However, using information in such ways is a matter of professional knowledge. Thus the ways in which new technology, such as EPRs, contributes to the coordination of everyday work is closely connected to the types of knowledge that are needed and used in different situations.

To sum up, EPRs are supposed to be the centre of information in care work. That implies that patient records are designed/structured to contain very detailed information about care work, which in turn, is important for further planning, evaluation and decision-making. A presumption for EPRs to transfer information in an intelligible and searchable way is that the content is structured and categorized in a way that all users are familiar with.

To standardize and structure the terminology is one way to facilitate communication and reduce the risk for misunderstandings. Even though it is a great challenge to develop a terminology that can be used simultaneously by different professions, several attempts have nevertheless been made. In Sweden, the most common systems used to structure and classify information in the health care sector are the VIPS system (Well-being, Integrity, Prevention and Security) together with Snomed CT.
(Systematized Nomenclature of Medicine, Clinical Terms). It is hoped that such standardized systems will contribute to greater coherence in the descriptions in EPRs, which, in turn are expected to facilitate communication between professionals and institutions.
CHAPTER 4

PREVIOUS RESEARCH ON EPRs

The research on the introduction and use of EPRs will be presented and discussed in this chapter. The research reported has been selected since it mirrors the different perspectives that are common in research related to the use of EPRs in health care practices.

The presentation that follows organizes the selected studies of health care work and EPRs into five themes. The themes are partly interrelated and some of the studies could be categorized into more than one theme. Nevertheless the themes illustrate what I have found to be the dominant foci for research on health care work and EPRs. Thus I have chosen, under each theme, to present what I have found as central in the studies in terms of visualizing and clarifying perspectives, objectives and the state of knowledge in previous research.

The research that is presented under the first theme, Implementation centric research, focuses on how EPRs are integrated and how they have become a part of health care practices. The studies presented under the next theme, Change centric research, include studies that focus on the relationship between EPRs and how the users perform their work. In the third theme, Documentation and information centric research, studies are presented that focus on the extent to which the introduction and/or use of EPRs in health care improves the content and the amount of documentation. The fourth theme, System centric research, is characterized by its focus on the relation between electronic patient record systems and work practices. Finally, the theme, Efficacy and quality centric research, includes studies that have an interest in whether, and if so how, the use of EPRs has an impact on the efficacy or quality of care.

4.1. Implementation centric research

A substantial body of research has focused on the implementation of digital patient records. These studies identify and problematize central aspects of implementation where strategies and approaches for implementation are of
particular interest. Implementation centric research brings to the fore issues concerning user involvement (Vimarlund, 1999), adoption and organisation resistance to change (Darr, Harrison, Shakked and Shalom, 2003), alignment and integration of existing procedures (Håland, 2011).

Vimarlund’s (1999) study shows that, instead of getting involved in the planning and the local development and adjustment of EPRs, staff members feel that they do not become involved in the integration process until the very end. This provides an explanation, Vimarlund argues, for why staff members – who regard themselves as competent and skilled professionals – in some cases question motives for introducing EPRs. Such resistance or problems arise if, or when, the introduction of electronic medical records is assumed to involve demands for new skills and users feel insecure about the types of skill needed to perform medical work.

de Veer, Fleuren, Bekkema and Francke (2011) wanted to gain a better understanding of determinants influencing the success of the introduction of new technologies as perceived by nursing staff. The factors most frequently mentioned as impeding actual use were related to the (kind of) technology itself, malfunctioning, ease of use, relevance for patients, and risks to patients. Furthermore nursing staff stressed the importance of an adequate innovation strategy. Further, a prerequisite for the successful introduction of new technologies was, the authors claim, to analyse determinants that may impede or enhance the introduction among potential users. For technological innovations special attention has to be paid to the (perceived) characteristics of the technology itself.

Boulos and Bjorn (2010) conducted a longitudinal ethnographic study where, over the period of one year, they followed IT-staff during the introduction of EPR-systems in Norway and Canada. They found that the more integrated the EPRs are in the institution itself and the more they become an extension of routines and procedures, the better the possibility for the information in the EPR to be used for several different purposes.

Håland (2011), on the other hand, sees the introduction of new technologies such as EPRs, as both a part and a result of changes of tasks, responsibilities and control in health care. Here Håland (2011) was focusing on how the participants use and experience the EPR and how the introduction of the EPR, as experienced by the participants, affects the work practices and boundaries between various professional groups in the healthcare system. In
the study implications this has for the understanding of medical practice are discussed.

The study indicates that the understanding of, and experiences connected to the introduction of EPRs can be seen as a set of socio-technical negotiations in which nurses and doctors, to some extent, negotiate the continuation of the established relationship between them. Thus the EPR can be seen as a part of the more extensive changes in modern healthcare, where health personnel have to face new demands for rationalisation and efficiency. The professional discourse of what medical work is – and what it is not – is impacted upon by the introduction of the EPR, and becomes part of the professions’ boundary work. Doctors do not consider EPR work to be medical work. On the contrary, they point out quite strongly that the EPR should not interfere with their medical work, which can be understood as an articulation of professional discourse aimed at constructing a boundary between ‘truly’ medical and other types of work.

Håland’s arguments are, to some extent, similar to those of Darr et al. (2003), who wanted to understand how health professionals view managerial and technical innovations and implementations in general, and EPRs in particular. The study by Darr et al. (2003) also shows that physicians, initially after the implementation of EPRs, felt concern regarding six main domains; managerial implications, limits of professional autonomy, its impact on communication with colleagues, facilitation of research, legal defence and influence on the professional hierarchy within the hospital. However, after a while, they changed their opinion and saw possible payoffs in using EPRs, such as, for example, gaining an extended infrastructure with great potential to enhance communication with colleagues in different departments and location, accessing patient records and, as a consequence, thereby improving patient care.

The findings of Darr et al. (2003) and Vimarlund (1999) are in line with studies conducted by Nikula (2001) and Millak (1998) who found that the earlier staff members feel involved in the integration process, the more their engagement rises. When people feel engaged it is also easier to be involved in solving problems that come with the introduction of the technology.

This section has reviewed a number of studies that focus on how technologies such as EPRs are integrated and used in practice. The overall conclusion from these studies is that integration of new technologies in
settings with well-established routines and procedures is often problematic, and that extensive efforts to incorporate EPRs as new tools at work are demanded on the part of both users and management.

4.2. Change centric research

Research with a change centric approach although problematizing the introduction of EPRs, also focuses on the change of workplaces rather than on the strategies for implementation. Questions that are brought to the forefront concern effects and routines (Miller and Sim, 2004), users perceptions of the EPRs (Stevenson and Nilsson, 2012) and intended versus practical use (Lomotan, Hoeksema, Edmonds, Ramírez-Garnica, Shiffman and Horwitz, 2012).

These studies make the point that there is a difference regarding how care work is performed compared with what EPRs are expected to support. An example is that professionals using EPRs (and using them as tools for different situations) tend to “translate” procedures from paper-based records, “simply” seeing the electronic patient record as a digital copy.

For example Miller and Sim (2004) found that the introduction of EPRs meant that care plans were not only more detailed and more individualised, but also updated and changed more frequently than paper records. This means, they argue, that health care activities (such as diagnoses or treatments) have the potential to be dealt with in a different ways than when paper-based records were used, something which actually transforms the routines at work. However, EPRs were not used to evaluate health care activities or patient-related aspects of care. One reason for this could, according to the researchers, be that such a kind of use presumes a change of procedures and practices. Instead the technology was mainly used in the same way as the paper-based records. Quite simply opportunities provided by the technology take time to "discover" and implement.

Stevenson and Nilsson (2011) explored nurses’ perceptions of using an electronic patient record in everyday practice in a general ward setting. Nurses reported that the EPR did not support nursing practice when they were documenting crucial patient information, such as vital signs. Neither did the EPR give a satisfactory overview of the patients. In addition, a majority of the interviewed nurses found that the EPR system was unreliable, complicated and slow. Compared to how care was previously performed and delivered, the EPR system demanded changes of routines.
For example the EPR had an impact on what to pay attention to and thereby what to document. And, as the EPR was used for several reasons, data needed to be documented in ways that supported several aspects of care. Sometimes this could increase the possibilities to work in a locally optimal way.

Lomotan, et al. (2011) conducted a study that investigated the use of a new guideline-based, computerized clinical decision support (a function in the EPR) at a medical centre. Their study indicated that the paediatric pulmonologists entered enough data to trigger the decision-support system in 397/445 (89.2%) of all cases. However, the interviews and direct observations revealed that the use of the decision-support system was mostly limited to documentation activities after clinic sessions had ended. The reasons for delayed use can be seen as both reflected barriers, which, according to the researchers, are common to general medical care, and barriers specific to subspecialty care. In conclusion they argue that their study demonstrates that, because in asthma care there is a combination of general and specialist specific factors, there was a low use of a computerized decision-support system. Although vital for the asthma care, such specialist specific factors are not supported by EPRs. Therefore it is important not to underestimate such demands when designing computerized decision-support systems for use in subspecialty settings.

Varpio, Schryer and Lingard (2009) conducted a study to explore the inter-professional communication strategies of nurses and doctors (trainees and experts) when their communications were mediated by EPRs. In their study, three inter-professional communication strategies were identified: (i) all participants routinely formulated ‘workarounds’ to circumvent problematic EPR-mediated communications; (ii) workarounds were classifiable as instances of Abandoning, Forcing or Submitting to the EPR, and (iii) although novices learned workaround strategies through an informal curriculum, they did not however learn to manage the inter-professional effects of such workarounds. Further, the study shows that trainees relied on workarounds as simplified routines, demonstrating routine expertise. Staff members, demonstrating adaptive expertise, used workarounds as part of a broader network of people and communication tools. Explicit training regarding this network and the ways in which workarounds conceal this network may, according to the study, help trainees develop adaptive expertise.
The research referred to in this section reveals that the ways in which health care professionals use EPRs are, compared to the inbuilt functionality, somewhat limited. One reason for this can be that those settings where EPRs are used are based on historically established routines, which, to some extent, determine what the professionals regard as problems and, further, the kinds of resources they believe to be appropriate tools for handling these problems. To come up with, and implement, new routines and standards takes time and encompasses the day-to-day work as well as the organization of the institution as a whole. However, those studies do not scrutinize or reveal anything about how such systems support staff members’ needs, which, in terms of the objectives of the current study, is of particular interest. Nevertheless, routines at work and structures and standards in EPRs can, in the long run, be seen as two sides of the same coin.

4.3. Documentation and information centric research

In studies by Björvell, Wredling and Thorell-Ekstrand (2002) and Nilsson (2002) that focused specifically on the content and amount of documentation in EPRs as measures of efficiency and/or quality, found an increasing amount of documentation when, instead of paper-based records, staff used EPRs. The findings showed a significant increase in quantity (amount of words) of documentation. They also showed an increased quality in the nursing documentation. This means that, for example, diseases and treatments were described in more detail. However, despite an increased amount of documentation of care activities, no differences could be found in how health care professionals valued or understood the activities, either directly in situ or in retrospect. This means, as both Nahm and Poston (2000) and Varpio (2007) argue, that the move towards increased documentation via the introduction of EPRs does not in itself have the qualities necessary to form the bases for examinations, evaluations or indeed to map routines and procedures in the care sector.

Other studies, such as that conducted by Björvell, Wredling and Thorell-Ekstrand (2002) have, however, shown that the structure in EPRs and staff members’ training in documentation has a substantial impact on the content of the records. Training regarding documentation and the structural
composition of the system increases the amount of documentation both with respect to quantity and quality. When care staffs are given the opportunity to understand the structure of the documentation system, and opportunities to use it in care activities, documentation changes from being merely retrospective, to becoming a mediating tool for planning and decision-making.

Jones (2009) focuses on one area of nurse-patient communication, the hospital admission interview, which has been put forward as an ideal arena for increased patient participation. The results in Jones (2009) study shows that topics discussed during admission closely follow the structure of the EPRs that nurses complete during the interview. Whilst it is tempting to describe the admission document as a ‘super technological power’ in influencing the interaction and restricting patient participation, this analysis attempts a more rounded reading of the data. Findings demonstrate that, whilst opportunities for patient participation were rare, admission interviews are complex interactional episodes that often belie simplistic or prescriptive guidance regarding interaction between nurses and patients. In particular, issue is taken with the lack of contextual and conceptual clarity with which best-practice guidelines are written.

Laitinen, Kaunonen and Åstedt-Kurki (2010) investigated the types of expressions nurses used when they documenting patient-focused nursing care in EPRs. The data in their study consists of analyses of forty EPRs and focuses on whether nurses’ written expressions reflected a patient-focused approach. From their data three discrete categories emerged:

- The patient’s voice is when patient has expressed his/her thoughts, which have been written in the EPR by the nurse.
- The nurse’s view is when the nurse recounts the patient’s own thoughts, state or situation and view this as a mutual, patient–nurse, conclusion.
- Relationship, which is when the documentation in the EPR that describes the patient–nurse relationship.

As the study reveals, nursing documentation represents much more than simply a record of (or the continuity of) care. Rather, the documentation also contains patient-focused narratives. As the EPRs had in-built structures, which highlighted perspectives and topics from the patient’s point of view, patients’ voices become more present than in paper based records. Information written from the patient’s perspective can become an
effective tool in nursing and its documentation, and can provide a clear source of information for improving the care provided.

Over the years, substantial efforts have been made in the development of care documentation. And, as seen in this section, many studies have found inadequate reporting with, in some cases, the focus being more on tasks and treatment than on the documentation itself. When electronic patient record-systems have been introduced, they have sometimes involved challenges due to staff members’ lack of familiarity with computers. However, even if EPRs have caused discontent and frustration, a number of studies have shown that, given enough time and effort, improvements in documentation. A common conclusion to be drawn from these studies is that if information in the EPRs were to be sufficiently standardized and structured, this would improve the ways in which care could be performed and understood. This is in line with the findings of Bowker and Star (2000) who argue “ubiquitous, textured classifications and standards help frame our representation of the past and the sequencing of events in the present” (p. 46).

In the studies referred to above, functionality is often seen and measured as equivalent to, for example, the amount of typed words in a patient record or the amount of information that is transferred by means of the EPR. However, when adopting such a focus, it is often difficult to see or to understand why or how the EPRs are used in certain ways. Moreover, the ways in which EPRs are used needs to be discussed in relation to the different ways they are understood to be tools, both by members of staff and by hospital management.

### 4.4. System centric research

A system centric approach to the studies of EPRs brings to the fore questions concerning system functionality and system architectures (Chen, Chang and Wang, 2010), methods of implementation (Rose, Schnipper, Park, Poon, & Middelton, 2005) the adaptation of systems in use (Yousefi, Moradi, Ghazisaeidi and Fazael, 2011), the integration of system modules (Bossen, 2007) and human-computer interaction (Newsham, Johnston, Hall, Leahy, Smith, Vikram, Donnelly, Velikova and Selby, 2011).

Rose et al. (2005) individually observed five physicians and two nurses using a traditional EPR system in the setting of their clinical workplace. From the
observations carried out the researchers concluded that the integration of modules could substantially facilitate services such as reminder systems, online prescribing, and telemedicine applications. Increasing module integration could also introduce new challenges such as technical issues, as well as individuals’ knowledge of using the technology.

Bossen (2007) studied a trial implementation of an electronic medication plan into an EPR at three regional hospitals in Denmark, finding that each new module resulted in additional technical problems. As an example, different modules demanded usernames and passwords that were independent of each other. Another example was that for security and access control, each module needed to be logged into separately and, once logged in, the user could be logged out for security reasons or if the process in between the use of modules was too slow. This was regarded as a considerable impediment, which, according to Bossen, highlights the difficulties and the need for technical adaption and solutions following on from the integration of different modules into the EPR. What Bossen (2007) shows is that there is sometimes a contradiction between, on the one hand, high demands on security and autonomy for separate modules and, on the other, accessibility when modules form parts of an integrated system.

That problem was also addressed by Chen, Chang and Wang (2010), who developed a user/aspect-oriented design and implementation scheme to provide adaptable access control for web-based EPR systems. In their system architecture, access control logic is decoupled from the core of the EPR application and collected into separate modules that were automatically synthesized from access control. They argue that their approach accommodates a wide range of fine-grained access control requirements that exist in health care, such as for example, the requirements of patients and different professional groups.

Newsham, et al. (2011) show that, even though EPRs are primarily designed to support the care of individuals, such systems could nevertheless be adapted to serve the research-driven investigation of large sets of data. Their research describes how they developed and implemented a system where clinicians and researchers could compare and work with EPR data. Their starting point is that there of is a conflict of interests and needs when different stakeholders share the same system, as is the case with an EPR. Further, they wanted to illustrate how a system provides a resource to meet the needs of both clinicians and researchers. They argue that their system is
developed in response to bridge a knowledge gap between clinicians and researchers from other disciplines. One key advantage that is presented about the system, they argue, is the ability to directly correlate different demographic material (sex, age, diagnoses, time of treatment and so on) with each other, and to conduct advanced data comparisons. However, in common with all systems, the interrogation function in the system relies on the quality of the data. That in itself is a particularly critical factor if the users are relatively unfamiliar with the system. In sum, the research presented by Newsham and colleagues forms part of an evolving process of research combined with clinical programs. Further, their study shows that the integration of effective databases is, primarily, a matter of designs that facilitate patient care combined with multifaceted requirements. Whilst this is necessary, it also presents a highly complex challenge.

In a review of the literature Yousefi, Moradi, Ghazisaedi and Fazael (2011) scrutinized various aspects of the implementation of clinical information systems between 1997 and 2008. They conclude that financial, behavioural and technologies can, in implementation of EPRs, create potential problems. Furthermore, they argue that for effective implementation of clinical information system to take place, a review of success and risk factors in the local setting of implementation is necessary as a means of preventing system failure. This, they point out, is often neglected, meaning that problems are often ascribed to the system, rather than to contextual factors.

The studies referred to above, focus on design and how different technological devices are integrated with each other and, amongst other things, examine the types of information – digital x-rays, lab-results etc. – that can be transferred and are accessible through EPRs. The general conclusion is that by studying and comparing the characteristics of data systems and their roles and functions in daily care routines, it becomes clear that when different systems and various modules are not properly integrated with each other, problems arise. In turn, problems of integration reduce the possibility to receive information necessary for decision-making, evaluation and planning, but also that needed for evaluations. Thus it becomes clear that issues of security, integrity and access control can interfere with competing needs of accessibility and transparency. Such system centric knowledge is particularly important in the future development and integration of systems. However, the conflicting interests revealed by this research emanate from and interfere with health care work. Nevertheless we still do
not know how such systems interfere with the carrying out of health care work and how health care professionals in situ handle such conflicting needs and interests. Moreover, differences in how the systems are designed or what they support need to be discussed in relation to the different social or physical contexts in which they are used.

4.5. Efficacy and quality centric research

In line with the expectations of increased efficiency (Johnson, Johnson and Zhang, 2005) and quality (Shi, 2010), which formed the basis for the introduction of EPRs (Health-Committee, 2007; Socialstyrelsen, 2006:107), the focus of many studies has often been on issues of efficiency or quality. This is interesting given the fact that, according to Berg (2007), approximately 75-80 per cent of all ICT-applications in health care have failed to live up to such expectations.

Raghupathi and Kesh (2009) studied how different applications are integrated in EPRs. Their conclusion is that EPRs can be understood as a poor source for handling information in terms of what they refer to as efficient. But, as they argue, if EPRs are used in proper ways they could provide insights as to where, when, and how the information is needed, thereby managing the cost of care while protecting and improving clinical quality and customer satisfaction. This is argument is in line with Reijers and van der Aalst (2005) who contend that if work is routed by an automated system, information can reach people faster and will not get lost. This could decrease both lead- and wait-time and could also allow people to spend less time on the coordination and the transfer of work, thus leading to a decrease in service time.

Bossen (2002) found that the information in EPRs is more often read by co-workers within and between wards than previously when paper-based records were used. However, other studies (Patel, Arocha, & Kushniruk, 2002; Patel, Kushniruk, Yang, & Yale, 2000) have arrived at almost the opposite conclusion, namely that the introduction of EPRs can in some cases have a negative effect on clinical reasoning. Here it has been found that members of staff actually talked less with each other and instead of asking colleagues questions; they relied on what could be read in the EPR. When verbal interaction with each other decreases, this can impact on mutual discussions about, for example, different interpretations and various
courses of action. Such decreases in clinical reasoning could, according to the researchers, have negative long run effects on day-to-day work.

Goud, Engen-Verheula, de Keizer, Balc, Hasmana, Hellemansa and Peek (2010) see computerized systems (such as EPRs) as one of the most effective instruments to improve guideline implementation. However they point out that little is known about the relation between cognitive, organizational and environmental factors, and the effectiveness of computerized systems. The objective of their study was to assess the effect of computerized systems on cognitive, organizational, and environmental factors that hamper guideline implementation. The study shows that the use of digital systems can improve guideline implementation to some extent. However, computerized decision-support is not effective when organizational or procedural changes are required that users consider to be beyond their working remits and responsibilities. And, although all of the study participants had used the technology for more than one year, none of them actually put effort in overcoming what can be seen as ‘higher level’ barriers. Apparently, technologies (like EPRs) do not incite users to realize changes that, as they see it, exceed their ‘own’ tasks, responsibilities, or control.

Johnson, Johnson and Zhang (2005) wanted to understand the extent to which the implementation of digital technology led to improvements in terms of efficiency and productivity. Their study shows that users of computerized applications experienced increased usability when the design was adapted to the problems the users were mostly dealing with. However, the productivity in terms of time for processing etc. remained, on the other hand, the same as before. Their conclusion is similar to the study performed by Rodriguez, Murillo, Borges, Ortiz and Sands (2002) who studied the interaction of 48 physicians with a paper-based patient record system compared to a graphically-based electronic patient record system. In their study they evaluated the usability attributes of efficiency and satisfaction of the physicians’ activities using the two patient record systems. The study did not reveal a significant difference in the overall time it took to complete typical physician tasks. However, on average, while the physicians could perform viewing tasks faster using the EPRs, documenting tasks took more time with ordering tasks being at about the same speed. They also found that the user interface on the electronic patient record system could contribute significantly to reducing the users’ hurdle.
One major question informing Shi’s (2010) study is whether EPRs really do help to improve hospitals’ efficiency and quality? The overall aim is to show the following: That it is the use of IT not its purchase that actually affects the performance measures. Two levels of data were analysed: the IT spending data at the health care organization level and the IT adoption data at the hospital level. This study shows that EPRs used as a Clinical Decision Support System had a significant but small effect on several procedures. Hence, empirical evidence is inconclusive and the difficulty of showing such impacts could be due to the possible endogeneity of IT adoption. Such an issue can result from the various unobserved confounding factors that possibly affect both quality and information technology adoption. There is also the possibility of a reverse causal relationship, namely the adoption of IT might be caused by, instead of causing, the quality performance of a hospital. Moreover, how to measure health care quality is itself an active research topic thus adding to the complications involved.

Hertzum and Simonsen (2008) investigated the effects of an electronic patient record (EPR) system on clinicians’ work during team conferences, ward rounds, and nursing handovers. They evaluated the EPR system regarding its effects on clinicians’ mental workload, overview, and need for exchanging information. They measured the effects by comparing the use of electronic records with the use of paper records prior to the trial period.

Their study shows that during team conferences, all clinicians experienced a reduction of mental workload. The physician in charge in each team conference also experienced increased clarity about the significance of and obligations for work tasks. The physicians also felt reduced mental workload during ward rounds. During nurses shift-handovers they, the nurses, felt that they misses fewer pieces of information, which implied that fewer messages needed to be passed on after the handover. Further, they experienced that the status of the nursing plans for each patient was clearer, except for the nurse team leader, who experienced less clarity about the status of the plans. The effect that the EPR system has on clinicians’ work is, according to the researchers, important in its own right as it is “likely to affect clinicians’ acceptance of EPR systems, their command of their work and, consequently, the attainment of ‘downstream’ effects on patient outcomes”.

Holroyd-Leduc, Lorenzetti, Straus, Sykes and Quan (2011) conducted a review of the literature around the impact of EPRs within primary care
outpatient practices, where they examined the effectiveness and benefits of EPRs broadly, considering the impact on structure, process and outcomes. In all, they analyzed 90 English-language articles published between 1998 and 2010. In all, the studies reveal that EPRs appear to have both positive and negative impacts on health care practices. However, they found clear advantages over traditional paper-based records in terms of legibility and accessibility. Although previous studies have highlighted concerns around the privacy and confidentiality of EPRs, they did not in the review find any evidence that a fear of computers was interfering with the patient-physician relationship. Yet, they argue, based on evidence in the literature, EPRs contribute only marginally to improved health care. Even though many primary care physicians appear to perceive a positive impact on the quality of care, the impact that an EPR system can have on measured quality indicators within primary care appears to be mixed.

The studies reported in this section can, to a great extent, be characterized as one-dimensional. Measuring quality and efficiency is indeed important. However it is often, I would argue, necessary to take into account the social and cultural contexts in which the technology is used.

Summary

Although there are different rationales for using EPRs in health care, one interesting overall conclusion of many of the studies presented here is that EPR systems require the integration of several sources of information into one system of considerable complexity. This changes the ways in which traditional routines and procedures are carried out, which in turn implies that staff members must develop their professional knowledge in knowing how to handle and cope with the technology.

The research presented in this chapter represents different research interests and perspectives from which there are at least three lessons to be learned.

The first lesson is about how the technology is seen and understood in terms of it almost being an actor in itself that has certain built-in capacities. This perspective has put the focus very much on the technology and how, and to what extent, health care providers make use of EPRs in their everyday work. As shown, several studies rely on assumptions that EPRs increase, or should increase the quality of care or care work. Such studies (see for example Rose et al., 2005; Johnson, Johnson & Zhang, 2005) almost
ascribe EPRs abilities to be able to transform activities and processes. But, as we can see from previous research, it is hard to find evidence that the introduction of EPRs per se increases the quality of, for example, documentation or efficiency in terms of, for example, time for work processes. Even though EPRs have built-in capacities, it is the integration of EPRs, how they become a part of the procedures, and how the very architecture of the systems responds to obligations, cultures and needs, that determine how EPRs are used.

The second lesson to be learned concerns the extent to which EPRs conform to the expectations (of the different stakeholders) that are connected with their introduction. Earlier studies to a large extent focused on quantitative aspects of the impact of the introduction of the technology, such as for example the amount of words that are documented in EPRs. Although the introduction of EPRs increases the amount of documented words in patient records, this in itself does not guarantee that the use of EPRs has qualitative effects on planning, information-sharing and decision-making. Instead, such effects are, I would argue, connected to the change of historically established cultures and the use of standardized terminology and structured information. If cultures, working processes and ways of handling information and documentation are not changed, staffs are more than likely to use EPRs in a similar way as previous paper-based records.

The third lesson is about starting points and choices of perspective, where previous studies tend to take a starting point for their analyses in either the technology (Rose, Schnipper, Park, Poon, & Middelton., 2005), the staff (Aarts, Ash and Berg, 2006) or the organization (Poissant, Pereira, Tamblyn & Kawasumi, 2005). However, as shown in the research presented here, issues concerning the extent to which EPRs change or increase certain aspects of care or care work, or how staff members communicate or provide information, cannot be separated from organizational routines and the resources available. Therefore it is important to consider how staff members in situ handle EPRs, and how they manage the change of routines and procedures that follow from the introduction of the new technology.

As evidenced in previous research, EPRs can be seen as a solution to a set of problems. However, EPRs do not perform any tasks by themselves, and they cannot be seen as the solution without taking their practical use into consideration. To develop knowledge about how EPRs are used, or in what ways their use enters into and transforms everyday care practices, my aim
has been to examine how staff members use EPRs in their ongoing practices. Such a perspective can contribute by providing answers to questions about organisation, coordination, communication and what is to be regarded as professional knowledge, all of which relate to the research area of work integrated learning.

In sum, the studies referred to here have a focus on what technologies do. The results of those studies provide valuable insights as to how EPRs affect the professionals’ activities and the organisation of work. Nevertheless there is still a need to broaden our understanding of the relation between the use of technology and everyday social activities and interactions in the workplace.

Consequently in this thesis the sociocultural tradition forms a theoretical base, which will be further elaborated in the next chapter.
CHAPTER 5

THEORETICAL FRAMING

The concern in this thesis is how EPRs are used in everyday health care practice and it is of certain interest to understand the impact of EPRs on how professional knowledge is handled and communicated as part of work activities. Using socio-cultural theoretical tools, the thesis aims at contributing to our understanding of how this is done in collaborative work in professional and inter-professional settings. Workplace studies are in this thesis seen as a way to convey the importance of the sociality of work by shedding light on the complex actions and interactions that occur.

This approach to research takes a starting point in the activities where members of staff use the technology, scrutinizing how EPRs intervenes in the daily care work. The focus is thus on “technology in action” (see further Heath & Luff, 2000), rather than “technology per se”. This is a different approach compared to the interests and perspectives of most of the research that have been presented in the previous chapter.

EPRs provide extensive access to information, but simultaneously such information presupposes input of information into the system. Consequently the introduction of EPRs is affecting the entire work activity, collecting information, transforming and categorizing information into the EPRs and subsequently utilizing this information. So, EPRs offer the potential for not only sharing information, but also for supporting collaboration between physically dispersed professionals. The analytical perspective adopted in this thesis aims at understanding how EPRs are used in the context of professionals’ everyday social actions and interactions in the workplace (Luff, Hindmarch & Heath, 2000), rather than contributing to design of such technologies.

The research in this thesis has evolved over time, which means that the research questions posed in the studies that are presented in the articles are different. Aligned with this the theoretical tools used varies, within a general socio-cultural theoretical framework. In this chapter, I give an account of
this theoretical framework and the more specific theoretical notions and concepts that are used as analytical tools in the studies.

5.1 A sociocultural approach

Sociocultural theory has many features but I will highlight some that are important for studying a professional practice, health care, that are changing due to the use of emerging technologies, such as EPRs.

- It highlights the relationship between individual learning and the social situations in which that learning occurs. The focus helps to see and understand learning in the workplace as a process through which we appropriate what is valued in a culture and in turn to contribute to that culture.

- It provides an approach to understanding individual and collective meaning making where activities are understood as object-oriented, built on purposeful and intentional individual and collective actions, and where the relation between subject and object is mediated. Socio-cultural theory therefore provides useful ways of understanding why and how people engage with tools, tasks and problems.

- A socio-cultural perspective also supports the analysis of the practice where the professional work is manifested and developed. It thereby helps to understand the relation between professional knowledge and the use of new tools and technologies.

In the following section I will elaborate on these aspects of socio-cultural theory and the relation between technologies and human activity and how I see the concept of learning and its relation to professional knowledge in the activity system where the studies took place.

5.2 Activities and institutional practices

A central concept in socio-cultural theory is activity, which refers to both what individuals do or participate in and what is institutional or collectively organized. Engeström (1991, p. 7) argues that “… the object-oriented and artifact-mediated collective activity system is the prime unit of analysis in cultural-historical studies of human conduct”.

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Activities or activity systems can be understood as something that is stretched over time and that is realized by individual's actions (Ludvigsen, Lund, Rasmussen & Säljö, 2010).

This means, first, one can study individual learning without de-emphasizing the social and cultural aspects; second, that one can study how people learn and coordinate their activities in order to achieve a productive level of intersubjectivity and, third, that one can pay attention to how activity systems change learning at the collective as well as at the individual level (ibid, p. 5).

Leontiev (1978) argues that “activity – action – operation” are three levels of an activity system that are dialectically related to each other. Activities are object oriented and realized through actions, which in turn, are realized through operations.

Even though an activity can be described as individual it is always socially and culturally situated. Engeström and Miettinen (1999) makes a distinction between collective and individuals actions:

Mediation by other human beings and social relations was not theoretically integrated into the triangular model of action [proposed by Vygotsky, 1978]. Such an integration required a breakthrough to the concept of activity by distinguishing between collective activity and individual action. This step was achieved by Leont’ev by means of reconstructing the emergence of division of labor (p. 7).

Moreover, according to Leontiev (1978, p. 52) activities are always related to an object and a motive. Many times individuals are not fully aware of neither the object nor the motive. The individuals’ actions, on the contrary, are often linked to more or less conscious goals. The concept of object is already contained in the very concept of activity; there is no such thing as objectless activity, because as soon as a phenomenon becomes a human need or desire, it becomes an object of activity.

In his model Engeström added the concept of community to the triangular model of Vygotsky. A community embraces several people who have the same general object and who thereby, consciously or unconsciously, distinguish themselves from other communities. In such communities there are usually a division of labour, which refers to both the division of tasks between the members of the community and to the division of power and status. Moreover, there are rules, which refer to the explicit and implicit regulations, norms and conventions that constrain actions and interactions within the activity system.
Vygotskij’s (1978, p. 40) triangular model of cultural mediation of actions is a triad of subject (the actor in an activity system), object (the purpose of the activity), and mediating artifact. From that model follows that individuals needs to be understood from his/her cultural belonging and society needs to be understood from a perspective where individuals act, use and produce artifact and objects are the cultural orientation.

The inclusion of social dimensions like rules, communities and division of labour are important to capture the collective and institutional nature of activity systems.

Wells (1996) discuss the relation between the concept of activity and the concept of practise:

In any event-in-a-setting, the 'Activity' that is being undertaken can be identified according to its motive the "object" in view that provides its driving force. In the classroom, the predominant activity is that of education, although, in practice, the object of this activity takes a range of varied, and sometimes mutually incompatible, forms. In educational discourse, however, the term "activity" is typically used in a non-technical sense to refer to a relatively self-contained curricular event, often occupying one time-tabled lesson; so, in order to avoid terminological confusion, I shall from here on refer to the stratum of 'activity,' as it applies to education, as the Practice of Education (p. 75).

Wenger (1998) formulates this in another way, from the perspective of a theory of social learning. In his words practice can be described as an activity system that includes shared repertoire, shared negotiations and mutual engagement between people (for a further discussion see Wenger (1998)). Such activity systems include an object-orientedness (the objective of the activity system), actors engaged in the activities, social context (where all actors are involved), artifacts (used by actors in the system), division of labour (the division of activities among actors in the system) and rules (conventions and guidelines regulating activities in the system).

5.3 Cultural tools, artefacts and mediation

A central idea in sociocultural theory is the importance of artefacts as tools in human conduct. That tools are critical in human thinking and development was originally argued by Vygotsky. Tools are the mediating link between subject and object in human thinking.
“Tools refers to those resources, both linguistic (or intellectual) and physical, that we possess and that we use when we understand our world and act in it” (Säljö, 2000, p. 20).

Vygotskij (1986) distinguish between physical and intellectual/linguistic tools where language is underscored as the most important physiological tool as it strongly influence our thinking through categories and terminology. Imagine for example how the indicative function of language as it mediates meaning, for example “stroke” as an injury. Another example is the clock, which gives information of time; seconds, minutes, hours but also date and year. Conceptions of time are thereby mediated from others to the “user” of the clock who has to act in relation to that conception of time.

Simultaneously, as Säljö (2000) argues, the impact of language is that we learn to think and act within and through the intellectual tool. This, however, does not mean that a cultural tool in an activity determine how it will be conceived or used.

Vygotskij (1978) means that tools have evolved over time, they are historically developed, bring values and knowledge and are used for communication and mediate experiences between human beings. They (often) have a cultural and artefactual nature.

Artifacts are (man-made) tools we use in our daily life; material tools, such as patient records, and immaterial tools, such as language. One important aspect of the development of artifacts is that they are based on thoughts, ideas, knowledge and conventions (Wertsch, 1991).

Over time, the production and use of artifacts leave cultural traces that have an impact when artifacts are used in the present. When trying to understand human action, we need to include artifacts in the unit of analysis since they direct action through mediation. According to Cole (1996), artifacts are characterized as:

..an aspect of the material world that has been modified over the history of its incorporation into goal-directed human action. By virtue of the changes wrought in the process of their creation and use, artifacts are simultaneously ideal (conceptual) and material. They are ideal in that their material form has been shaped by their participation on the interactions which they were previously a part and which they mediate in the present (p. 117).

In sociocultural theory, both development and use of artifacts are closely connected to the development of human cognition and thought. And the
way we understand and see ourselves and our surroundings influence how we act. So, simultaneously as artifacts mediate thoughts and conceptions, they can be seen as reifications of human action, for example how to understand and adjust to time. Lave and Wenger (1991) argues that the ways we use and adopt to artifacts are closely connected to becoming a member in a community of practice. “Understanding the technology of practice is more than learning to use tools; it is a way to connect with the history of the practice and to participate more directly in its cultural life” (Lave & Wenger, p. 101).

A central aspect of artifacts is that they are not seen as dead objects, rather they are conceived as having an ability to mediate human action (Cole, 1996). Mediation origin from the German word “Vermittlung”, and means that our thinking and conceptions are grown from, and thereby influenced by, our culture and its material and immaterial tools (Säljö, 2000, p. 81). In that way mediation is crucial when it comes to understanding the relation between humans and artifacts. And as Guribye (2005, p. 37) says, “through the mediational process, cultural tools simultaneously enable and constrain human action”.

Cultural tools can be seen as the result of historically developed knowledge and experience, which means that by using and appropriating cultural tools, people are taking part and sharing the understandings of other people and generations. Mediation thereby forms our relation to the surrounding world as our mind and thinking is shaped and formed by historically and culturally evolved cultural tools and artefacts.

5.3.1 Infrastructure, institutional practices and human activities

Infrastructure is usually seen as an underlying foundation or something permanent that is built and maintained. However, from the perspective adopted in this thesis, a different understanding of infrastructure, offered by Star and Ruhleder (1996), Hanseth, Monteiro and Hatling (1996) and further discussed by Guribye (2005), is used. In this thesis, the infrastructural perspective is EPRs in use where infrastructure is seen as an ecology of tools, action and activities in environments. EPRs are from such perspective seen as interwove with and inseparable from social and other technical and non-technical elements. As such, an infrastructure is part of the technological, material, historical and social conditions of practices.
Infrastructure is, as Gurbye (2005) means, usually designed to support a wide range of activities. In this way an infrastructure also allows for very different uses. In other words, infrastructure is open in the sense that “there is no strict limit between what is included in an infrastructure and what is not, and who can use it for which purpose or function.

Star and Ruhleder (1996), Hanseth, Monteiro and Hatling (1996) as well as Gurbye (2005) identify several dimensions of infrastructure that this thesis adapts to, which all together expands the understanding of infrastructure:

- **Embeddedness.** Infrastructure is “sunk” into, inside of, other structures, social arrangements and technologies;
- **Transparency.** Infrastructure is transparent to use, in the sense that it does not have to be reinvented each time or assembled for each task, but invisibly supports those tasks;
- **Reach or scope.** This may be either spatial or temporal – infrastructure has reach beyond a single event or one-site practice;
- **Learned as part of membership.** The taken-for-grantedness of artifacts and organizational arrangements is a sine qua non of membership in a community of practice. Strangers and outsiders encounter infrastructure as a target object to be learned about. New participants acquire a naturalized familiarity with its objects as they become members;
- **Links with conventions of practice.** Infrastructure both shapes and is shaped by the conventions of a community of practice, e.g. the ways that cycles of daynight work are affected by and affect the electrical power rates and needs […] ;
- **Embodiment of standards.** Modified by scope and often by conflicting conventions, infrastructure takes on transparency by plugging into other infrastructures and tools in a standardized fashion;
- **Built on an installed base.** Infrastructure does not grow de novo; it wrestles with the “inertia of the installed base” and inherits strengths and limitations from that base […]; Becomes visible upon breakdown. The normally invisible quality of working infrastructure becomes visible when it breaks (Gurbye, 2005, p. 113).

This means that infrastructure means different things in different situations and for different people, and its boundaries cannot be a priori defined. This way of viewing and understanding infrastructure is important for understanding my perspective of workplace studies and technology in action. Hereby I can scrutinize human agency in its environment in where EPRs are used which also is affecting the data collection that is further elaborated in the next chapter.
5.4 Learning in professional practices

There are a number of perspectives and theories on learning. A common distinction between different perspectives is behaviouristic, cognitive and sociocultural perspectives (see Säljö, (2000) for an overview of these perspectives and their distinctions).

In sociocultural theory learning is seen as the *appropriation* of material and immaterial tools (Säljö, 2000, p. 97). Thus, the artefacts of a practice are thus central to this view on learning. The concept of appropriating (Wertsch, 1998) refers to become familiar with the sociocultural tools or recourses of social practices (ie, to learn new things). This is in line with Lave (2000) who argues that learning is situated in social practices.

How participants in a practice use and handle artifacts (for example, language and technical tools) is particularly important with regard to understanding the relation between learning and technology such as EPRs. Becoming knowledgable in the use of the artifacts and resources of a practice or community is a key aspect of becoming a competent practitioner.

Learning is also about taking part or participating in cultural practices. In this thesis learning is characterized something that takes place in the constitution of meaning when people take part in (institutional) activities (cf. Wertsch, 1998). That is in line with Lave and Wenger (1991) who argue “learning as increasing participation in communities of practice concerns the whole person acting in the world. Conceiving of learning in terms of participation focuses attention on ways in which it is an evolving, continuously renewed set of relations” (p. 49-50). Even though learning is an integrated aspect of taking part in activities, learning is not seen as equal or similar to activities, but a potential aspect of such.

Within the context of distributed cognition, Hutchins (1995) argues that learning can be understood as an individual’s change of ability, or change of mind. In situations, people use experiences to make sense on a local level to understand what is going on. This involves obligations and resources in different contexts as well as how to adhere to them. The experiences the individual have from the situations are then resources in moving the situation further. This implies that every situation leaves marks on the activities that follow and that every activity contributes to a change of mind, for the individual. The processes in which cognition is distributed can be
generalized into three different types; between people in social groups, between the external and internal and from past to present.

Following the thoughts of Hutchins (1995) and Wertsch (1998), learning is inevitable. However, since individuals are parts of many activities, what people learn is an empirical question that is problematic and more complicated. As individuals take part in different activities, learning occurs within different contexts (Cole, 1996) or communities of practice (Lave, 2000).

Context is here understood as an integral aspect of practices and activity systems that becomes an identifiable whole which one can act within. As such, there are, as Säljö (2000) puts, no neutral context, they are always situated and can only be understood within the activity system they are a part of.

It is in the interaction between human and context, as Säljö (2000) says, that we create and use intellectual/linguistic and material/technical resources to take an activity further. The most important one is our language through which we appropriate and mediate meaning in and about activities. Therefore one can say that as we learn to use historically developed tools which to some extent are discursive, which simultaneously also mediate the discourses when we use them in new situations. So when we use historically developed resources, Säljö (2000) argues, they are the fruit of, and simultaneously represent, historical experiences and understandings.

This means that learning is seen as integrated with those tools that are used in activities. But just as activities develop our knowledge; our knowledge also transforms how we contextualize the next activity. This implies, with the following logic, that we approach the next activity in a different way. Therefore one can say that historical experiences are a part of the present activities. Moreover, this presumes that knowledge cannot be seen as only an outcome of either a purely mental or purely physical world (Wertsch, 1998).

A concept that highlights the social nature of learning is the proximal zone of development (ZPD). "Every function in the child's cultural development appears twice: first, on the social level, and later, on the individual level; the first, between people (interpsychological), and then inside the child (intrapsychological)" (Vygotskij, 1978, p. 57, emphasis in original). This concept puts attention on the learning-potential under assistant, which
broaden the concept of learning from what one can, to the learning potentials. Thereby the proximal zone of development brings both cognitive and social issues, which is important in talk about learning without talking about development.

5.5 Collective and individual meaning making


Meaning can not be seen as simply the relation between a sign and a reference, nor on projecting experiences or on communication. Instead, in this thesis meaning and meaning making is seen as a complex process that presumes and involves participation, experiences, communication and belonging. That also means that meaning can not be understood as something that is fixed and ready over time and situations. On the contrary, meaning is negotiated, temporary and situated.

Meaning can be be seen as organised knowledge, which in itself can be set up for negotiation of meaning. Therby meaning is both a product and a process. Moreover, meaning is relational and it emerges from social and historical processes. It is a joint production and is closely connected to local settings. As well as it is a cultural production it is also produced by participants engaged in specific interaction, in a context which “people collectively draw on to organize their conduct” (Wheterell, 2001, p. 18) and create an interaction order.

5.5.1 Text and meaning making

One can say that written text in sociocultural theory are seen as mediating between individual and collective and are important tools in processes of meaning making.

As a resource for mediating meaning and knowledge and through its flexibility, text can be used in different situations for meaning making. Bowker and Star (2000) argue that meaning making when reading text, concerns both the reader's and the writer's knowing in and about the setting(s) wherefrom the text originates and where it is to be used and/or
Meaning refers to the lexical meaning of language and constitutes the base for human interaction.

Written text is separated from the writer which means that the meaning making occurs in different ways, or under other circumstances than in verbal communication. Therefore, written text needs to be structured and produced so that the message, the meaning, stands out autonomously (Olson, 1977).

Texts in EPRs are supposed to mediate the meaning, where it becomes important that there is a relationship between the writer’s intention and the reader’s meaning making from reading the text. This can be illustrated in an example of a notation in the physicians’ module an EPR: “Adam needs at least 1000 ml fluid every day”. Is it a suggestion, a recommendation or an order? What the notation says is maybe that Adam is dehydrated, that he is not restoring his fluid balance on his own, that it is important to supervise the liquid level and to make sure that Adam gets at least 1000 ml of fluid every day.

In an institutional setting, such as a hospital, written texts allow tremendous amounts of information to be stored over time, and can be used later in a wide range of situations and for numerous purposes. A presumption for making meaning out of texts is that we, the readers/users, have a well-developed knowing of the relation between the terms in use, and what they represent. A necessity for that is to bridge between the context in which text was written and the situation where it is read.

5.5.2 Meaning making and indexicality in texts

An expression can be defined as indexical if it changes its reference from one context to another. In a broader definition one can also talk about an indexical behaviour or utterance, which points to some state of affairs. In text, indexicality indicate and hint meaning of the sign by relating to what we associate with the sign, e.g. a certain type of bacteria indicates Borrelia, Borrelia indicates ticks and ticks indicates high grass.

The information sent and received by members of a practice has meaning in a particular context. Without some knowledge of the context the perspectives of the interacting parties, their knowledge domains, their purpose and their past interactive experiences, the risk for
misinterpretations of the symbolic communication among the participants would increase.

Heritage (1984, p. 143) argues that all utterances [and all meaning production] are indexical and that meaning is relative to who is speaking, their relationship to what they are speaking about, where, when and to whom they are speaking. Meaning is thereby seen as ‘bound up with and occasioned by’ the context in which words are used (Wootton 1975, p. 58). From this perspective, words do not have an absolute meaning but in their use they get a meaning.

But that words and utterances are indexical begs the question of how they become rationally understood. And as Garfinkel (1967) means, the substitutability of meaning is always accomplished by contexts and by referring to a certain context indexicality is remedied and managed, which also means that the meaning of the word or utterance becomes objective, or at least “good enough” objective.

In documentary practices, practitioners develop a shared knowing of concepts and how to use lexical resources as tools for writing and reading. This means that language functions as a cultural tool that mediates the knowing of historically generated knowledge domains (Wenger, 1998). When it comes to the health care professions, extensive education/socialization in using professional language is needed. Morrison (1990) argues that what characterizes professional readers and writers with a shared knowledge are that they can create and use texts that serve as anonymous representations, or mediators, of meaning.

Following this line implies that texts in EPRs to some extent are seen and used as indexical mediators of meaning by the professionals. This is tantamount to Bowker and Star (1999) who argue that language, including categories, is essential in meaning making activities that both presume and develop shared knowledge. Such knowledge concerns how to conduct and bridge to, from and between the professional terminology and how it is used and expressed in order to distribute meaning (Hutchins, 1995) via the standardized terminology and structure in the EPRs. Text can thereby not only be seen as storage of information, but as an inscription of knowledge and meaning (Latour, 1998).
5.6 Mediating professional knowledge in institutional practices

How professional knowledge is mediated in an institutional practice is a central issue in this thesis. From my epistemological perspective, knowledge is embedded in activities. Thång (2004) argues that knowledge is personal, but also manifested and shared between people in activities. The interpretations and use of seemingly fixed and frozen medical categories and classification systems, often embedded in the EPR, presumes a great deal of professional knowledge.

However, knowledge can be seen in several different ways and from different perspectives. One can see knowledge as being connected with facts and principles, having familiarity or conversance with subjects, which in this case should be subjects related to health care work. On a general level one can say that professional knowledge is a prerequisite for competent acting that is valued in situations, which also means that knowledge is the ability to participate in a cultural activity. Leaving an individual perspective one can also see knowledge as shared, as a community’s ability to perform social tasks and to engage in those practices.

5.6.1 Categories and categorization as mediating tools

When studying workplaces and activities, categories and categorization mediated by artefacts are interesting as they capture important aspects of production and communication of professional knowledge and meaning making.

According to Bowker and Star (2000) category and classification systems are developed within a context of institutional practice to fulfil certain needs. From a sociocultural point of view, categories have a history and they are founded in human practices (Mäkitalo & Säljö, 2002), which makes them “historically situated artifacts” (Bowker and Star, 2000 p. 287). Categories emerge from organized activities and learning them is part of developing knowledge within a professional domain. That means that categorizing and classifying are situated, collective and historically specific activities (Bowker & Star, 2000).

In order to make sense in communicative practices staffs need to express themselves in such a way that it is intelligible to others. Beyea (1999) argues
that since professionals in health care act and speak through scientific and administrative institutionalized categories, there need to be a mutual understanding about their (the categories) meaning and what they represent. In an ambiguous world they help to bring clarity to objects, events, people etc according to the way they are used and have been communicated through history (Mehan, 1993). That is similar to what Mäkitalo and Säljö (2002, p.63) argue, referring to Marková, “The way we make sense is thus always dialogical: in terms of its adressivity an utterance is intelligible as responsive to something preceding it in a concrete situation”. From such a standpoint, Silverman (1998) means that categories help to extend and deepen professionals’ knowledge of properties, which implies that the categories are both recycled and developed in use.

It is impossible for an institution, such as a hospital, to take all facets of a person’s life, their history, thoughts, needs, concerns and circumstances into account simultaneously. It is therefore a necessity for the institution to apply a set of categories in order to describe a person and his or her situation so that it relevant for the hospitals obligations and routines (Järvinen & Mik-Meyer, 2003a). In health care, citizens are daily transformed to patients, which allows, or even demands, hospitals to process people through the institution. The change of perspective in health care, from a citizen to a patient perspective, is on the one hand crucial and on the other hand a professional act, in which a person is processed, reduced and/or focused on as having some medical needs.

Mäkitalo (2000) argues that these kinds of transformations can be seen as a way to determine the institutional obligations and resources. Similarly, Sarangi and Slemrouck (1996) argue that categories and categorizing often are activity-bounded and that they are used to organize and coordinate work and professional skills. Also Säljö (2001) argues that categories often are bound to activities and thereby also constitute phenomena that become conducive to a social practice.

An example from health care can illuminate this. To be categorized as having a cardiac infarction or being depressed are examples of institutionalized categories that professionals in health care use to transform people into patients. At the same time as those categories specify the individuals’ health problems they point to the institutional responsibility as they set up the relationship between the patient, the health care and the members of staff (Bowker & Star, 2000). Moreover, the categorization specifies the division
of labour and the responsibilities within different wards and knowledge domains (Star & Ruhleder, 1996).

What is also interesting is that the professional use of categories maintains the professionals' authority and professional knowledge. Sacks (1992) argue that a great deal of the professional knowledge is stored in categories that allow professionals to use and develop a terminology to talk about complex and temporal properties of work. To develop professional knowledge implies getting more and more familiar with the categories that apply to activities within the setting.

Organizing medical information into EPRs means organizing the context into pre-defined fields and categories. Such organisation of information is a vital part of staff members’ work, which also presumes knowledge about both how to express oneself as well as how to “unpack” categorized information. Therefore, categorization can be considered as a part of staff members’ professional knowledge. This process is what Bowker and Star (2000) calls “the naturalization of categories or objects” (p. 294) which means that the categories and how they are used become more or less taken-for-granted.

5.6.2 EPRs and the mediation of professional knowledge

By expanding communication and language into digital arenas, we can see that through the introduction of digital technologies, new ways to communicate are on offer in comparison to what was possible before. Through the use of digital technologies, which EPRs are examples of; communication is mixed and consists of both spoken and written language (Severinsson Eklundh, 1986). We expand our understanding of context to involve not only physical arenas, but also virtual arenas. But what the physical and the digital arenas have in common is that the communication often is carried out through the means of written language.

Säljö (2000) argues that the biggest challenge concerning ICT is to learn how to use or control the new technology, but that it inversely seems as if ICT itself tends to be the object for learning and the form becomes the content. To master the interface for human computer interaction together with built-in system logics can be seen as a process of material and conceptual coordination. From this follows that learning as well as the development of knowledge takes place in the use of EPRs, in the interaction
between humans, materials and conceptual systems. As the technology, to some extent, responds to the human user, it also becomes an interactive part that out of pre-programmed functions even pre-structures how the user can or should make sense of it. That does not mean, from the point of view in this thesis, that the technology itself can be ascribed the changes that occur in a work practice. Instead, in order to understand activities, work practices and professional knowledge in transition, one must study the technology in use where the social and the material are inherently intertwined in practice (Orlikowski, 2007).
CHAPTER 6

ENTERING THE HOSPITAL WARD:
RESEARCH DESIGN AND METHODS

In order to understand the significance and impact of EPRs in health care, it is necessary to see how they are used in the flow of activities in particular forms of health care practice. For this reason, focus is directed to the staff members’ communication, interactivity and concrete uses of the EPR.

Several choices had to be made during the data collection regarding how to get to grips with the work at the ward and how to find and understand interesting activities. In this chapter the design as well as the analytical and methodological problems will be discussed.

Workplace studies are (Luff, Hindmarch & Heath, 2000) concerned with the organization of collaborative activities and how technologies such as EPRs feature in interaction and practical activities in the workplace. They imply the detailed analyses of human conduct and interaction in complex technological environments. From this it follows that the data collection in the current work is based on observations and it could not in advance be known which situations would turn out to be the most interesting or have the greatest impact. The data collection took place at a hospital with seriously sick people, and there was a risk of getting close to ethically sensitive situations, which increased the importance of consideration.

6.1 The setting

The empirical setting is a rehabilitation ward for patients with neurological disorders at a mid-size hospital in Sweden. There are 20 beds for patients on the ward and the beds are placed in groups, the blue and the red side, with 10 beds each. The physicians have three offices close to the entrance and in the middle of the ward there is a large office mainly used by the registered and assistant nurses. This office has four separate desk spaces, and in a back room there are two additional desk spaces. There is a computer in every desk space providing access to the EPR and, since the desk spaces are free
for anyone to use, staff constantly come and go. The staff members on the ward consist of physicians, two teams of registered nurses (RN), assistant nurses, physiotherapists and occupational therapists. The latter two groups serve as consultants on the ward.

6.2 Data collection

In this study I have examined the practices and procedures and the socially organized competencies where participants use tools and technologies in the emergent production and co-ordination of social action and activities. This means that it is the practices and procedures that give objects and artifacts their occasioned and determinate sense (for a further discussion see Suchman, 1987, Heath & Luff, 2000).

In order to understand the workflow, and how the work is organized, about 200 hours of observations were carried out over a period of six months (see Figure 7). The observations were carried out two to three days a week. Those observations had different foci, and the purpose of the initial part of the research was to understand the overall expectations, norms, purposes and procedures already-in-place that adhered to the organization and coordination of work (Agar, 1986). This follows Agar (1986) and Patton (2002) who argue that observations make it possible to gain an understanding of what overall expectations and claims have an influence on the staff on the ward when organizing and coordinating work. This is also similar to Bryman (1988) who argues that it is by observing everyday activities that patterns and elements of locally shared knowledge that have emerged through history and which the staff consider relevant to orient to, are made intelligible for the researcher.

The observations primarily focused on the overall work activities at the ward. Owing to the highly interactive nature of work in health care, those activities involved nurses, physicians, physiotherapists and occupational therapists. The approach to observations adopted in this thesis is thus in line with Bryman (2007) and Kvale (1996) and can be described as a funnel shaped process where the point of departure was questions starting with ‘What…?’ Therefore, the observations were directed towards different activities and different discussions. They also involved talking to different staff members in and about various situations. Field notes were written in close conjunction with the observations, and the time, place, activities, as
well as what my immediate interpretation of what the participants addressed as important, were all recorded.

As the observations advanced, the focus gradually shifted to those activities that appeared relevant to the issue of the role of the EPR in the observed practice. At this stage the observations were guided by questions such as ‘How…?’ and ‘Why…?’ or ‘Under what circumstances…?’ The field notes documented the type of activity observed, the participants and the interaction that took place. Preliminary interpretations of what happened were also written down. The field notes, about 50 pages all in all, were typed the same or the following days after the observations. They were read and reread in order to obtain both an overall view of the data and detailed insights to guide further observations. As argued by Silverman (2000), situations, procedures and interactions were noted in the margin and guided the further analysis in order to understand how EPRs are used in everyday health care practices for communication and handling of information about patients’ problems. Another purpose of the fieldwork was to highlight those activities for closer scrutiny that played a critical role in using the EPR for organizing and coordinating information and work.

*Ethical considerations*

In 2002, the clinical management and the research director at the hospital in question confirmed their support for the study, and in 2003 the Research Ethics Committee of the Medical Faculty, Gothenburg University, approved the study (Ö 323-03). Thereafter, in 2003, the staff members employed on the wards in focus were asked for their permission to conduct the studies. In the work reported on here, all the members of staff on the ward were given oral and written information about the aims, and all volunteered to participate in the study. They were also guaranteed confidentiality and informed that, without further explanation, they could withdraw their participation. None however did. They were also informed that all data, recorded and written material, would be codified, handled carefully and that it would remain strictly confidential and used solely for the purpose of research. For ethical reasons all of participants’ names, as well as the institution where the study took place, were made anonymous.
6.3 Data material

An important aim was that the various methods of data collection would complement each other in providing answers in relation to the focus of research. In Figure 7, the methods, amount and types of data are presented in relation to each of the three studies that comprise this thesis.

<table>
<thead>
<tr>
<th>Study</th>
<th>Observations</th>
<th>Video recordings</th>
<th>Audio recordings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Study 1</td>
<td>190 hours of observations of the work at the ward which included 40 hours focusing on how staff gathered information for, and selected information from the EPR.</td>
<td>10 shift reports of 7.5 hours in total</td>
<td></td>
</tr>
<tr>
<td>Study 2</td>
<td>200 hours of observations of the work on the ward which included 15 hours of observations of 16 shift reports</td>
<td>10 shift reports of 7.5 hours in total (the same as in Study 1)</td>
<td></td>
</tr>
<tr>
<td>Study 3</td>
<td>190 hours of observations which included 15 hours of observations on 5 team rounds and including the nurses’ preparatory work</td>
<td>9 recordings (approximately 3 hours) from the nurses’ preparatory work with the EPR.</td>
<td>9 team rounds of approximately 7 hours</td>
</tr>
</tbody>
</table>

Figure 7. Collected data in relation to each of the three studies

About 100 hours of the observations presented in Figure 7 originate from the initial part of the research and this formed the basis for Study One and Study Two, together with an additional 20 hours of observations that were
carried out for Study Three. Approximately 70 additional hours of observation were directed to more specific activities in accordance with the interests of all three studies. A total of 120 hours of initial observations thus focused on the overall activities on the ward, and 80 hours were directed to certain specific interests. This amounts to 200 hours of observations.

6.4 Data analyses

The focus of the analyses of the observations was an interest in how staff members reach a comprehensible and mutual understanding of the patients’ problems and needs, and how they reach agreements on what are realistic overall goals and possible treatments for each patient. This implied forming analytical questions about what staff members do, what becomes a resource in different care activities and how such resources are used.

The field notes were used for documenting the workflow and guided the analyses, initially in order to form a preliminary hypothesis of how the EPR guided the staff’s focus on various aspects of work and patients’ care. Three activities were identified during the fieldwork from which analytical questions emerged:

- How do EPRs intervene in and structure the production and use of information concerning patients’ problems in the context of rehabilitation.
- What knowledge is inherent in processes of transforming vast amounts of information into brief presentations that are relevant for staff members in their care of patients?
- In what ways does access to structured information from multiple professions in EPRs enter into the phases involved in arriving at final agreements about patients’ future care?

*In Study One*, the interest was to explore how staff developed new strategies and competences for the organization and coordination of care activities when using EPRs. The analytical focus was to identify how the technology was integrated into the activities when staff construed and juxtaposed crucial information concerning patients and the delivery of care. More specifically, the analytical focus was to identify recurrent patterns of interaction and to describe how the staff interacted with each other and the EPRs. The 190 hours of observations at the hospital ward included approximately 40 hours
of observations of physicians’, physiotherapists’, occupational therapists’ and nurses’ daily work where they used the EPR to organize and coordinate their work. All observations were documented in field notes, which focused on the activities, participants and the interaction that took place. Preliminary interpretations of what happened were also written down.

Data material
The work of collecting and organizing information in advance of and during shift reports between the day and the evening shifts turned out to be a central routine activity in which the EPRs were regularly used to coordinate and organize the work. The data also consist of video recordings from ten shift reports, covering about 100 patients, where information in the EPR was used. One video recorder was arranged next to the nurses to capture how they interacted with each other and directed to the monitor and their notepads. A second video recorder registered what happened on the screen.

Analyses
The video recordings were transcribed and the participants’ talk was represented verbatim. Marks were made on the transcripts to guide a more detailed scrutiny of the video recordings. The repeated scrutinizing of marked parts on the video recordings focused on how the staff interacted with each other, how they turned to the EPR, and how they used the EPR to guide their understanding of how to carry out their work. Here, one particular interest was to understand how the information in the EPRs structured how entries were made, and how the information in the EPRs was understood when put to use. The ten video recordings from shift reports, which were used in this study, were also used in Study Two.

For Study Two, focus was directed to the kinds of knowing professionals need to contribute in order to make sense of past and future health care activities while using EPRs. The data consist of approximately 200 hours of observations of the workflow on the ward. The shift report between the day and evening shifts was a daily routine activity where information from the EPRs was remoulded from text to talk by the staff in order to share important information about the patients’ care. The EPRs were used on a regular basis as a major source of information by the team starting a new shift. When the registered nurses arrived at a new shift, they completed a cursory reading of the EPR before giving an oral report to the group of assistant nurses.
Data material

The data include observations of 16 shift reports, of about 12 hours in duration. Field notes were used during the observations to document sequences in the reporting activity. The focus of the field notes was on what topics were highlighted and what types of interaction took place.

To be able to capture detailed aspects of how the members of staff interacted with each other and with the interface of the computer system, the video recordings from Study One were used in this study as well. One video recorder was arranged next to the nurses to capture how they interacted with each other and other devices in the room, such as the monitor and notepads. A second video recorder registered what happened on the screen. The reason for this arrangement was to see both the interactions of the staff, and the simultaneous view of the user-interface.

Analyses

The transcripts of the video recordings were read and reread to identify patterns of how, in their practice, the staff carried out the work of selecting and organizing structured information in the EPRs in order for it to become relevant for the care of their patients. These readings resulted in marks on the transcripts, which functioned as a guide for further analyses of the videos. Here the focus was on the differences between how information was sequentially ordered in the EPR and the ways in which it was selected and organized in the oral presentations. The interest was on how, in order to make the oral handovers in the shift reports both intelligible and sufficiently concise, the reporting nurses distinguished between pieces of information in the EPR from different professional groups, and between what was relevant and what was not.

In Study Three, the focus was directed to the use of EPRs as a resource in collective decision-making when knowledge from different professionals needed to be taken into account. Team rounds turned out to be one such core activity where EPRs play a critical role for organizing and coordinating work. The analytical focus involved identifying how the information was used in a process of decision-making by the staff members and how, in different ways, the EPRs were used in the process of juxtaposing various types of information.

Data material
The data consist of approximately 190 hours of observations of the work on the ward including the initial observations of five team rounds. In order to capture more detailed aspects of the collective decision-making in the team rounds, nine additional team rounds were audio recorded. Those nine team rounds were also observed and documented in the field notes.

The data also included nine video recordings from the nurses’ preparatory work before the team rounds. Here, a video recorder was placed beside the nurse in order to capture how she/he interacted with the computer and the notepad. A second video recorder registered occurrences on the screen.

Analyses

On average, the nine audio-recorded team rounds lasted about 45 minutes. All of the audio recordings were transcribed on the same or the following day. The transcriptions were read and reread in order to identify patterns of how the participants interacted, with what, and how they backed up their standpoints. Subsequently, the repeated analyses of the field notes and audio recordings focused on identifying the ways in which the EPR could provide tools for collective decision-making and how these tools were used in the activity.

The analyses from these nine team rounds focused not only on the interaction and interplay between participants and devices such as notepads or printouts from the EPR, but also on glances at each other, where the care staff sat, how they interacted orally and by means of body language. The reason for making video recordings of the nurses’ preparatory work was to identify how the nurses navigated in the record to gather relevant information. The video recordings were analysed in order to find patterns of the information in the EPR and in the subsequent patient briefing.

6.5 Reflections

Two central questions are whether the results are valid, and whether they can be transferred and/or generalized. The trustworthiness in the analyses depends on the focus of the study, the sampling of data and the approach to the data. In this thesis I have used different methods for data collection and collected various types of data, depending upon the different characteristics of the studies. These include observations, field notes, audio- and video recordings as well as samples of printed patient records. The field notes
were taken to record what I saw and heard and, in accordance with Silverman’s (2000) suggestions, were dealt with in the following way:

- short notes made contemporaneously
- expanded notes made as soon as possible after each session, where I developed a deeper and more general sense of what was happening
- fieldwork journal where I recorded issues and ideas that arose during the fieldwork
- a provisional running record of analysis and interpretations

These ways of dealing with field notes were crucial for the understanding of the work taking place on the ward, but also for the ongoing planning during the data collection. During the whole data collection and in the initial analysis of the field notes, I collaborated with a colleague who is an experienced registered nurse. With him I could discuss everything from specific terms that had been used on the ward, to situations I had observed in the care work. This colleague is also a co-author of the articles that comprise this thesis.

Sacks, Schegloff and Jefferson (1992, p. 622) told students that an advantage with recordings is that they can be replayed:

...I could study it again and again. And also, consequentially, others could look at what I had studied, and make of it what they could, if they wanted to disagree with me.

Sacks’ view is consistent with how I have approached the data. I have repeatedly read, listened and watched, and carried out data sessions to conduct collaborative analysis. This is an approach that has enabled me to keep an open mind and to minimize the risk of being trapped in premature interpretations and conclusions.

The questions about validity and generalizability are, at the end of the day, questions about the extent to which the data corpus and results serve as examples of routines and procedures. From my point of view, analyses have been shown to be fruitful and significant in relation to the aim of this thesis. But of course, the patterns of workplace activities and professional knowledge that I have found in this study cannot be seen as something solid and ‘prefabricated’ over time. Instead, they must be seen as dynamically changing and developing in relation to how the conditions for carrying out care change. It is reasonable to assume, however, that changes in workplace
activities and professional knowledge are, in themselves, mainly stable entities.

The methods employed in the data collection and analyses provide one way of ensuring validity. And, since the results of my analysis have been presented by providing detailed descriptions of what I have found as typical cases, it is possible for the reader to generalize the results to other situations. Thus the value of the results and questions relating to validity and generalizability depend, to a great extent, upon how this thesis contributes with analytical contributions to understanding workplace activities and how staff members know how to pursue with their work in a changing and technological environment.
CHAPTER 7

SUMMARY OF THE STUDIES

Article 1: Local knowing and the use of electronic patient records: categories and continuity of health care

The electronic patient record (EPR) is a multi-purpose tool that is intended to support a range of activities such as planning, decision-making and evaluation. Each of these activities is quite complex in their own right. The interest in this study is to explore how EPRs intervene in and structure the production and use of information concerning patients’ mundane problems in the context of rehabilitation.

The results from this study show how the use of EPR, which contain information from different knowledge domains, co-ordinates activities round the clock. In the shift reports between the day and night shifts, the EPRs structure what is made topical. In the short shift report in the morning the nurses’ first check the EPR and then assign tasks to the enrolled nurses. But to assign tasks presupposes that extensive knowing about each patient has been elaborated in the previous shift reports between the day and night shifts. To co-ordinate activities during the day, notepads, whiteboards and test lists are used to mark who, where and when activities are to be performed. During the day, the staff members make new entries in the EPR to mark test results, provide information about interventions etc. that are used by staff on the coming shifts.

Further, as staff members document and read from the EPR to uphold information about the patient’s health status. EPRs also make relevant what to observe. This, in turn, affects what it is that has to be reported, organized and further documented in the EPRs. Since EPRs are intended to serve a multiplicity of information needs, demands are put on the user to make sense of the documented information in ways that are relevant for the specific purposes at hand (Berg 1996). Consequently, there is a need for local interpretative work concerning the meaning of the text, signs and data and their consequences for the care delivered. When staff members use
EPRs, they constantly have to contextualize what is written in relation to what they know about patients and/or the current situation. On the local level, the increasing standardization that follows the introduction of EPRs will make it even more necessary for professionals to engage in such interpretative work to close the gap between the standardized categories of the EPR and contextually relevant health care interventions.

As the results show, there is a tension between the highly uniform structures and standards for documentation in EPRs, on the one hand, and, on the other, how information is designed and put into use by care professionals. However, EPRs fulfil functions of both organizing information and sustaining a specific division of labour and thus have a predominant role in the constitution of what is treated as relevant problems.
Article 2: Electronic patient records in action: Transforming information into professionally relevant knowledge

The purpose of this study is to contribute to our understanding of the practical work of selecting and organizing structured information in an EPR that enables staff members to make sense of past and future care activities. Of particular interest is the knowledge inherent in this process of transforming vast amounts of information into brief presentations that are relevant for staff members in their care of patients.

The result from this study shows how the order of events in the nurses’ presentation of patients regularly follows a structure that deviates significantly from the structure of the classification system in the EPR. This puts demands on the reporting nurses to reorganize the information in a way that is more adapted to the responsibilities of the staff to help patients with their daily needs. Such reorganizations presuppose that the nurses are knowledgeable of how to apply a narrative structure for presenting the patients, which is also recognizable for the health care staff as an established way of organizing knowledge. The sequencing of the presentations often follows a typical order of all reports on the ward and is recognized as a typical narrative structure for presenting medical cases which has been in use since the early days of medicine.

At other times, the nurses’ reporting follows the sequence of notations in the EPR. But to follow such sequences presupposes knowledge of what pieces among all available information are relevant for the staff in order to fulfil their task on the following shifts. Most of the information about day-to-day care is entered into daily notations and is only chronologically ordered. Moreover, certain subcategories that may include specific health problems are not even searchable. When reporting, however, all daily notations about a patient during the present caring episode have to be scrolled through to find the relevant pieces of information. There is thus a need for knowing how to sort out and relate needs and interventions, something that is also necessary for evaluating the care delivered.

The interactions studied show that transparency of meaning cannot be taken for granted. A conclusion from the results is that such interactions also are necessary for establishing a shared sense of what the meaning of the information actually is. One implication is that the implementation of
information systems needs to account for the concrete work these systems are intended to support. The ongoing development of standardized information structures in healthcare should be a prerequisite for developing information structures so that they can facilitate documentation, as well as supporting everyday knowledge production. But, at the same time, it is necessary to take into consideration the extent to which writers and readers familiar with different terminologies, professional knowledge, etc. are able to understand each other.
Article 3: Electronic Patient Records in inter-professional decision making: Standardized categories and local use

The overall aim of this third study is to explore how, in EPRs, access to structured information from multiple professions features in the process of making decisions about patient care. In particular the ways in which staff members make use of EPRs to retrieve information about their patients, and how this subsequently is factored into the negotiations involved in collaborative decision-making processes are closely examined.

The results show that decision-making in multi-professional team rounds is a matter of pre-structuring a pathological reality. When the nurse, in this case, prepares the patient briefing, her knowing about the context – the inter-professional team rounds – is of great importance. This involves knowledge about, for example, the team round, the surrounding setting, the audience, historical knowing about what is considered relevant and necessary information, as well as historical knowing of how to structure a narration. This knowledge becomes a resource even before the nurse starts to search for information about a patient.

Therefore, recasting patients’ problems involves knowing how to make sense of categorized information. Such knowledge is simultaneously pre-structuring the understanding of the problems at hand. Moreover, as seen in the results, categories in EPRs have an indexical logic that is based on knowledge of and about the local work and the institution’s obligations. Hence, the logic of decision-making is not to be found in the technology itself. Instead, the logic can be seen as locally shared knowledge of the specific meaning of standardized categories as they are put to use in decision-making practices.

One important implication is that the implementation, design and use of information systems and their built-in conceptual structure needs to handle information in the actual health care work. A major conclusion is that the staff members’ knowledge on how to bridge between standardized categories in EPRs and their local meanings is decisive for understanding the basic conditions necessary for how EPRs can support inter-professional collaboration.
CHAPTER 8

DISCUSSION

The overall aim of this thesis is to convey the importance of the complex actions and interactions that occur when EPRs are introduced in a healthcare practice. The theoretical approach to learning that is adopted implies that learning takes place in social activities where both novel technologies and more traditional tools, such as notepads or paper-based documents are used. Empirically, this means that studying learning and professional knowledge is a matter of studying activities where technologies are put into practical use since this is where experiences and knowledge are brought to life. Therefore, in this thesis, learning and knowledge are seen as an integrated part of human activity, which involves language, communication, thought and actions situated in different activities and where learning and knowledge only can be seen and understood in relation to these.

Taking technology in action as a point of departure provides an opportunity to shed light on issues relating to professional knowledge as well as transformations and tensions between information and knowledge. Put another way, it makes it possible to understand how EPRs are integrated in meaning making activities and used for knowledge production. From the perspective adopted in this thesis, it becomes possible to explicate knowledge of how EPRs are used in and for communication and information handling in healthcare.

During the initial observations at the hospital ward where the data collection took place three analytical questions emerged, which each will be addressed in turn.

The first research question focuses on how EPRs intervene in and structure the production and use of information concerning patients’ mundane problems in the context of rehabilitation.

The ways in which EPR systems are structured, with categories like ‘anamnesis’ and ‘oversensitive’, mediate both the content and the structure of the duties and expectations as to what the staff should do and what they should find out. In this sense, the EPRs serve as very concrete tools that
distribute responsibilities and expectations not only as to what to do and how to do it, but also when to perform tasks. As can be seen in Study One, the EPRs simultaneously coordinate several activities for a number of professional groups. One example of this is how the EPR is used by staff for taking up anamnesis, and documenting care activities etc. In its extension, the outcome of the anamnesis is used as a guide for future work. In this way the EPR also becomes, as Timmermans, Bowker and Star (1998) contend, a means for making sure that the working tasks that staff are responsible for have actually been performed.

Moreover, the results from Study One underline the view that EPRs can be seen as constitutive of what is to be considered as relevant knowledge and what the profession is all about (Beckerman, 2006, p.169). Health care is characterized by a high incidence of routines, and the design of EPRs, with their standardized terminologies, can be seen as an attempt to further homogenize the ways in which work is carried out. Even though there are written guidelines, it is the built-in expectations in EPRs that structure how and when to perform work, as well as how and when to use different artifacts. But, as illustrated in Study One, there will always be a tension between the expectations of homogenized standards and the actual use of artifacts in everyday practices. Guidelines and structures can never predict every detail and circumstance, nor can they enclose every work activity. Moreover, no matter of how well developed guidelines and structures might be, the members of staff are still ultimately responsible for how they perform their duties. This implies that the exact manner of how to take up anamnesis, explain a patient’s status or planned care, must be adjusted in situ.

As demonstrated in Study One, there is a relationship between the text in the EPR and how duties are performed. However the transitions from text to care and vice versa are made by the staff and depend on their knowledge in and about health care in general and the specific situations at hand in particular. This implies that staff members cannot completely allow their accomplishment of procedures to be determined by the standardized terminology built into the EPRs. This is illustrated in Study One where, in a shift report, it is notated in the EPR that a patient “is firm, eats well but little”. The standardized information entered in the EPR, is an outcome of a chain of re-representations (Bowers, 1992), where knowing from different professions is condensed into a single notation. It indexes a diverse range of
action-relevant knowing about a patient’s eating habits that could be relevant for the organization and coordination of work. The nurses who lead the shift reporting activity read from the computer screen and say to the others “She eats and that is good but she is very firm sort of. If she doesn’t want more she takes the hand and ... shoves it away” and “She sort of eats very little” (Excerpt 1). This utterance is consequential in the sense that it offers a basis for continued action; the actors understand it in the sense that they know how to go on.

The second research question focuses on the types of knowledge that are inherent in the process of transforming vast amounts of information into brief presentations that are relevant for staff members in their care of patients.

As demonstrated in Study Two, the differences between the structure and the content of information in the EPR and the nurses’ oral presentations during shift handovers are significant. There are vast differences between the EPR and the oral report in the terms that are used and how topics are sorted and categorized. By taking a look at Excerpt 2 in Study Two, it is possible to see how categories such as Fax, Tests and Referrals are used in the shift report to provide a status report. However, this categorized information is also used to establish a division of labour in the following shift. An example is when the reporting nurse says “eheh urine culture just like on the fourteenth” (Study Two, Excerpt 2). It is the information of the status, what has been done, which simultaneously prompts the nurse (in this case) to check up the result of the test. Thus it becomes clear that categories contain both a status dimension and a dimension of division of labour. However it is equally important to notice the type of professional knowledge that is necessary in order to understand the relationship between the status dimension and its impact on the professional obligation, i.e. areas of responsibility in focus for the following shift.

The standardization of terminologies and structures that is inbuilt in the EPRs is a prerequisite for organizing information as well as making such information searchable. However questions as to what pieces of information are relevant, in what order and to what extent, are a matter of understanding the meaning in situ. So, even if the standardization of terminologies and structures in EPRs constitute a presumption for staff to be able to access the necessary information in shift reports, there is a gap between the standardized terminology and structure in the EPRs and the structure and
content in the shift handover itself. As seen in Study 2, bridging this gap is not only about transmitting a codified content. Instead it requires knowledge of how to codify information. Knowing how thus becomes a prerequisite for knowing that, i.e. what is relevant in situ. Knowing how and knowing that originate in a shared institutional and professional history. It is this history that constitutes the knowledge necessary for the achievement of bridging the gap between, for example, the notation "weak left, aphasia" (Study 2, Figure 2) and how this is reported and understood in a shift report, related to both the patient’s health and the staff’s work. Doing this demands knowledge of how to re-organize, select and highlight information from the EPR. These are decisive steps in translating the information contained in the EPRs into practical use, particularly in that account has to be taken that the knowledge relates to and emanates from different knowledge domains and cultures. For instance, when nurses prepare and accomplish their shift report, their experiences from doing this previously in the same setting become resources even before they start to search for new information about the patients. Therefore, as argued by Montgomery Hunter (1991), it becomes clear that these activities involve historically established knowledge of what is considered to be relevant and necessary information, together with the knowledge of how to structure a narrative. This is also in line with the perspective taken by Sacks, Schegloff and Jefferson (1992) who argue that making sense of information involves knowledge about how to handle predictable social structures in activities and specific settings. Thus to re-organize, select and highlight information from EPRs is a way to constitute causality between past, present and future work activities.

The research question in Study Three focuses the ways in which access to structured information from multiple professions in EPRs enters into the phases involved in arriving at final agreements about patients’ future care.

Although an EPR can contain a description of a patient’s status, past, ongoing and planned care activities etc., it can never contain a complete representation of a patient. This is shown in Study Three where a short patient briefing, although functioning primarily as a formulation or presentation of a patient’s condition and needs, still leaves the story open to negotiation.

However, just as the EPR contains categorized information about a patient, it simultaneously pre-structures the ways in which problems are, or can be,
understood. This pre-structuring does not determine the outcome; there are still possibilities for the staff involved in the briefing to recast the information into specific meaning and knowledge in situ. This can be seen in Study Three, Excerpt 5, where the physician combines information from the nurses’ and the physiotherapists’ modules. The information from different modules and categories in the EPR is recast by the physician and used to arrive at a formulation of both the patient’s condition and the actions that need to be taken. Knowledge about a patient’s status and what this means for continuing work can be seen as generated in and through practice. And of course it is. However, at the same time, it can be seen as distributed through a semantically and practically used artifact (EPRs), which implies that professional knowledge, in many respects, is maintained through talk and textual practices.

8.1 Standards and structures of EPRs

The standardization of terminologies in EPRs forms a way of structuring the relationship in and between different items and topics and has great importance for the ways in which health care professionals understand clinical problems and make decisions. Moreover, as evidenced in Study One, it has implications for the ways in which care is organised. However, it is neither the EPRs themselves, nor the standardized terminology or the structures of information that are maintained that give life and meaning to the EPRs, but rather the ways in which the health care professionals use them. Therefore, as revealed in Study Two, when members of staff use the EPR they have to relate to the predetermined standardized terminologies and structures. This means that the EPRs constrain the individual’s understanding of the patient’s situation and the related procedures.

When staff members update themselves via the EPR they have to adapt to the predetermined standardized terminologies and structures, both as readers and as writers. Ways of expressing oneself in the EPR cannot be separated from the understanding of the content itself. And the content cannot be separated from the activities from where it originates. Therefore EPRs with their standardized structures and terminologies, work as a means, not a goal. Such a means transforms not only the understanding but, as an outcome, also the procedures and routines in the activities, as showed in Study 1. That is also in line with the results from Håland (2011) and Goud
et al (2011) who found that the introduction of EPRs must be understood as a wider change of work and presumptions. The health care professionals that use EPRs are all members of care units that work together in situations where standardized terminologies are supposed to function as mediators of information from one individual to another and from one community to another. Whilst EPRs do not actively mediate information by themselves, they provide opportunities for the users to use them as tools for mediation. It is by allowing the EPRs to function as a means for mediation that, among other functions, the EPR becomes what Star and Griesemer (1989) call a boundary object.

There is no doubt that new technologies, such as EPRs, both offer and presuppose standardization, which, in turn, can be seen as examples of formalization. This also means that technologies might emerge as tools for controlling and indeed restricting work routines and procedures (Giddens, 1990). This, however, does not mean, as for example argued by Hylland Eriksen (2001), that databases such as EPRs format and structure information exclusively, nor that they are entirely driven by their own internal logic. The overall conception of databases as having their own logic (Franko-Aas, 2004) that users have to adapt to presumes that people are passive users of such systems. From such a perspective, standardized terminologies and structures control and restrict the room for manoeuvre of individual care staff. But, as evidenced in the studies conducted in this thesis, this is by no means the case. When the actual use of EPRs is examined, as in Study Three, this reveals the ways in which health care staffs relate to standardized built-in terminologies and structures with confidence and assurance. To a large extent staff members trust the possibilities of having social control over the content and use of information that the documentation in EPRs provides. They do not therefore unconditionally adapt to an imagined recipe or logic that is inbuilt into the EPR. Instead, the staff members observed in Study Three consciously choose segments of information from the EPR to evaluate or use in arguing for or from particular standpoints.

Analogous with the results in Study Two, Spinuzzi (2003) provides numerous examples of how staff members find or create local solutions for how to use and understand artifacts with built-in structures. Instead of letting the structures in the EPR get the upper hand, in Study Two the nurse systematically searches and selects information. The circumstances in the
shift report in Study Two, imply that the reporting nurse has to create a narrative which is logically adjusted to the overall report situation itself. This situation involves the intended audience, the meaning of the activity and the context. The creation of this narrative not only presumes knowledge of the situation, but also of how to use the EPR as a tool for organizing information into a coherent narrative. Furthermore, it presumes knowledge of how to handle the tool so that it does not get a superior position compared to other needs in the care work where it is to be applied.

Timmermans and Berg (2003) argue that a professional who works with standards is engaged in an “active act of allowing oneself to be transformed while at the same time transforming the standard (p. 73)”. To put it another way, where the general standard ends, the local design of local standards, created by local users, begins. This duality of transforming standards and of being transformed by using standards implies no contradiction. On the contrary, the duality is a requirement for ascribing power to standards (standardized terminology and structure). This can be seen in Study One where the structure and standards in the EPRs intervene with tasks such as taking anamneses. The questions put by the nurses in the anamneses originate in the EPR but are transformed and adjusted to the local needs and circumstances on the rehabilitation ward. As shown in Study One, every kind of standard exists in relation to something in a specific situation. This means that there is always a need for a specific type of knowledge to understand the standard. Moreover, this something and those situations will always tend to transform or change. The circumstances of when work is performed, what knowledge we have about the disease or injury, and what technologies are available etc. have historically always changed, and will most likely continue to do so in the future. That means that standards, as well as routines and procedures in which standards are used, will also have to transform or change (Timmermans & Berg, 2003). To understand and handle those standards in transformation and change requires a great deal of knowledge. Indeed, it would be true to say that most of us are quite familiar with the fact that it takes more than access to a cookbook to become a competent chef. Exactly how much is needed of a particular spice? When exactly has something been heated enough in comparison to the other ingredients? Just as in the case with taking up anamneses in Study 1, it does not matter how a phenomenon is structured. Further, no matter how well descriptions of what to do are formulated and how items and topics are
related to one another, no standardized descriptions will ever, in every possible detail, be entirely predictable or without omission (Lynch, 1997).

Meaning making processes such as bridging between the standardized information and the local circumstances presume that users understand how to apprehend specific categories, which, to a large extent, constitute the standardized and structured terminology in EPRs. Even though, for example, neither Sacks, Schegloff and Jefferson (1992) or Silverman, (1998) use the concept of a ‘boundary object’, categories as knowledge-bearers involve users of the categories who, collectively, evolve a common proficiency in understanding the content and the indexicality of the categories in use. This common proficiency is similar to boundary objects in that while both are sufficiently plastic to be adapted to local needs and circumstances, they are sufficiently robust to maintain a common identity across sites (Star & Griesemer, 1989).

Whether information in the EPRs is adequate and reliable must be seen in the light of how the information is related to something that is needed in a particular situation. As demonstrated in Study 2, the health care professionals address their remarks in the EPRs to colleagues. This means that they write in a certain way to mediate a certain understanding of a problem. Therefore, the remark “is firm, eats well but little” (Study 2, p. 16) presumes a shared local knowledge about how co-workers re-contextualize information. The information in the EPRs can thus, in this way, be seen as a reification of situated experiences transformed into textual information (Säljö, 2005), which is subsequently re-contextualized in other situations. However, re-contextualisation presumes both the possibility and the knowledge of how to put information together and how to use it in new situations. Therefore, the health care professionals’ knowledge about how to enter into or retrieve information from an EPR is transformed into a common proficiency. Seen in this way, EPRs develop the standardized categories into boundary objects, thus, in the process, transforming one’s the knowledge, or as Timmermans and Berg (2003, p. 73) put it, “allowing oneself to be transformed”.

8.2 Indexicality and transforming standards

But what about transforming the standard? Indexicality gives the possibility of putting information together in new combinations in new situations.
According to Silverstein (1976), indexicality appears, or becomes visible, in the knowledge of how topics, items and categories are related to one another in situ. So, if standards are transformed, there will be indexicality between topics, items and categories, but in a transformed way. This means that indexicality cannot be seen or understood as fixed paths or relations. Instead, indexicality must be understood as determined in relation to the situation.

Exactly as revealed in Study Three – both in the patient briefing (Excerpt 1) and in the decision-making process that follows (Excerpts 2-6) – categorized information can be used in new combinations in new situations. This forms a kind of indexicality in the use of categorized information, which simultaneously constitutes the meaning making processes in the activity. But this indexicality is not built into the EPRs; here, rather, it is a part of professional knowledge. Moreover, since activities, purposes and knowledge needs cannot be predicted, there has to be an indexical elasticity in the way information from EPRs is used where possible descriptors of patients imply a negotiation of meaning. There cannot be a fixed hierarchy in meaning making processes, which means that a particular category of information does not necessarily count more than any other, nor can it overrule contextual factors (Berg, 1996). Instead, there is an indexical elasticity that admits new combinations of information to make sense in situ. And, as revealed in Study Three, what makes sense in a situation is to a great extent a matter of how members of staff manage to re-contextualize information.

Another example of this indexical elasticity can be found in Study Three, Figure 1, where a physiotherapist’s notation is stacked under the category *Coordination*. This category mediates expectations connected to responsibilities for the physiotherapist and reaches out to the activity where the physiotherapist examines the patient. From one point of view, the notation is simply a status report, which responds to the expectations of the examinations carried out. Here however it is used by the physician, in collaboration with the others, to make sense and come up with a plan for further care. So notations made by the physiotherapist in the category ‘Coordination’, which originate in actions in the past, are used by the physician in the present situation to deal with activities in the future. This is an example of how categories bring together different activities made by different staff members for different purposes. This also means that new information is constantly notated in the EPR, something that has
consequences for how patterns of indexicality can develop differently in different situations. Thus, the indexical elasticity of categories involves different aspects of time.

The knowledge involved in using EPRs as tools for both retrieving and transforming information in an adequate manner can, in Study Two, Figure 2, be seen when the nurse scrolls up and down in the EPR, selecting information for the reporting narrative. The nurse clearly knows how to actively transform the structure of information in the EPR by selecting and sequencing information in a manner that the situation at hand demands. What the nurse is doing is bridging the gap between the standards in the EPR and the needs in the present situation. This presumes, initially, that the nurse is adaptive, secondly, that she has a local knowing in and about the situation and, finally, that the standards – the categories – are not entirely fixed.

Bridging gaps, as the nurse does in the shift report in Study Two, is analogous to Bateson’s (2002) argument that humans think in structures where the connectedness between A and B is the first thing we have to deal with. The next thing is to deal with is their membership in the present ‘story’ which involves both context and relevance. So, what Bateson so lucidly describes is that, even though thinking and creating a story implies a structure, the structure itself does not control the thinking that takes place. Further, Bateson argues that communication with and through standards is all about maintaining a fragile balance between process and form. This is similar to how the decision-making process in Study Three is performed. Bateson explains this balancing in the following way “Break the pattern which connects the item of learning, and you necessarily destroy all quantity” (Bateson, 2002, p. 3). The point he is making is that standards and standardized terminology must be allowed to be open-ended in their local definition and use. If not, there is a great risk that the pattern, or the structure, breaks down and can lead to collapse. This means that standardized terminology cannot determine its use in all respects. This can be seen in Study Two when the nurse is selecting and sequencing information from the EPR and, in so doing, adapting it into the particular circumstances of the shift report.
8.3 Implications

An initial question that can be asked is whether knowledge can be referred to as professional, on the one hand, and generic, on the other. The analysis in this thesis includes an examination of the ways in which knowledge within a particular activity system is made focal. As has been demonstrated, the indexicality of information in the EPR becomes visible in, for example, Study Three, where knowhow about topics, items and categories are related to each other. At the same time however indexical elasticity is an expression or an outcome of professional knowledge. Such knowledge is related to tools and categories in the EPR, and a particular activity system. It is within this activity system, with obligations, restrictions, social structures, relations and priorities, that the participants’ knowledge is developed and becomes valid. Wilson (1983, p.150) puts it like this:

> What one needs to know also depends in part on what others expect one to know. What one needs to know in order to perform an occupational role or to fulfill one’s obligations as a citizen participant in public affairs is set only in part, often a very small part, by technical requirements. What can be ignored and what must not be ignored are matters settled by collective agreements (tacit or overt) as much as, or more than, by the actual indispensability or dispensability of knowledge to performance. And finally, what one wants to know will reflect what one thinks others do know – what there is to know about.

So, just as indexical elasticity appears in relation to a specific situation, the situation itself cannot be understood as neutral context. Instead, situations can only be understood within the activity system under which they are a part. In this thesis the activity system is a hospital with its organisation and the knowledge is therefore related to the social practices and activities that take place there. From such a perspective, it can be argued that professional knowledge is connected to such activity systems. However, what this knowledge consists of is, as the results show, an empirical question.

Another question is what the above means for the development of knowledge, or what the individual development of knowledge in different social practices means for collective learning processes, is organized and maintained through formal education.

The learning of a profession involves not only learning a number of intellectual or practical skills, but also, as seen in the results, participation in a community where norms, values and expectations concerning the profession are included. These norms, values and expectations of a
profession are expressed in the individuals’ actions and are strongly related to health care as an activity system. Even though guidelines in, for example, EPRs emphasize certain procedures and activities, there is, as demonstrated in Study One, a tension between homogenized standards, the actual use of artifacts and the actual performance of care work in everyday practices.

Organizations, just like schools and formal education providers, need to take into account the different types of intellectual or practical knowledge that professionals are expected to have. While on the one hand such knowledge needs to be adjusted to the very local circumstances that pertain, on the other, it needs be transparent and related to the overall organizational discourse. How learning and development of such knowledge takes place are of particular interest for WIL and, as demonstrated in this thesis, there is an empirically inseparable relation between professionals’ knowledge and learning, and changes in organisation and work premises. From a WIL perspective this is interesting since it focuses on issues of how professional and institutional issues interplay with changes and understandings of what constitutes professional knowledge. This is also important for formal and informal education and for making tacit and local knowledge visible, understandable and transparent within and between professionals as well as organisations.

8.4 Conclusion

As demonstrated in this thesis, for staff to be able to transform standards an important presumption is that they understand that there are relationships between topics and items in the EPR. Such understanding and capacity of manageably is a vital aspect of what can be considered professional knowledge. So, the relationships always rely on some kind of logic. Consequently studies that focus on the databases themselves overlook the activities in which the databases are actually used. This makes it difficult, or even impossible, to see the relationships between the topics and the items from a user perspective. However, by including the actual activities that embrace users as well as the technology, a fundamental difference appears between the design and the actual use of the databases. The shift report in Study Two is a product of the nurses’ understanding of relationships between the design – with the structures and standardized terminologies in the EPR – and the demands of a particular situation. Here it becomes
obvious that the EPR – the technology – is a resource standing between the
users and the task at hand, and that the nurses’ narration in the shift report
is built upon and adapted to an understanding of the activity itself.

The analytical approach adopted in this thesis of scrutinizing the activities,
i.e. the technology in action, reveals fundamental issues about the backstage
communication and activities that are crucial for understanding what
Goffman (1998) calls the frontstage in the institutional environment. It is
the staff members’ professional knowledge that makes it possible to mediate
the meaning of information contained in the EPR and to transform the
information into contextually situated significance. And it is in this gap-
bridging process from one situation to another that standards are
transformed over time and across different activities.

The nurses’ professional knowledge is mirrored when the EPR is used to
mediate experience-based meaning in and about situations. But, as
demonstrated in all three studies, the staff members have extended their
knowledge from those situations to understanding the significance of the
textually-mediated meanings in other situations. This professional
knowledge only becomes visible in the borderland between the textually-
mediated meaning and the activity that the readers/users/team-members
turn their attention to. Moreover, by scrutinizing and making patterns of
knowledge and learning visible, this becomes a way to develop knowledge
about work-integrated learning.

As has been shown, it is necessary for the staff to use the EPRs in order to
be able to access and convey important and reliable information in and for
their work. Moreover, if several people are supposed to share and have
common use of EPRs, there is a need for standardized terminology that can
facilitates communication and professional dialogue. When members of
staff comply with a set of standards, transformations of those standards will,
sooner or later, occur. Those transformations are collective achievements
and, since each professional involved act in a conscious and active manner,
this affects the use of standards as well as the development of collective
proficiency. Therefore, it can be said that the significance and logic of the
meaning in the information is contextually situated, created and exposed by
the users. It is in the process of reliving, creating and exposing the meaning
of information, that health care professionals actually bring the information
in the EPRs to life.
In sum, the results demonstrate that using EPRs to make sense in different institutional settings presupposes extensive knowledge of the indexicality of categories; something that originates in the participants’ shared institutional history. To develop systems that increase the possibilities for professionals in different institutions with different professional domains, routines etc. to make sense of standardized information may be a much more demanding task than it might appear to be. Such boundary-crossing systems are nevertheless of great importance for the development of health care.

8.5 For the future

In the further development of EPRs that exceeds institutional and even national boundaries (Health-Committee, 2007; Socialdepartementet, 2006), it is important not to see this development as solely involving technical or organizational questions. Instead, one has to account for the local hermeneutics, and for the knowledge embedded in the information and categories.

As we can see in the result, health care work to a great extent is characterised by collective recourses of knowledge where EPRs are important tools for maintaining such shared knowledge. The concept of distributed cognition gives possibilities to scrutinize the process of reification of knowledge into information, which has been done in all three studies. One interesting aspect of seeing information in terms of reified knowledge is that it makes it possible to scrutinize and analyse the knowledge involved. That means that the methodological approach in this thesis can be used as a way to develop evidence-based insights and for further development of quality.

The development of health care sector and its premises has already begun, even though it is on an “experimental” stage, in that different institutions such as the municipal health care providers, hospitals and primary care have mutual planning meetings for the care of elderly people. Such mutual planning meetings are carried out with web cameras (without physical meetings) and all documentation and information is run by digital technologies such as EPRs. Thus it would be particularly interesting, and in line with the interests in work integrated learning, to, with the methodological approach in this thesis, follow this inter-institutional
development, both from a professional perspective, as in this thesis, but also from a patient perspective.

Another area potentially fruitful for further research is education. We are now in a situation that in many aspects is similar to the transformations in health care that took place in the early 20th century, as set out in Chapter Two. The crossing of institutional and international boarders and the introduction of digital technologies in health care have an extensive impact on organisation, coordination and communication, and are of particular interest in work integrated learning. As demonstrated in this thesis, those changes have implications for the provision of care and what can be considered as relevant and professional knowledge. However, how and to what extent digital technologies can be seen as a tool for future professionals, and what this means in educational settings, is still largely unknown.

Sammantaget kan man säga att övergången till att använda elektroniska patientjournaler inte bara innebär en digitalisering utan det ökar tillgängligheten (eftersom alla behöriga och inloggade kan ta del av infon, mellan avdelningar och sjukhus), men detta påverkar också t.ex. koordinering, organisering, beslutsfattande, planering och uppföljningar. Genom ökad tillgänglighet ställs också andra krav än tidigare på språk, kategorisering och klassificeringar.

Så som jag ser det så är frågan hur teknik används viktig av flera anledningar, inte minst för att både teknik och användningen av den påverkar sjukvården. Men det har också implikationer för personalens kunnande, vilket i sin tur är viktigt ur ett arbetsintegrerat lärandeperspektiv, både på arbetsplatser och i utbildningssammanhang.

Under de senaste åren har alltfler studier fokuserat arbete, interaktion, informationshantering och ökad digitalisering inte minst inom Actor Network Theory (ANT) och Human Computer Interaction (HCI). Inte sällan är fokus på teknik, design, effekter etc. Men perspektivet som jag har ansluter sig till workplace studies och är en del av det arbetsintegrerade lärandet där jag studerar användningen av tekniken, hur vård blir text/information och hur text/information blir vård. Detta innebär att jag
ser kontexten som viktig och i kontext ingår, från mitt sätt att se det, sociala, kulturella, historiska och institutionella aspekter, och det är också en viktig anledning till att jag använder mig av sociokulturell teori som verktyg i min forskning.

Det övergripande syftet är att bidra till vår förståelse av hur EPR påverkar kommunikation och information om patienters problem. Detta gör jag genom att undersöka hur EPR används i den vardagliga vårdpraktiken. En ytterligare avgränsning är att fokus är vilken kunskap som är involverad och utvecklas av professionella när de använder EPR för kommunikation, samordning och organisation av vård och omsorg.

Tre frågor är härledda ur syftet och dessa ligger också till grund för tre separata studier.

Den första frågan rör hur EPR griper in och är med och strukturerar framställning och användning av information om patienters problem.

Den andra frågan fokuserar vilken kunskap som är närvarande i processer med att omvandla stora mängder av information till korta presentationer som är relevanta för professionellas vård av patienter.

Den tredje frågan fokuserar på hur tillgång till strukturerad information från flera yrkesgrupper påverkar hur man fattar beslut om patientvård.

Dessa frågor behandlas och besvaras i tre separata studier som också utgör mitt forskningsresultat:


9.1 Elektroniska patientjournaler ur ett historiskt perspektiv

Patientjournalernas historia visar hur dess utveckling hänger ihop med utvecklingen från ”familjedoktorer” till allmänna sjukhus. En väsentlig skillnad gentemot familjedoktorer var att på sjukhus var det inte alltid samma läkare som arbetade med en patient, utan personal arbetade alltmer i skift och team runt patienten. Så från att tidigare varit individuell dokumentation, nästan som personliga anteckningar, så utvecklades patientjournaler till ett verktyg för att föra vidare information som var nödvändig för att organisera vården och skapa/upprätthålla kontinuitet.

Patientjournaler blev ett redskap för aggregering av kunskap som var viktiga för medicinsk och medicinteknisk utveckling, samhällsplanering, vårdutveckling och utveckling av vårdutbildningar. Genom att kunna samla information från många olika sjukhus, avdelningar och läkare, så kunde man göra analyser som liknade surveystudier för att hitta samband och relationer, men också få tillgång till information och göra utvärderingar om tillvägagångssätt vid behandlingar, medicineringar osv.

Allt detta ökade behovet av standardiseringar i uttryckssätt, terminologier, men också vad som finns med som frågor/rubriker i journalerna, dvs. standardisering av struktur. Jag visar också på hur utvecklingen har gått från pappersbaserade patientjournaler till elektroniska patientjournaler och hur dessa har utvecklats från de första embryonen på 1960-talet till dags dato.

9.2 Elektroniska patientjournalers strukturer

De förhoppningar som olika avnämare/intressenter riktar på elektroniska patientjournaler förutsätter olika saker. För det första så är förhoppningarna att EPR ska leda till ökad kvalitet och ökad effektivitet, för det andra finns förhoppningar om ökad säkerhet (lagring, vem som läst/skrivit) och ökad patientmedverkan (ta del av journalerna) men också ökad samverkan mellan olika aktörer såsom sjukvård, primärvård, FK etc.

Men eftersom all vård och behandling både förutsätter och genererar mycket information krävs att den är sökbar och begriplig, dvs. strukturering är en förutsättning. Ett sätt att beskriva hur elektroniska patientjournaler är strukturerade utifrån arkitektur (hos olika moduler/funktioner är integrerade med varandra), terminologier (termerspråket som används och dess
hemvist) distributionsregler (tillgång och rättigheter i systemet) samt kommunicering (regler för hur information ska spridas).

Det finns flera stora och viktiga terminologi- och klassifikationssystem såsom NIC (National Intervention Classification) och SnoMed (Systematized Nomenclature of Medicine, Clinical Terms). Det finns också olika fokus som olika strukturer i EPRs kan ha och som organiserar informationen; källorienterad (utgår från den profession som dokumenterar), problemorienterad (utgår från problemets art) samt processorienterad (som utgår från de olika vård- och behandlingsprocesserna). Jag visar också på hur VIPS-systemet är uppbyggt. VIPS är det största systemet i Sverige idag och också det system som används i det sjukhus som jag gjort mina empiriska studier vid.

9.3 Tidigare forskning om elektroniska patientjournaler

I kapitel fyra går jag igenom tidigare forskning och den har jag kategoriserat i fem underrubriker.

* System centric research* karaktäriseras av studier som har ett fokus på relationen mellan elektroniska patientjournalsystem och arbetspraktiker.

* Implementation centric research* fokuserar studier om hur elektroniska patientjournaler är integrerade i och har blivit en del av vårdpraktiker.

* Change centric research* fokuserar studier om relationen mellan elektroniska patientjournaler och hur vårdarbetet utförs.

* Documentation and information centric* fokuserar studier om documentationens innehåll, omfattning och fokus då man använder elektroniska patientjournaler.

* Efficacy and quality centric research* inkluderar studier som fokuserar på i vilken utsträckning elektroniska patientjournaler påverkar olika sätt att se på kvalitet och effektivitet.
9.4 Teoretiska perspektiv på forskning om användandet av elektroniska patientjournaler

Jag beskriver hur kunskap och lärande förstås i den här avhandlingen samt hur relationen mellan teknologier och aktiviteter förstås. Jag använder mig av sociokulturell teori och redogör för hur jag teoretiskt ser på;
- Kategorier och kunskap
- Meningsskapande
- EPR, kunskapsutveckling och lärande
- Läsande och skrivande som ett verktyg för att minnas

Sociokulturell teori ger verktyg att förstå och analysera relationen mellan individers lärande och de sociala sammanhang där lärandet sker. På det sättet kan lärandet på arbetsplatsen ses och förstås som en process med vilken vi förstår vad som värderas i en kultur och samtidigt också bidrar till att utveckla den kulturen.

Sociokultur innebär utifrån det här teoretiska perspektivet att det är ett samspel och samarbete mellan människor där en sociokulturell individ utvecklar sina grundläggande kognitiva färdigheter, det vill säga sin uppfattning om sig själv och andra människor. Det sociokulturella sammanhanget är därför av stor betydelse för individens utveckling.


De språkliga verktygen får mening genom interaktion med andra människor och begrepp används både för förståelse i allmän mening men också i specifik mening, dvs. vad det betyder just här och nu.
9.5 Datainsamling och analys

Data består främst i observationer och videoinspelningar. Observationerna (ca 200 timmar) började med att jag vistades på en vårdavdelning och försökte bilda mig en uppfattning om vad som hände där. Vad man gjorde, vem som gjorde, med vad man gjorde, hur man gjorde och så vidare. Totalt var jag där i ca 6 månader. Allt eftersom bilden klarnade för mig så började jag fokusera alltmer på de situationer där elektroniska patientjournaler användes på ett eller annat sätt. Under hela den här tiden skrev jag fältanteckningar som hjälp för min analys och förståelse, totalt ca 50 sidor.

Tre aktiviteter framstod som mer väsentliga att studera närmare:

- Hur EPR griper in och strukturerar framställning och användning av information om patienters problem och behov.

Studie 1 består av ca 190 timmar observation varav ca 40 timmar är hur personal samlar och selekterar information in och ut ur EPR. Dessutom har jag 7.5 timmars videoinspelningar av totalt 10 skiftrapporter.

- Vilken kunskap är närvarande eller förutsätts i arbetet med att omvandla stora mängder av information till korta relevanta presentationer.

Studie två består av 200 timmars observationer varav 15 timmar fokuserar på skiftrapporter. Dessutom har jag 7.5 timmars videoinspelningar av totalt 10 skiftrapporter, samma data som i studie ett, fast olika analytiska frågor.

- På vilka sätt är tillgången till strukturerad information från flera yrkesgrupper i EPR närvarande i de olika faserna när det gäller att komma överens om, eller fatta beslut om, patientens framtida vård?

Studie tre består av 190 timmars observation varav 15 timmar fokuserar teamronder och förberedelsearbetet inför de. Jag har videoinspelningar av 9 förberedelser av ssk (ca 3 timmar) samt ljudinspelningar av 9 teamronder.

9.6 Sammanfattning av delstudierna

Resultaten visar hur EPR fungerar som ett nav för koordinering av vårdarbetet och i de rapportssituationer som finns vid varje skiftbyte. Info från olika källor såsom anteckningsböcker och vitheboards förs in i journalen och vidare till nästa skift. Det i sin tur påverkar vad de fokuserar och vad de följer upp och dokumenterar i nästa steg. Men samtidigt ställer detta stora krav på personalen när det gäller att kontextualisera information, dvs inte bara förstå vad infon betyder i allmän mening utan också vad det innebär specifikt för patienten och för deras eget arbete. I viss utsträckning är det möjligt enbart genom den standardisering av struktur och terminologi som finns i journalsystemet men samtidigt är den standardiseringen på generell nivå medan personalen arbetar på lokal nivå. Det innebär att det krävs en kunskap och förmåga att transformera info både till och från lokal och generell nivå.


Resultaten visar hur den struktur som finns i EPRs skiljer sig från den struktur som finns i den muntliga framställningen av patienter och deras behov, problem och arbetet med dem. Den muntliga framställningen följer en annan logik, som också kan ses historiskt i gamla kardex-system och rapportblad. Att göra en muntlig patientframställning förutsätter två saker; dels att veta vilka förväntningar som ”publiken/åhörarna” har om hur en framställning ska vara, dels en förmåga att selektera informationen och förpacka den på det sättet. På det sättet kan man säga att den som håller i rapporteringen också är en länk mellan två olika logiker i framställning och presentation. Detta följer naturligtvis också en förmåga att veta vilken information som är relevant för åhörarna och hur den ska berättas så att den blir begriplig i sammanhanget.


Här framkommer det hur teamrondsmöte kan gå till. Efter en inledande patientbeskrivning tar de olika professionsrepresentanterna vid och försöker med hjälp av patientbeskrivning och journalen komma fram till beslut om
problem, behov, möjligheter, ansvar och fortsatt vård. Genom att ha tillgång till info från flera yrkesgrupper kan man problematisera bilden och skapa förståelse för vad som är både specifika och gemensamma möjligheter, ansvarsområden och åtaganden.

9.7 Diskussion

I detta avslutande kapitel diskuterar jag frågor om hur standardiserade informationen används av personalen i olika aktiviteter. Jag diskuterar vidare vilka typer av kunskap som behövs för att omvandla dokumenterad information till relevant och användbar kunskap, och hur kunskap och resultat från olika aktiviteter omvandlas och kategoriseras i ett standardiserat system. Detta vidareutvecklas och diskuteras ur olika perspektiv såsom meningsskapande, skapande av logik och indexikalitet.

Sammantaget visar resultaten av studierna att användning av EPR i olika institutionella miljöer förutsätter omfattande kunskaper om indexikala kategorier, något som har sitt ursprung i deltagarnas gemensamma institutionella historia. Att utveckla system som ökar möjligheterna för professionella i olika institutioner med olika professionella områden, rutiner etc. att förstå standardiserad information kan vara en mycket mer krävande uppgift än det verkar vara. Sådant arbete är ändå av stor betydelse för utvecklingen av hälso- och sjukvården. Jag diskuterar vidare om hur den fortsatta utvecklingen av EPR, inter-institutionella och även inter-nationella gränser, måste tag tag i inte enbart tekniska eller organisatoriska frågor, utan även den lokala kunskap (och eller tolkning) som finns inbyggd i information och kategorier.
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PART TWO: THE STUDIES
Local knowing and the use of electronic patient records: Categories and continuity of health care

Thomas Winman, Roger Säljö and Hans Rystedt

Abstract
The electronic patient record (EPR) is a constitutive element of medical practice and can be conceived of as a multi-purpose tool that is intended to support a range of activities such as planning, decision-making and evaluation. Each of these activities is quite complex in its own right. The aim of the present study is to explore how the standardized format of EPRs intervenes in the work of sustaining continuity in patients' care. In doing this we analyse how this format contributes to structure the production and use of information concerning patients' mundane problems in the context of rehabilitation. Data consists of observations, informal interviews and video-recordings from a ward for patients affected by stroke. The results show that there is a tension between the highly uniform structures and standards for documentation in EPRs, on the one hand, and, on the other, how information is designed and put into use by care providers. When staff members use EPRs, they constantly have to contextualize what is written in relation to what they know about patients and/or the current situation. On the local level, the increasing standardization that follows the introduction of EPRs will make it even more necessary for professionals to engage in such interpretative work to close the gap between the standardized categories of the EPR and contextually relevant health care interventions. In spite of requests for increasing standardization there will always be a need to adapt to specific needs for more flexible information structures. Otherwise, there may be the risk that non-standard features the initial standardization was intended to reduce may be reintroduced.

1. Introduction
Documentation is a central element of most institutions. We cannot conceive of a well-functioning legal system that lacks an extensive use of written documents. If we want to understand “how institutions think” (Douglas 1986), and how they remember (Ackerman and Halvorson 2004) we must consider the fundamental role that documentary practices play in most human activities (Bowker 2006). Health care is an interesting example of an institution with an elaborate and well-developed tradition of documenting its activities.
Historically, information about patients and their care have been recorded and stored in paper-based patient records. It is to these artefacts that health care providers have historically turned to in search of information about past, planned and on-going treatments. These records can therefore be seen as a kind of collective memory in health care and a hub around which work revolves (Timmermans and Berg 2003; Heath, Luff & Sanchez Svensson, 2003; Ruland 2000).

However, there are still some fundamental dilemmas related to documentation in health care (and in all other institutional contexts). Key among these, no reporting can be complete, neutral and relevant for all legitimate purposes. Documentation has to be selective and focus on that which is, according to given criteria and human interests, considered relevant and significant to attend to in a particular practice (Heath and Luff 2000). Moreover, since categories and terminologies are at the core of professional knowledge, and the ways in which problems and their solutions are formulated, they also define and delimit the tasks and obligations that health care institutions are responsible for (Timmermans et al. 1998). Thus, technologies for documentation are in a fundamental sense dependent on categorizing practices that are grounded in perspectives that represent different human concerns and forms of professional knowledge (Mäkitalo and Säljö 2002).

Since human knowing to a large extent is codified in language, the terms and terminologies used in these categorizing practices are more than arbitrary conventions that can be changed at will. Instead, as Bos and Kun (2011, p. 1) argue, there are “differences in languages, terminologies and coding schemes” built-in into technologies. Those differences origin from routines norms and values inherent in professional knowledge domains and thereby “reflect the way we live our life or perceive the world”. The introduction of electronic patient records (EPRs) during the last few decades is an example of a communication technology that has thoroughly changed the underlying premise of how information is created, stored and distributed among professionals for coordinating health care work (cf. Taneva et al., 2011).

Firstly, since this development dramatically increases the possibilities for sharing information across professional and institutional boundaries, there are growing demands for standardized terminologies and information structures to enable productive and precise communication over time and between contexts (Timmermans and Berg 2003).
To be available for multiple users, all information needs to be codified and structured in uniform ways that are searchable, and this has, in turn, augmented the need for standardization. These demands are also accentuated by the possibilities of aggregating digital information for the purposes of quality assurance, long-term planning and research (Moen 2001; Ruland 2000; Winthereik and Vikkelso 2005). Ball and Lillis (2000) highlight such increased expectations that have followed the introduction of EPRs:

…healthcare technology is poised to transform practice.

Healthcare information systems can extend and enhance the memory; streamline administrative processes; provide access to information where, when, and how it is needed; and manage the cost of care while protecting and improving clinical quality and customer satisfaction. (p. 386)

These promises of smooth information flow, supported by uniform terminologies and structures, have been difficult to deliver (Clarke et al. 2006; Hindmarsh et al. 2007). As indicated in several studies of health care over the last decades, both terminologies and classification structures may vary between professions as well as between clinics and hospital wards (von Krogh and Nåden 2008; Karlsson 2001; Nilsson 2002). These differences concern factors such as use of terms, modes of formulating reports, and the manner in which information is organized (Zhou et al. 2009).

Secondly, the introduction of EPRs significantly increases the complexity of care as more information becomes available and must be considered in the care process. In contrast to paper-based records, EPRs are available throughout a care unit, be it a clinic, a hospital or even at a national level (for a critical discussion, see Clarke et al. 2006). The increasing availability of records, not only kept by a single profession, but also by allied professionals that follows the introduction of EPRs makes it much easier to access and combine information from different knowledge domains (Tang and Carpendale 2007; Østerlund 2008). For instance, when nurses’ present a patient during shift-changes, they usually open and read the nurse’s record in the EPR (Zhou et al. 2010). In addition, and as a consequence of the
availability of documentation produced by physicians and occupational therapists, nurses may also consult these records in order to provide a more comprehensive presentation of the care to be delivered (Winman and Rystedt 2011). This, in-turn, implies that it is necessary to understand what a piece of information means from the perspectives of other professionals and how it is related to their roles and responsibilities. With respect to this, EPRs can contribute to a reorganization of how knowledge about patients is collected and distributed in health care settings (cf. Svenningsen 2003).

A range of studies on the use of patient records in the field of CSCW (Computer-Supported Cooperative Work) has demonstrated that the conditions necessary for writers and readers to understand each other cannot be reduced to a set of technical issues (e.g., Berg 1997; Bossen 2002; Østerlund 2008). The present study contributes to this body of research, and relies on the assumption that the practices of reading and writing patient records rest upon “a body of socially organized practices and conventions which inform both the production and intelligibility of the records” (Heath and Luff 2000, p. 33). From this it follows that information is not a self-sustaining entity that can be used and understood in uniform ways in different contexts. As Hartswood et al. (2003) demonstrated, local needs cannot be anticipated for all possible purposes and all future readers. Since records are intended to serve a multiplicity of information needs, demands are put on the reader to make sense of the documented information in ways that are relevant for the specific purposes at hand (Berg 1996). As shown by Winman and Rystedt (2011), information in EPRs is regularly transformed into a narrative form in oral shift-handover meetings that involve the practices of selecting, highlighting and re-organizing diverse pieces of information. Consequently, there is a need for local interpretative work concerning the meaning of the text, signs and data and their consequences for the care delivered (Østerlund 2008).

An additional dilemma involving the practical work of reading and writing is that EPRs have emerged from a medical tradition and have often developed with medical terminology that relies on the idea that health-problems as well as human concerns and the problems of managing everyday life can be neatly ordered into medical categories. Many patients, however, do not only suffer from single conditions, but sometimes and possibly as a consequence, also suffer from cognitive, perceptual and motoric problems that heavily impair them from managing and expressing their basic needs. Consequently,
such mundane problems may be regarded as diffuse from a medical point of view and highly problematic to transform into such categories (Winman and Rystedt 2011; Zhou et al. 2010). In relation to EPRs, this is significant for how knowledge about such problems can be documented in a pre-structured format. As pointed out by Jones (2009), topics discussed during hospital admission interviews closely follow the structure of a pre-formatted admission form, forecasting that electronic versions of such forms will be consequential for the patients’ anamnesis and future care. In a similar vein, Moore et al. (2010), in the context of service work, give insights into the ways in which the standardization involved in the digitization of an order form causes typical routine troubles that mainly emerge from the fact that customers often have difficulties in matching their orders to pre-formatted categories. In this context, new compensatory practices were introduced by the service workers in order to deal with inadequacies, mainly by re-introducing non-standard features that the form was intended to eliminate.

Another significant aspect of how EPRs mediate between readers and writers involves the ways in which information is used and reused across a patient’s care episodes as a basis for providing appropriate care. In this study we shed light on the issue of how EPRs are built up through a hierarchy of standardized categories for structuring information. More precisely we investigate the ways in which such systems intervene in how staff members, as both writers and readers, sustain continuity in patients’ care through the production and use information on patients’ mundane but often complex problems. In doing this, we have studied how a newly introduced EPR is used in sustaining the information-flow in a rehabilitation ward for patients affected by stroke. The EPR in use is based on a classification structure in nursing that has many categories in common with a medical terminology (see Ehnfors et al. 2000). This setting is thus a relevant site for the study of how information about patients with the many multifaceted problems following from stroke can be communicated by means of an electronic format that is largely based on pre-structured categories. In line with Zhou et al. (2010), we have explored how nurses assemble and use information, for instance in shift-handovers, which is a site where information is presented and unpacked in order to convey essential knowledge about patient care and sustain continuity over patient care periods. Two research questions guided the analysis of the staff’s
information work and the significance of the standardized format of EPRs involved in this.

- How do the pre-formatted categories in the EPR enter into the production of information, i.e. in assembling and entering information about patients’ problems and needs?
- How are patients’ problems and needs expressed in these categories, and what local interpretative work do nurses employ to make practical use of this information?

2. Methods

In order to examine how information is documented and used to support health care work, this study has examined the use of a Swedish information system at a stroke-rehabilitation ward at a mid-size hospital in Sweden. In this setting, the EPR system had been used on a regular basis for two years as the major source of information. Data collection was guided by qualitative ethnographic principles (Agar 1986; Hammersly and Atkinson 1995). These principles also guided the analysis of the data, consisting of observations, informal interviews, patient records and video recordings.

2.1 Empirical setting

The ward where data was collected has 20 beds and is divided in two sections. There is a long corridor running through the ward and close to the entrance there are offices for physicians. The nurses’ office is located in the middle of the corridor. In the nurses’ office there are four computers and a space where nurses sit down to document and read patient records. This is also the place where medicine is kept and where all documents like referrals and administrative forms are placed and handled. From this office, there is a door leading into a small meeting room with one computer on a desk and six chairs where shift handovers take place.

In all, four to five nurses and six to eight assistant nurses work on the ward each morning and evening shift. In addition, there is one physician in charge between the hours of eight am and five pm. Outside this time physicians can always be called in from the nearby wards. Also, one occupational
therapist and one physiotherapist work on the ward during these hours. They can be seen as consultants, since they serve all wards at the clinic. For each section of 10 beds there is a team consisting of one registered nurse in charge who works together with another registered nurse and about three assistant nurses.

The nurses in charge have overall responsibility for the daily delivery of care, but also for most of the administrative work such as coordinating information about referrals, test-results, admission and release processes (after physician decisions). They are also responsible for contacts with patients’ families as well as with other caregivers if the patient needs further assistance at home after being discharged. In all they need to handle extensive amounts of information, both within the hospital and from other stakeholders, to provide and coordinate care.

When the nurses in charge arrive at a new shift they receive a short briefing about urgent or on-going matters from the nurses on the previous shift. The registered nurse on the arriving shift completes a cursory reading of the EPR before giving an oral report to the assistant nurses. During the handovers, team members are placed so that they can all see the EPR on the same computer screen.

2.2 Data and data collection

This study is based on extensive field-based observations during a period of six months, in all about 190 hours. The observations were carried out two or three days a week for about four hours a day by the first author (TW) and were distributed between both morning and evening shifts. Nurses’ work was the focus from the start, but owing to the highly interactive nature of work at the ward, physicians, physiotherapists and occupational therapists were also included. The activities observed included admission interviews, rounds, shift handovers, post-rounds discussions, documentation work, administration of medicine, team meetings, release procedures, and so on. These activities were documented in field notes including the names of those that participated, what the aims of the activities were, and the topics addressed. The purpose was to get an overall understanding of the work processes and how different activities were related, both to each other and to the overall responsibilities of the institution. Field notes were transcribed
the same or the following day and were also used to guide further observations.

After an initial observation period the focus of the observations was changed from separate activities to the larger processes the activities were parts of. By following one nurse during a whole work shift, the intent was to gain insight into how different activities are related to each other and what interventions are made and were a part of the staff’s regular work. Attention was directed at how staff members navigated the ecology of information and tasks on the ward and how information was used in the preparation of activities such as shift handovers.

The observations also involved informal interviews with staff members both in and about situations. The questions asked in situations were meant to uncover explanations of what was going on, and questions about situations were asked if the situation itself did not allow for direct questioning or if the purpose was to know more about the relations between different activities. A typical example of questions in and about situations was when we followed a nurse during an admission interview. When she prepared for it, we asked questions about what she was doing, why she read about the patient in the EPR and why she made notes on her notepad. After the interview, we asked questions about the situation.

Observations covered numerous occasions of documentation and use of patient records. In addition about 200 printouts of patient records were reviewed by the first author. Combined, this gave us the opportunity to follow the links between assembling information, providing patient-directed care and documenting with the EPR in its original context.

Shift handovers, in particular, were found to be a significant site for studying the importance of the EPR for sustaining information flow and ten such situations were videotaped. These observations afforded the capture of detailed aspects of the nurses’ interaction with each other, and with the interface of the computer system (see Heath et al. 2010). This was enabled by placing one camera next to the nurses to capture how they oriented to each other and to other devices in the room, such as the monitor and notepads. In this way not only the orientation of the reporting nurse was recorded but also how other participants’ oriented to the EPR. A second camera registered what happened on the screen. The purpose was to see both the interaction of the staff and to simultaneously view the user-
interface and how the reporting nurse navigated in the patient record. All video recordings were transcribed by the first author at a level of description in which the participants’ talk is represented verbatim.

2.3 Data analysis

All data including field notes from observations, interviews, printouts of patient records, and video recordings were used to form the basis for an endogenous analysis of the members’ perspectives embedded in their practices of producing and using information as part of their everyday work. The field notes were used as resources for corroborating our understanding of the overall workflow and ways in which the EPR functioned as a link between activities. The printouts of the patient records, in combination with the recordings and transcripts of the shift handovers, allowed for a further analysis of the content of each patient’s record in relation to what was orally reported during the handovers. The analysis of the video recordings focused on how and when the nurses oriented to the content of the EPR, i.e. on occasions in which it was appropriate to turn to the EPR, what pieces of information were selected as relevant, etc. This included instances when the reporting nurses assembled information in the EPR from different professional groups and selected what was relevant. The analysis also included how these pieces of information were made intelligible in the staff members’ interactions, for example, how chunks of text were transformed into verbal utterances that were addressed to other team members (cf. Winman and Rystedt 2011). Verification of the analysis was carried out through a discussion of preliminary findings with a group of hospital staff members.

The results are presented through a description of the development of a single case over time. The description is built up through the general patterns emerging from the analysis of all data presented above, i.e. field notes, printouts of documents, records and transcriptions of shift-handovers. The purpose is to show how continuity is maintained by means of EPRs and how general problems of handling information are constituted on a local level. The case is thus according to our data significant for how care information was transferred to text in the EPR and how this information, in turn, was understood as consequential for patients’ care needs.
3. Results

There are many aspects of care work, but as Zhou et al. (2010) argue, it can be divided into two major parts, patient-directed care and the documentation needed for providing this. We consider those parts of care work to be complementary. Patient care has to be sustained around the clock which requires mechanisms for distributing information among various members of staff. To accomplish everyday care thus requires continuous collective remembering, providing staff members with relevant information. The shift handover is one crucial element in this process, in which the EPR is used on a regular basis by the arriving shift for retrieving the information necessary for carrying out work. The EPR system in use in the studied ward includes a wide range of functions that are needed for handling text, referrals, laboratory tests, results of examinations, x-rays, etc. In this hospital, the co-working doctors, nurses, physiotherapists and occupational therapists, use separate modules in the system. Each module, in turn, is divided into a number of general classifications and subordinated categories. These classifications and categories might resemble each other, but their meanings are grounded in the responsibilities of the specific profession. All staff members have access to the information in all modules, but each group can only make entries in their own module. Let us illustrate some of the features and dilemmas of this system when used in practice by means of a case description.

3.1 EPRs as re-representations of multiple activities

In this case we follow the care of Anna, a 75 year-old woman with dementia, who has arrived at the ward with a cerebral infarction. Her symptoms include aphasia and perceptual difficulties. When one of the nurses interviewed Anna’s relatives, she noticed that Anna had a history of not being particularly eager to eat or drink. The interview revealed that these problems had become more pronounced as her dementia progressed, a condition that may cause a loss of feelings of hunger and thirst. Of course, as the nurse said, one of the most fundamental elements of healthcare is to make sure that patients are eating and drinking properly. This, in turn, requires a range of care routines and, in this case, included finding out if a problem still existed in this respect when Anna was admitted to the hospital.
Through an interview with Anna’s relatives, the nurse secured that the necessary information was available to be sure that problems concerning eating and drinking needed to be attended to and documented while caring for Anna. To prepare for care activities, more specific information was also needed on this matter. This was provided through the physician’s anamnesis by, for instance, asking questions such as: are there any special needs, treatments etc. that must be attended to? Is the patient oversensitive to anything? Can she swallow properly? Does she have a lack of any important nutrients? Can she eat and drink without assistance? The outcomes of these interviews were documented in the specific modules for each profession in the EPR. This illustrates the complexity of the concrete delivery of high-quality care, which must rely on information and insights from different professional domains.

As argued by Bossen (2002), co-workers in health care generally need at least some understanding of each other’s duties and responsibilities. Thus, it is necessary to establish a reasonably shared interpretation of how to proceed. To manage this in a collaborative setting, it is vital to have access to relevant information. If we consider EPRs to be a technology for accumulating and organizing information in healthcare, as suggested by Nilsson (2002), it is interesting to see how, and in what sense, it is consequential.

Returning to the case of Anna, when entering the evening shift, the nurse responsible for the team received a ten minutes briefing from one of the nurses on the previous shift that focused on urgent and on-going matters. The arriving nurse made notes on her notepad and then read what was documented in the modules of each profession in the EPR. She repeatedly shifted focus between her handwritten notes and the EPR and carefully read about each patient at the ward and entered additional notes in her own notepad. After about fifteen minutes, she gathered the assistant nurses on the evening shift in a room adjacent to the office where they all sat down around a computer. The nurse in charge, Nurse 1 in Excerpt 1 below, opened the nurses’ module in the EPR and began to report on the first patient, Anna. Some minutes into the report the nurse attended to her problems with eating and drinking that were found under the heading of ‘Nutrition’ in the EPR. The following conversation took place:
Excerpt 1

1. Nurse 1  | She eats and that is good so but she is very firm sort of. If she doesn’t want more she takes the hand and (.) shoves away ((reading and looking at the nurses module in the EPR))

2. Nurse 2  | She sort of eats very little ((Reading the EPR and then looking at her colleague))

3. Nurse 1  | Yes and it is important that you get her to drink a lot. The doctor said yesterday that she is to (.) 1000 millilitres during twenty four hours otherwise (.) we will drip-feed her then ((looks at the EPR and turns to the team))

4. Nurse 2  | at least

In turn 1, Nurse 1, who leads the shift handover, turns to the computer screen and verbally reports on the documented topics. When reading, she makes clear that the patient eats. But when she says this, she also makes it implicitly clear that Anna has no difficulties in swallowing or any other obvious physical problems with eating. However, she also makes explicit that the patient is very firm sort of, indicating a reluctance to comply, and that there are in fact still issues to attend to when it comes to Anna’s eating habits. This is confirmed in turn 2 by Nurse 2, who, while looking at her colleagues, points out that Anna eats very little. It is thus established that Anna eats, but she eats very little. The assistant nurses silently nods and raises no further questions or comments about this matter.

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1 Participants’ talk is written in Courier New. When members of the staff produce talk that is reading from the text of the EPR, the transcript is italicised. Non-verbal activities are indicated within double brackets and (.) indicates audible pauses.
Excerpt 1 represents a typical interactional sequence where the EPR is used. What is accomplished in this sequence, however, in spite of its seemingly trivial character is rather complex. When the nurse says she eats, this is an outcome of a chain of re-representations (Berg 1996), where knowing from different professionals is condensed into one utterance that is rich in information. Some of the steps that have gone before the nurses are able to make this claim include the following: both a physician and a nurse have examined whether or not there are any known allergies or oversensitivities to food or medicine provided. Moreover, the occupational therapist has examined if Anna is able to move her arms and hands in manners that will allow eating and drinking. The staff must also make sure that Anna’s swallowing reflexes function properly. The physician has made clear that her injury does not affect her ability to eat and also examined whether or not there are any indications of malnutrition. Each contribution to the care process made by each professional involved in this chain has to emerge from their own specific knowing in these particular circumstances. That which is considered to be relevant from each examination is then entered into the EPR by each professional, but what is interesting here as a preliminary observation is that seemingly simple entries such as she eats, incorporate and codify information and knowing from many different sources and professional perspectives. This implies that she eats is more than terminology; it is what Timmermans et al. (1998) refer to as knowledge that has been reified as professionally relevant information. Furthermore, it is consequential in the context of the shift handover in the sense that it offers a basis for continued action; the actors understand in the sense that they know how to go on, to use Wittgenstein’s (1981) suggestive expression, with what they are supposed to do.

3.2 EPRs in the production of information

Much information in the EPR emanates from admission interviews, which in-turn, form the baseline for subsequent care periods. When doing this kind of interview, the nurse follows a paper form corresponding to the categories of the EPR in use, which will eventually store the information. This form, or scheme, can be seen as yet another institutional tool for documenting and remembering vital information as it provides a framework for structuring what is relevant and is instrumental in ensuring that interviews are coherent and exhaustive.
At some level, the nurses on the ward are constrained by these schemes since they are accountable for the content of the anamnesis. In this way they are operating under what Suchman (2000) calls a regime of administration and control. When interviewing a relative, as in Anna’s case, the nurse mostly followed the headings in the scheme, but, again, the manner in which an institutional tool is put to use must be considered in context (May et al. 2005). For instance, in Anna’s case the nurse did not take up those items in the scheme that had to do with culture and religion, even though such factors in a multi-cultural society would often be important for understanding the patient’s lifestyle and food preferences.

In Anna’s case, culture and religion were not attended to, since she obviously was seen as a member of the majority population, and therefore such factors were not expected to play any significant role. Thus, even though the nurse used the scheme as a structuring resource that was guiding the interview, the scheme did not determine exactly which aspects the nurse considered important to include in the anamnesis (cf. Jones 2009).

The next step for the nurse after this kind of interview is to selectively represent that which is considered essential in the EPR by condensing the outcome of the interview into an institutionally relevant discursive form. In this specific case, the nurse considered that the information about not having any food allergies was relevant, and she wrote *no known allergy or oversensitivity* to food under the category ‘Oversensitivity’ in the EPR. Other information that the nurse considered relevant about Anna’s earlier medical history such as family, lifestyle and social life, were picked up from the interview, modified and documented under other categories and sub-categories in the EPR. Again, there is an intricate relationship between the nurse, who is performing the task on the one hand, and on the other, the artefact, a specific EPR with a pre-defined structure to which the information has to be adapted in a relevant manner.

After data have been documented in the EPR, it is impossible for a nurse to change it. The data entered becomes part of a body of shared information for all co-workers that is structured in a specific manner and that is available whenever needed. We can see from this specific case that the tool, through its scheme and structure, supports the organization of the interview, and at the same time, is a foundation for what and how information is documented in the EPR. Thus, there is circularity in this process involving contingencies between people, categorizing practices, artefacts and social action. Tools
mediate not only that content which is of importance, but also provide a structure of how items and topics are related to each other (cf. Heath and Luff 2000).

Extensive clinical observation and, equally importantly, extensive knowledge in and about situations underlie the piece of information Is firm, eats well but little which is entered into the EPR (see Figure 1). Most important, one must be familiar with the intrinsic system of categories that constitutes the structure of the EPR to be able to classify problems so that they are accessible to colleagues. Figure 1, exemplifies some of the categories in the nurses’ module: ‘Communication’, ‘Probation’, ‘Elimination’ and ‘Nutrition’. Since the brief notation in the EPR not only indicate that Anna eats small quantities of what is served, but also that she refuses to comply, her problems also may be related to other aspects such as difficulties to express her wishes or to understand the necessity of eating and drinking. Consequently, it is far from obvious under which category the observations should be entered. In this case the perceived problem was entered under ‘Nutrition’
The present case illustrates that there is no given correspondence between, often vague and complex problems, and a pre-given information structure. The production of documentation thus involves knowledge on how to co-ordinate observations and situated experiences with the categories of EPRs. Knowing what and where to enter information also suggests an awareness of institutional obligations, what can be taken for granted and what must be made explicit (Säljö 1996; Heath and Luff 2000). Moreover, one must know how to use specific terminology and how to express oneself when transforming experiences from practice into a text-based reality of the kind represented by EPRs.

Institutional terminology can, as Berg (1997) puts it, be seen as a tool for elaborating, condensing and transforming individual local knowing into shared information mediated by the means of EPRs. This, in turn, implies that assigning categories to what happens in daily practices can never be a completely algorithmic, classificatory process. Especially when it comes to
issues that are difficult to medically categorize that might be vague or
diffuse, but are still likely to be of importance for a patient’s care. This is
typical of working with multifaceted problems such as this case where
people have suffered strokes. Human judgement will inevitably play a role
in how the transformation from care practices to textual documentation
takes place (Suchman 2000).

3.3 Making practical use of information in EPRs

Equally, the role of human judgement is important in the opposite direction,
i.e. when we put textual information into practical use. To understand
information in EPRs, it is necessary to share the local knowing of how
terminologies are used in order to be able to retrieve information and re-
construe the situation in a relevant manner. On this particular ward, the
formulation Is firm, eats well but little has a specific meaning that is shared
by the participants. The information in EPRs can be seen as a reification by
means of which situated experiences are converted into information in
textual form (Säljö 2005). The gap between the textual representation (EPR)
and the practices documented (i.e., the terrain) has to be bridged through a
process of re-converting the information into relevant knowledge about
patients’ specific needs for care.

In addition, the classification work is a collective achievement in which the
classification structure is not only reproduced, but also continuously
modified. The information found in the EPR Is firm, eats well but little
means something if it is produced on a ward for people with
anorexia, and it means something else if the patient is admitted to hospital
for obesity or a hip-operation. Thus, one piece of information cannot be
understood in isolation without taking into consideration how it is linked to
other kinds of information (Heath, 1982). Evaluating the situated relevance
of information is therefore a complex process that per se is a significant type
of knowing that is important for organizing and coordinating work
activities.

The formulation in writing, Is firm, eats well but little, thus, is
the outcome of a process of combining general and local knowing and of
condensing it into one rather simple phrase in the EPR. As it says nothing
about the causes, what to expect in future or what to do, the expression
might appear superficial in terms of its information. It seemingly merely
clarifies a patient’s ability to eat and it gives a general indication about her attitude to life. However, when analysing how the information is put to use, its power becomes obvious. The message both codifies considerations from a range of perspectives and serves as a tool for intervention.

Documenting in the EPR is obviously not an end in itself. Rather, it is a step in a practice, and it is consequential for action since the information in the EPR is used prospectively. For instance, when reading the entry *Is firm, eats well but little*, the nurse is guided in her further search for additional information. The nurse had not noticed this in her preparation work but during the report session she found this information in the EPR and made a note about it in her notepad. Then, she searched for additional information in the EPR about Anna’s problems. So, the initial entry structures her subsequent searching of relevant information and, thus, shapes her orientation and informs her about what to look for and what to disregard. Furthermore, new questions on food intake arise. For instance, did the occupational therapists or the physiotherapists make the same observations, and if so, what were their conclusions? This will be necessary to check which was also what she noted on the notepad.

After finding out that Anna eats very little, and that her colleagues from the other professions had not reported this in their respective modules, the nurse raised this issue with the physician who examined the patient after the shift handover. She also consulted the physiotherapist for additional information of possible relevance. When the nurse, physician and physiotherapist talked about Anna, they all turned to the EPR as a source for reconsidering and contextualizing the present problem from their specific professional perspectives. The agreed-upon solution was to drip-feed the patient, which, as we can see below in Excerpt 2, was followed up by another nurse, Nurse 3, who was part of an arriving team two days later. At a new shift handover she brings up that the drip-feeding was taken away and that the staff had tried to feed the patient again.
Excerpt 2

Nurse 3: Now it seems as if now let’s see if she has been drip-fed or (. ) now let’s see what they said during the round (. ) no, eats and has been drinking well for breakfast* and ((changes from the nurses’ to the physicians’ module in the EPR) eats and drinks for lunch today**

* From the nurses’ module in the EPR

** From the physicians’ module in the EPR

The nurse in charge retrieved this information anew from the EPR and presented it for the team in the following shift handover. However, what knowledge is needed to understand what is presented in Excerpt 2? Without knowing something about the patient, interpretations of what this information means would vary a lot. For instance, if the patient was a young woman hurt in a car accident and just recovering after having been unconscious for two days, the user would inevitably interpret both the patient’s problem and needs for future care in a very different manner than what is relevant in the present case. This points to a very interesting contingency that we have referred to: the entries can never be complete and exhaustive. Rather, one always has to rely on users filling in the background information necessary (Hartswood et al. 2003; Törnwall 2008). Especially when it comes to information that is difficult to medically categorise and can concern several aspects of patient care and needs.

The information in the EPR system does not explicitly specify what interventions should be performed, but instead implicitly suggests what care that should be provided. Presuming that the staff members share a local knowing in this specific practice, the EPR mediates not only information about the patient, but also the information necessary to distribute knowledge across shifts about ongoing tasks and activities (Berg, 2004; Törnvall, 2008). The information that no drip-feeding is necessary and that the patient has been eating and drinking properly at breakfast and lunch the same day, implies that for all staff members involved there was a list in the
patient’s room in which they had to document everything that the patient eats and drinks. When the nurse reads aloud (Excerpt 2) from the EPR, nobody asks what this means for their own work. All participants know who the patient is, they know the history of the patient, and they are familiar with the local routines in these kinds of situations. Since the team members on different shifts share this knowledge, the information received during the shift report contains much more information than is expressed in the EPR or by the reporting nurse and all the potential ways in which this information may be of consequence in the future cannot be foreseen.

4. Discussion

Having a large number of routines is a general characteristic of health care settings. Through attempting to design tools that have standardized structures and terminologies such as EPRs (and all the documentary practices that go with written texts such as the form used for admission interviews), healthcare management attempts to create environments that can be monitored in a uniform manner (e.g., the Swedish National Board for Health and Welfare: Socialstyrelsen, 2006:131, 2007:131, 2011). Written instructions on how to deliver care are supposed describe almost every possible situation that can occur when treating patients, including information about how and when to use different artefacts. As our observations illustrate, however, there will always be a tension between the expectations of uniform procedures and the actual uses of artefacts in everyday practices that require concrete interventions.

In the case presented in this paper, this tension involves the relationship between stroke-patients’ everyday needs and adapting these needs to a pre-defined category structure. This structure, although originally developed for nursing, heavily draws on a medical terminology, and is supposed to be applicable to most domains in healthcare. In general, our observations show that such tensions are often dealt with in unproblematic ways by the staff involved, but we also noted that nurses on the ward made extensive use of ‘Daily notations’ in which observations and interventions can be entered in the EPR as free, unformatted text. Although this relieves the technology’s producers from the difficulties of classifying mundane, but often multi-faceted problems in rehabilitation, this matter also constrain other users’ possibilities for finding the information entered. As noted by Moore et al. (2010), an increasing standardization might be difficult to handle, since the
problems it is intended to solve are necessary to circumvent, often by the re-introduction of non-standardized text that the uniform structure was intended to constrain.

In addition, people in general do not talk in terms of ‘Nutrition’ or ‘Elimination’, and the staff cannot expect them to do so when interacting with care-providers. Extracting significant information from people is a process that inevitably has to rely on standardization and relevant manners of improvising in situ. The gap that needs to be bridged between standardized documentary practices and a complex, partially indeterminate, world of human activities and concerns requires skilled craftsmanship and judgement on the part of the professional. Instead of asking a relative about the status of nutrition of an elderly person, the nurse will ask about food, eating and drinking in everyday terms and expressions, which later will be codified into institutionally relevant terminology (Bowker and Star 1999). The nurse, when interacting with the relative on a later occasion, will have to re-contextualize the information in the institutional terminology into an everyday form that is suited to the needs of the interlocutor. In Anna’s case, although the relative willingly starts telling the nurse about food, drinking and eating habits, the interview is moved forward by questions and requests for information that are related to how the interaction proceeds. Questions such as “I see, but is she allergic or oversensitive to something?” or “Is there some sort of food she does not like?” interrupt the predetermined sequence as do short comments such as “I see” or more extended comments like “Please tell me about her breakfast habits.” The paper form and the EPR must be seen as resources for bridging the experiential and private world of the patient and the institutional language that is used by professionals. They will structure the interview, but they can never determine it completely (Jones 2009). Even highly standardized routines need improvising in order to fulfil the requirements for eliciting the information necessary.

In a similar vein, understanding what is documented presupposes familiarity with the contexts of use. When members of staff use texts in the EPR written by some co-worker, they try to contextualize and reconstruct patient’s needs and/or situations. For instance, the phrase Is firm, eats well but little tells the nurse that Anna does not have any obvious physical problems to eat, but still there are important issues to attend to about her eating habits. This illustrates how information can never stand on its own, it
always relies on the reader/user realizing what the relevant presuppositions and consequences are.

When members of staff use documents in the EPR, they must also be aware of when they do not have the necessary information for understanding what is relevant to know in that particular situation. An interesting general aspect of these processes of taking meaning from text, as Olson (1994) puts it, is that these interpretative practices rely on subjective skills of meaning-making, but they are not in themselves subjective. Rather, they rely on people being socialized into professional modes of thinking and acting so that they know how to contextualize and re-contextualize information in productive manners. The simple observation *Is firm, eats well but little occasions a range of institutional activities, such as asking fellow members of staff for additional information and introducing the need for having a food and drink chart where Anna’s eating/drinking can be monitored. All the potentially relevant actions cannot be standardized; they have to unfold on the basis of local knowing and insight.*

Another important aspect of the introduction of a tool of this kind is that EPRs, in a very concrete manner, will serve as tools that distribute responsibilities and expectations of what to do and how to work. By using EPRs in work practices, nurses will use the system as a means for making sure that all work tasks they are responsible for have been performed (Suchman 1997). As the EPR system mediates both the content and the structure of the duties, it can be seen as becoming increasingly constitutive of what the profession is all about. The EPR will be used for the anamnesis, for documenting care activities, prescriptions, advice to patients etc., and these documentary practices provide strong signals about what a professional is accountable for. As a consequence, identities will be shaped by textual practices.

When scrutinizing how the members of staff perform their duties, it is obvious as Berg (1997) argues, that it is not routines that give life to organizations. Instead, the fundamental unit that moves the system will always be actions and activities by people in response to local circumstances. Even highly routinized actions have to be mobilized in manners that take account of the specifics of situations. What we illustrated in Excerpt 1, turns 1 and 2 about Anna’s eating habits, is an example of how seemingly simple and standardized information is entered into the EPR, but in spite of its mundane nature it must be inevitably understood as an abstract summary.
that indexes a diverse range of action-relevant knowledge about a patient’s eating habits. These highly abbreviated notes presume local knowing about what is of relevance and what has to be paid attention to. Even though many activities are standardized, for instance when taking up an anamnesis, the exact manner in which this is done varies since patients and their problems differ in manners that cannot be predicted in every detail (May et al. 2005). When engaging in such activities, nurses cannot completely let their procedures be determined by the standardized terminology built into forms and/or EPRs.

5. Conclusions
The present study points to some interesting paradoxical, potentially counter-productive elements in the attempts to standardize terminologies in health care by means of EPRs. At one level, standardization may be seen as a central instrument for conveying a consistent meaning over time and between staff members. On the other hand, at the local level when attending to patient mundane needs and priorities, increasing standardization of documentary practices may imply a mismatch. As demonstrated in our results, there is a tension between how these needs could be adequately formulated and the pre-structured category system originating from a medical discourse. This matter will make it even more necessary for professionals to engage in the kind of practical hermeneutics that take into account the diversity of experiences and constraints that are relevant to attend to when intervening in the lives of people.

For the design and introduction of EPRs, this will imply that the ever-increasing requests for standardization will imply new problems. First, the work needed for bridging between standardized formats and local needs may increase further, both in the production and use of information. Secondly, as our observations point to, a highly structured format may imply a tendency to re-introduce more non-standard text that will make it difficult to retrieve information. Avoiding such problems is one of the most important arguments for introducing EPRs. If information structures, and the systems of categories they rely on, are not flexible enough to fulfil local needs, we believe that many of the potential gains of EPRs’ will continue to be hard to realize.
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References


Electronic patient records in action: Transforming information into professionally relevant knowledge
Thomas Winman and Hans Rystedt

ABSTRACT
The implementation of generic models for organising information in complex organisations like healthcare creates a gap between standardization and needs for locally relevant knowledge. The present study addresses how this gap can be bridged by focussing on the practical work of healthcare staff in transforming information in EPRs into knowledge that is useful for everyday work. Video recordings of shift-handovers on a rehabilitation ward serves as the empirical case. The results show how extensive selections and re-organizations of information in EPRs are carried out in order to transform information into professionally relevant accounts. We argue that knowledge about the institutional obligations and professional ways of construing information are fundamental for these transitions. The findings point to the need to consider the role of professional knowledge inherent in unpacking information in efforts to develop information systems intended to bridge between institutional and professional boundaries in healthcare.

Keywords: communication, electronic patient records, professional knowledge, shift-handovers, workplace studies
INTRODUCTION

Electronic patient records (EPRs) have a central function in accumulating and coordinating the extensive flow of various kinds of information that is needed for providing day-to-day patient care (1). In comparison to paper-based records, the EPR functions as a hub for coordinating a wider range of professionals, specialities and stakeholders and in assembling information from different sources within a single system (2, 3). The objective is to facilitate both access to information and to achieve more effective ways of entering, organising and sharing information (2). Internationally, much effort is currently being channelled into the development of information systems that facilitate the flow of information between different healthcare providers, social welfare institutions and other agencies (4). This vision of seamless information sharing places extensive demands on “writers” and “readers” within different institutional and professional domains to understand each other (5).

Entries formulated by one actor must be intelligible, not only colleagues, but also for other professional groups with different knowledge domains, obligations, terminologies and information needs. Against this background, the standardization of information structures and terminologies has been put forward as the general solution for sharing information both within and between professions and institutions (2). This presumes, however, that structured information could be treated as a self-sustaining entity that can convey a similar meaning in different contexts (6). Assumptions about the standardization of information structures and terminologies are questioned in the current study by explicating the interpretative work inherent in selecting and organizing standardized information for the specific purposes at hand. In so doing, our aim is to contribute to the current discussions on the possibilities and constraints of facilitating knowledge-sharing through standardization across professional and institutional boundaries.

In the light of what actually takes place in face-to-face reports between healthcare workers, it is invariably so that much more than a simple transmission of information takes place (7). As claimed by Hartswood et al. such interactions have a constitutive role in, “arriving at some shared sense of what the meaning of information actually is” (p. 244). Moreover, as Hartswood et al. have demonstrated, local needs cannot be anticipated for all practical purposes and all possible readers. Patient records have different
audiences and the information provided is intended to serve a wide range of purposes additional to everyday patient care. As brought to the fore in Garfinkel’s (8) groundbreaking work on documentary practices, whilst medical records could perfectly well serve the purposes of staff members, the information contained therein can be inappropriate in another context (see also Heath and Luff) (9). The reasons, he argues, is that the sense of expressions and remarks in records, “… cannot be decided by the reader without his knowing or assuming something about a typical biography and typical purposes of the user of the expressions…” (p. 201). In a similar, although more far-reaching manner, information in EPRs is meant to be an important information source for other care providers outside hospitals, such as primary and elderly care, as well as serving the function of providing data at an aggregated level to serve external stakeholders. Since records are intended to serve a multiplicity of information needs, demands are placed on the reader to make sense of data that is relevant for the specific purposes at hand. Consequently, there is a need for a local interpretative work concerning the meaning of the text, signs and data and their consequences in particular contexts (10).

In line with a growing body of research claiming the necessity of a better understanding of the practices that information systems are designed to facilitate (7, 9, 11), we argue that there is a need for a better understanding of the concrete conditions necessary for sharing information by means of EPRs. Although there are many studies elucidating the contextual nature of information in medical records (12-14), few have addressed how healthcare staff actually makes use of information in EPRs in situ. The purpose of the current study is therefore to contribute to our understanding of such activities by placing focus on the practical work of selecting and organizing structured information in an EPR in a way that enables staff members to make sense of past and future care activities. Of particular interest is the knowledge inherent in this process of transforming vast amounts of information into brief presentations that are relevant for staff members in their care of patients. To address this issue we have carried out detailed investigations of how nurses in shift-handovers search for, organize and present information provided by EPRs. As suggested by Wilson, Galliers and Fone (15) this is an instance of collaborative work “that has not yet been subject to as much scrutiny…” (p. 28).
Following one tradition of workplace studies, the interest is to understand how participants organize their activities so that they become intelligible and actionable (9). In doing this we combine ethnographic observations with analyses of video recordings of activities central to the setting. In this study, we scrutinize the use of EPRs in a series of shift-handovers and address (a) the process of drawing different pieces of information together into coherent presentations, and (b) how specific forms of construing information are intertwined with specific professional ways of organizing and presenting information. By explicating the practical work inherent in making use of information on the local level, we aim to shed light on and discuss the additional possibilities for sharing information over professional and institutional boundaries.

**Empirical setting and analysis**

In order to examine how EPRs feature into everyday healthcare work, this study has examined the use of a Swedish information system (Melior) at a stroke-rehabilitation ward. In this setting the EPR had been used on a regular basis for two years as the major source of information by the team starting each new shift. Every shift invariably included one registered nurse and two or three assisting nurses. When the registered nurses arrived at an evening shift they received a short briefing by the nurses on the day shift about urgent or ongoing matters. Thereafter the registered nurse on the new shift completed a cursory reading of the EPR before giving an oral report to the other assistant nurses.

Shift-handovers were chosen for the empirical study since these provide highly relevant activities where structured information in the EPR is actualized and explicating. The handovers were held in a meeting room on the ward itself where the shift members all sat around a desk so they could all see the EPR on the computer screen. The EPRs provide access to extensive amounts of information about every patient’s health status and needs that are derived from all of the professional groups operating on the ward (nurses, physicians, physiotherapists, occupational therapists). Since the time scheduled for handovers is constrained, in order to make oral handovers both intelligible and sufficiently concise, the reporting nurses have to differentiate between those pieces of information that are relevant
and those that are not. The focus of the analysis is directed towards the differences between how information was sequentially ordered in the EPR, and the ways in which it was selected and organised in oral presentations.

In all, 200 hours of observations were carried out by the first author and, on the basis of these, 10 shift-handovers were subsequently video-recorded in order to enable a closer analysis. Each shift was responsible for on average 10 patients and the handover usually for between 45-60 minutes. In order to be able to capture detailed aspects of the staff members’ interaction with one another and with the interface of the computer system, a cam-recorder was positioned in a way that enabled it to capture the way in which the team members oriented to each other and when the nurses wrote in their notepads. A second cam-recorder registered what happened on the screen. The reason for this arrangement was to make it possible to see both the interaction of the staff, and the simultaneous view of the user-interface.

All of the video recordings were transcribed and the principles of video analysis, as suggested by Heath, Hindmarsh and Luff (16), were adopted. In line with these guidelines the whole data corpus was systematically reviewed. The aim was to find regularities in how nurses searched for and selected information in EPRs as well as what they said when doing this. In a subsequent step the analysis was narrowed down to a closer scrutiny of the differences between how information was sequentially ordered in the EPR and the ways in which it was selected and organised in oral presentations. The sequences presented are aimed to illustrate the regularities in these differences in order to demonstrate the type of transformations that take place in ordinary care work.

**RESULTS**

Information in EPRs is retrieved in other ways and is differently structured in comparison to paper-based forms of documentation (2, 3). Although many classes and categories of information are reproduced in the digital format, it is not possible to simultaneously view information in different files in the EPR. Interweaving information from different classes or files thus demands scrolling through the EPR and sometimes moving between menus.
When the ‘Nursing record’ is chosen and a name from the list of patients is clicked on, a text is displayed that is structured by the main and subcategories shown above.

This implies that the reporting nurses cannot simply reproduce the written text. Frequently, an extensive reorganization of the content is carried out. Certain parts are selected and emphasised, whilst others are not taken up at all. One could say that different transformations or readings of the EPR are at play.

Re-organizing information into locally relevant knowledge

To illustrate how presentations of patients are sequentially structured we will give a typical example from the onset of the report on one patient suffering from stroke (Excerpt 1). When the registered nurse starts reporting to the assisting nurses about the patient, she initially focuses on the patient’s name, year of birth, date of arrival and to the major medical disorders.
next we have Birgitta
(looks in her notepad)
in two one, Birgitta Svensson born thirty, who came in on the ninth
(scrolls in the record and looks into her notepad)
look at this… weak right, aphasia
(looks interchangeably between the screen and her notepad)
I haven’t had a report on the CT… there is probably nothing there either… we’ll see…
Fax one we could start with anyway…

When compared with the disposition in the EPR, the patient’s name, year of birth and date of arrival are provided in the first part displayed when the record is opened up. The room and bed number, on the contrary, emanate from the nurse’s own notations. Up to line 3-4, “who came in on the ninth”, the presentation of this piece of information seems rather straightforward, although not all information can be retrieved solely from the EPR. In Line 5, however, the nurse scrolls between different parts of the record for a while. In line 6, she pays attention to two major symptoms, “look at this”, and reads from the screen: “weak right, aphasia”. In line 8, the nurse moves on, looking for the results of the CT-scan (computed tomography), which is a routine examination in cases where a hemorrhagic or infarction in the brain is suspected. In the present situation the results are not found in the notes made during a prior report from the nurse on the previous shift, “I haven’t had a report on the CT”. Nor does she find the information sought

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2 Participants’ talk is written in Courier and emphasised parts of utterances are italicised. Short pauses are indicated with ‘...’ and non-verbal activities are indicated within single brackets

3 The names of patients used here are fictive.
for in the EPR under the main category Enrolment and its subcategory X-ray: “there is probably nothing there either, we’ll see”. When the information sought for is not found immediately she scrolls up to the main category of Planning and to the first subcategory Fax I ⁴ (Line 10).

The selection and order of data attended to by the nurse seem to be relevant for giving the other staff in the team basic information about who the person is, as well as her major disorders. It is important to note here that, these data cannot be retrieved from a single section in the EPR. The analyses show that, although taken for granted and unnoticed in everyday practice, extensive work is expended in the ordinary retrieval and organisation of data provided by the EPR. Due to the ordering of categories in the EPR and the order in which different topics are addressed in the handover, an extensive re-organisation is carried out, which is further illustrated in Figure 2:

⁴ To send ‘Fax one’ refers to a routine applied when the authorities caring for the elderly in the municipality have the responsibility for the further care.
<table>
<thead>
<tr>
<th>EPR categories</th>
<th>The order of utterances in the oral report</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name, date of birth</td>
<td>…Birgitta Svensson born thirty</td>
</tr>
<tr>
<td>PLANNING</td>
<td></td>
</tr>
<tr>
<td>Date of arrival</td>
<td>Who came in on the ninth</td>
</tr>
<tr>
<td>ENROLMENT</td>
<td></td>
</tr>
<tr>
<td>Fax I</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Fax</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>X-ray</td>
<td>I haven’t had a report on the CT… there</td>
</tr>
<tr>
<td></td>
<td>is probably nothing there either… we’ll</td>
</tr>
<tr>
<td></td>
<td>see</td>
</tr>
<tr>
<td>DISCHARGE</td>
<td></td>
</tr>
<tr>
<td>GENERAL INFORMATION</td>
<td></td>
</tr>
<tr>
<td>NURSING ANAMNESIS</td>
<td></td>
</tr>
<tr>
<td>Contact reason</td>
<td>look at this… weak right, aphasia</td>
</tr>
<tr>
<td>Time scale (sec)</td>
<td>-0</td>
</tr>
<tr>
<td></td>
<td>3-5</td>
</tr>
<tr>
<td></td>
<td>12-14</td>
</tr>
<tr>
<td></td>
<td>16-20</td>
</tr>
<tr>
<td></td>
<td>21–</td>
</tr>
</tbody>
</table>

Figure 2. The first column shows the five first main categories of the record and the subcategories addressed. The other 5 columns show, from left to right, the order of utterances, whilst the last row starts with zero when the first utterance is finished and indicates the onset and duration of the following utterances (in seconds) corresponding to each category.
The steps needed for carrying out this re-organization are underlined by the difference between the structure of the EPR and the order of the nurses’ utterances. A typical feature of the reports is that the moves undertaken vertically are frequently associated with interruptions in the flow of talk. The sequential order follows a regular pattern in the nurses’ oral reports, but it is noteworthy that it deviates significantly from the structure of the classification in the EPR. The transformation needed for bridging these different structures puts demands on the reporting nurses in that they are required to reorganize the information in a way that is better adapted to the responsibilities of the team, i.e. to help patients in their daily living and rehabilitation. Since the structure of the EPR is supposed to serve information needs for different purposes, different professionals and different stakeholders, the structure of the oral report needs to be transformed to the specific tasks and obligations of the team. The selection and re-organization of particular elements into a coherent whole, as demonstrated here, is a necessary presumption in order to convey a meaning that is sufficiently specific and precise.

It is apparent that it is not the patient’s story that is referred to in a chronological order, or the order of the EPR, but rather a specific order that is structured by the conventions of oral briefings in healthcare. This is what Montgomery Hunter (17) refers to as institutionalized narratives. For nurses, this structure serves as a means for deciding not only what information is relevant, but also for re-organizing pieces of information emanating from different parts of the EPR into an intelligible and concise briefing. In contrast to the findings of Montgomery Hunter, the nurses’ briefings in our study seldom resulted in explicit suggestions for further interventions. Still, the shift handovers regularly seem to fulfil the staff’s prospective needs about how to go on with their work by providing highly specific pieces of information. The instance of “weak right, aphasia” (Figure 2), addressed initially in the briefing, is a piece of information indicating both the nature of patient’s problems (perceptual, motor, intellectual) and the needs for assistance to manage her daily life (eating, walking, communicating). Both understandings are important for the staff members since the utterance implies a background both from which further information would be understood and for the specific care activities that have to be carried with respect to their obligations as professionals on a rehabilitation ward. Even though the utterance is intelligible regardless of professional group, its
consequences are bound to the context in which it is used (8). In a similar vein, the results of the CT-scan would have provided explanations of the current problem and what other potential problems and needs that could occur.

The sequencing of the presentation in Excerpt 1 follows a typical order of all reports on the ward and is recognized as a typical narrative structure for presenting medical cases used since the early days of medicine (18). It is noteworthy that the EPR does not itself support a narrative structure. It is something that nurses have to familiar with to be able to organize information so as it becomes intelligible in the context of her own, and the other team members’ duties. The extensive re-organizing of the information provided also involves a way of constituting a new temporality that in turn provides possibilities for addressing causality. A typical way of doing this is exemplified in Figure 2, in which the cause of the patient’s initial request for care is addressed immediately after presenting personal data about the patient and her date of arrival. This parallels the results of other studies of professionals, such as for example how engineers need to break down complex issues in order to re-organize information into solvable problems (19). If, instead, the structure of the EPR had been strictly followed it would have implied that the burden of the interpretative work would have been put on the individual team members in the sense of having to re-organize the information needed for the following shift.

**Constituting figure-ground through highlighting and selecting**

In addition to re-organizing the content of the EPR, as illustrated by Figure 2, specific topics are regularly put in focus by foregrounding some parts and back-grounding others. Figure-ground is created by processes of highlighting and selecting. One way of doing this is to stress certain parts of phrases and merely mention others. In declaring, ”look at this… weak right, aphasia” (Excerpt 1), the first phrase is uttered in a low voice whilst the symptoms articulated in the second phrase are stressed, thereby indicating that the latter is to be regarded as something significant to be taken into consideration. Similarly the CT-scan was focused on when the nurse says that “I haven’t had a report on the CT”. In contrast, the following utterance, “there is probably nothing there either, we’ll
see”, is pronounced with neutral tone. The symptoms and the results of the CT scan are thus as highlighted as being of significance for the team, whereas the subsequent utterance appears as less relevant and as a sort of meta-comment to the nurse herself in her attempts to find relevant data.

A similar pattern can be seen in Excerpt 2 below, in which “fax one” is emphasised, whilst the tests and examinations are enumerated as mere reiterations of the text. What is shown below, however, is that although the text in the EPR is not reorganized, the nurse’s oral presentation still includes extensive work in selecting relevant information.

**Excerpt 2**

```
...fax one was done on the fourteenth... eeh urine culture just like on the fourteenth
(writes in her notepad)
eeh she’s been on a clinical UCG... doppler carotids...
(referal to speech pathologist has been sent
(writes in her notepad)
the fourteenth that is... right hand lens should be changed it
says... says that right hand eye lens should be changed round
about the thirteenth of the first
(writes in her notepad)
```

As mentioned above, Fax I is the first subcategory under Enrolment. The tests attended to by the nurse – Urinary culture, UCG, Doppler of carotids – and the fact that a referral has been sent to the speech therapist, are reported in the same order in which the subcategories appear in the EPR. It is important in this respect to note that following the order set by the EPR does not mean that the content is simply reproduced. Similarly to the case in Excerpt 1, when data about the patient and her major medical disorders were in focus, parts of the text in the EPR are omitted and not referred to at all. In Excerpt 2, by focussing the tests carried out, only 3 out of a total of 21 tests entered in the EPR were mentioned, i.e. Urinary culture, UCG and
Doppler of carotids. This means that a relatively limited part of all the information available in the EPR is in fact brought to the fore as relevant to the task at hand. Moreover, Excerpt 2 demonstrates how information is organized into a useful form by entering specific pieces of selected information in notepads. Various events such as Fax I, results of tests and the referral to the speech therapist, are all facts that are entered in the notepad by the reporting nurse. This means that making notations has a prospective purpose, where the notepad can function as a tool in fulfilling essential professional obligations during the following shift. This parallels findings from other studies (20, 21) which have suggested that handover sheets have the possibility to function prospectively as a personal waypoint, rather than merely as repository of information.

Several studies have emphasized the centrality of shift-handovers to support the planning of care, but have also criticised nurses’ handovers for lacking prospective perspectives or for giving mere summaries of past events (18, 22). Lamond (23) argues in a review study of shift-handovers that “all of this indicates that the information in the reports sometimes takes the form of a summary of the patients’ condition or progress”. Our results, in addition, point to the practical and ordinary ways in which such retrospective accounts actually fulfil prospective purposes. On the one hand, our study indicates that the structure of the EPR poorly supports a prospective approach, since extensive re-organisations often are needed for relating interventions and their effects. On the other hand, nurses provide prospective perspectives on what has to be done by making use of the mainly retrospective content of the EPR. In Excerpt 2 this is done by the nurse in reading out a temporally ordered case that involves known details stored in the EPR. This bit-by-bit reading and entering of notations in notepads are important steps for highlighting instances that can be further checked and questioned during the following shift and which can function as a basis for future entries in the EPR. Reading information in its original form is thus the first step for ordering information and in constituting a problem that is possible to act upon. All relevant aspects to the case are read out as they occur on the screen. This first step, however, does not say anything about the causes of the patient’s problems, or how these should be dealt with. In line with Suchman (24) a second step is necessary for constituting a temporality that provides opportunities for understanding the causal relations between the discrete aspects of the problem (cf. 25). This is
achieved by the selective reading and re-organizing of information into a textured account, implying a focus on conjectures as to causes and effects that are anticipated to follow on from the work to be carried out. This constitution of causality not only involves knowing how to select those events that are related to each other (26) (27). It is, additionally, also a matter of constituting a temporality that provides opportunities to understand the causality of the problematic aspects of the case, as well as the problematic aspects of working with the case. This is what Berg (26) calls “bringing life to text”.

**DISCUSSION**

The nature of the gap between formal information and the demands of locally interpretative work is demonstrated by the differences between the structure and content of information in the EPR and the nurses’ oral presentations during shift-handovers. We maintain that the employment of this work displays essential aspects of professional achievements necessary for putting information into practical use. In a similar vein, as suggested by Duguid, we propose that sharing information is not only about the transmission of codified information, in that it also requires knowledge on how to codify this information. Knowing how is thus a prerequisite for knowing that. The explication of the practical work in selecting and reorganizing may also shed light on the possibilities to share standardized information over institutional boundaries. As claimed by Duguid (27), such efforts require a degree of shared knowing on how such information should be understood: “But when the practice of knowing how of two communities are different, epistemic barriers develop and productive sharing knowing that become much more challenging” (p. 114). Our argument, that transformations of information needed within one single institution demand intrinsic knowledge both of the situation in which it is produced and will be used, counteracts the idea that increased standardization by itself is a solution to the problems of sharing information between different kinds of institutions. This is in line with Færemann et.al (28) who argue that, in contrast to local, or internal work, the inter-institutional is “..much more complex. Actors do not in the same way have direct accesses to each others’ knowledge and capacity” (p. 178).
The movement towards standardization has been further accentuated by the introduction of EPRs since the possibilities to enter free and unsorted text is further constrained in the electronic format (29). The efforts to standardize information structures in EPRs imply a restriction to its openness. We suggest, however, that the openness is essential for the utility of the EPR, something that is illustrated by the nurse’s moves between categories and which is indeed a prerequisite for constituting a coherent narrative (Figure 2). Moreover, the instance of “weak left, aphasia” simultaneously refers both to the patient’s problems and possible needs for care, i.e. both a diagnosis and an intervention. This exemplifies how open category-systems cause relevant information – which relates to both the patient’s present health problem and the staff’s work – to be loaded into the system (7). Information entered under a given category in the EPR can refer to different phenomena, and similar aspects of a patient’s health problem can be classified under different categories. Since it is impossible to know in advance when, where and why specific pieces of information are relevant, the category-system needs to be open to many possible demands for information (30). An important conclusion is that the necessity of openness also points to the need for professional conduct to transform information into locally relevant knowledge. As a consequence a more constraining structure is unlikely to provide a solution for limiting diverse interpretations, since it may simultaneously constrain the possibilities for staff to transform information into practical use and, thus, weaken it as a clinical tool (31).

In the move towards a standardized information structure it is suggested that standardized terminologies are a prerequisite for sharing information, especially across professional and institutional boundaries (32). We do not deny that there are needs for a shared conceptual apparatus in healthcare and social welfare that is sufficiently distinct for entering and retrieving information. We argue, however, that it would be a mistake to believe that a shared conceptual framework could by itself provide such as a solution since the application of a given terminology also presupposes extensive skills for transforming the formal and conceptual into something that is relevant and intelligible for users in specific situations. As stated by Timmermans et al. (10), the use of categories and terminologies contributes not only to link professionals’ everyday language to education and research, but also to permeate ideas of what the profession is all about. Since the conceptual
apparatus is at the core of the professional knowledge itself, the changes of terminologies interfere with the language already in use. The implementation of standardized terminologies thus has to take into consideration can be raised the extent to which writers and readers with different terminologies, professional knowledge, etc. are able to understand each other. The specific meaning of *weak left, aphasia* for instance, is dependent on the staff members’ knowledge of what these terms imply in terms of their obligations for this particular shift on this particular rehabilitation ward. For administrators of care for the elderly, or a speech or physiotherapist, these terms imply very different meanings of the nature of the problem and the institutional obligations they imply. As a consequence, one decisive condition for sharing standardized information is that it is open for different readings that can serve the information needs of different parties and stakeholders. Taking this into consideration is necessary for meeting the challenges of the computerization of health care, or as Færgemann et.al (29) puts it “One of the main challenges for computer support in the health care area is to facilitate shared care to ensure coherence and continuity” (p. 165).

**CONCLUSION**

Our results demonstrate how processes of re-organizing, selecting, highlighting and constituting causality are decisive steps in putting information in EPRs into practical use. One central conclusion is that professional ways of codifying information are necessary resources in transforming text to talk in ways that are relevant for the purposes of shift-handovers. This dependency of institutionally bound knowledge, in turn, indicates the necessity to acknowledge that knowing how is needed for information systems to serve the purpose of providing important information about patients and clients over institutional and professional boundaries. Our argument is that the extensive efforts currently paid to developing standardized information systems for sharing information in and between healthcare and social welfare institutions on national and international levels, ought to take into account the knowing how inherent in transforming information into professionally relevant knowledge. Most importantly, it seems necessary to consider the extent to which professionals within different institutions and authorities share the knowledge needed for
transforming the same information into something that makes sense in relation to their different obligations and tasks. If this does not take place it is our belief that enormous efforts and financial resources will be wasted on an endeavour that may lead up a blind alley.

REFERENCES


Electronic Patient Records in interprofessional decision making: Standardized categories and local use

Thomas Winman and Hans Rystedt

Abstract

Electronic patient records (EPRs) are a constitutive element of medical practice and are expected to improve interprofessional communication and support decision making. The aim of the current study is to explore the ways in which access to structured information from multiple professions within EPRs enters into the phases involved in arriving at final agreements about patients’ future care. The results show that decision making in interprofessional team rounds involves a prestructuring of a pathological reality. Further, the results demonstrate how information in EPRs is deconstructed and recast into patterns that presuppose knowledge about the EPR’s structural organization. This means that EPRs are highly flexible technologies and that their design does not determine their usefulness. A major conclusion is that the members’ knowledge on how to bridge between standardized categories in EPRs and their local meanings is decisive for understanding the basic conditions necessary for how EPRs could support interprofessional collaboration.

Keywords: Electronic patient records, decision making, categories, standardization, communication, information technologies.
INTRODUCTION

In the present study we explore the ways in which digital information systems for documenting patient care feature in interprofessional decision making. A common characteristic of systems of this type is that they provide an extended access from not only a single profession, but also from other professions involved in the provision of patient care. One crucial issue addressed in the present study is how information from various professions is used to present a typical case, and how such cases are reformulated in the processes of decision making in respect to the patient’s future care.

In addressing these issues, we concur with a number of studies in areas such as computer supported collaborative work (CSCW) and human–computer interaction (HCI) that suggest that research on digital technologies it is necessary not only to focus on technical elements, but also on how such work is carried out in situ (e.g., Hindmarsh, Jenkings, & Rapley, 2007; Kane, Groth, & Randall, 2011). Further, our study aligns with an increasing interest in going beyond doctor–patient consultations and in the direction of collective decision making. In so doing, the forms of communication that arise “between members in health care teams” (Pilnick, Hindmarsh, & Gill, 2009, p. 5) thus become of central concern. Much of the research in this field has a focus on the ways in which health information systems function as constitutive elements of organizational memories (Ackerman & Halverson, 2004), thus pointing to the centrality of these systems for making informed decisions about patients’ ongoing and future care (for organizational implications, see also von Krogh & Nåden, 2008). Not only is it widely acknowledged that patient records function as a hub in health care (Berg, 1996), but there is a growing consensus that the introduction of electronic patient records (EPRs) can extend possibilities for interprofessional decision making (Napolitano, Ranaghan, Middleton, & Gavin, 2011), mainly by serving as a source of adequate, timely, and location-independent information for understanding patients’ problems (Bossen, 2006).

In this context the present study forms a contribution to the growing body of research on the role of technology in the types of problem solving that take place in medical team meetings (Måseide, 2003, 2007, 2011). Not only do these studies suggest that such processes are deeply intertwined with the institutional order and its responsibilities, but they further demonstrate how
decisions emerge as a result of the interaction between experts, where cases become reformulated and reconstructed as part of a sequenced process. The reformulations and reconstructions that take place at such meetings ultimately aim at the professionals involved arriving consistently at joint decisions regarding “what can and should be done” with a patient.

Having said this, the ambition of implementing technologies such as EPRs in complex organizations and work processes can often involve overlooking existing problems and, indeed, creating new ones (Clarke, Rooksby, Rouncefield, Procter, & Slack, 2006). This poses a particular risk if the information in EPRs is seen or treated as a self-sustaining entity that can be used and understood in uniform ways, irrespective of the context. Many aspects require attention in order to further improve the understanding of the multifaceted interplay between the organization, professionals, and technologies in collaborative decision making (Tang & Carpendale, 2007; Niazkhani, van der Sijs, Pirnejad, Redekop, & Aarts, 2009). These include problems of cooperation and coordination; of time, space and place; of institutional and professional obligations; and the conceptual knowledge of the professions built into the technology (Bossen, 2002; Martin, Currie, & Finn, 2009; Svenningsen, 2003; Timmermans, Bowker, & Star, 1998).

An important point of departure for the present study is that the meaning of information cannot simply and unproblematically be transferred between one context and another. Rather, such transfers presuppose a shared knowledge among health-care workers as to what the information actually means, and the implications that are to be drawn (Hartswood, Procter, Rouncefield, & Slack, 2003). The meaning of information thus cannot be taken as a given. Because EPRs are intended to serve a multiplicity of information needs, considerable demands are placed on users to make sense of data that are relevant for the specific purposes at hand (Berg, 1996). Consequently, local interpretative work in discerning the meaning of texts, signs, and data is needed before transforming it into a locally relevant fact in the process of decision making (cf. Østerlund, 2008).

A fundamental feature of EPRs is that they enable both intra- and interprofessional decision making, where decisions are built upon categories that facilitate the communication of similar and precise meanings within and across professional boundaries. For this reason EPRs are organized according to certain terminologies and hierarchically structured categories which, simultaneously, are intended to obstruct the input of unformatted
information (Timmermans & Berg, 2003; Tjora & Scamnler, 2009). This development also relates to ambitions that EPRs should serve a wide range of processes, such as patient-directed care, quality assurance, and administration. Because of this multiplicity of needs, the information provided in EPRs is often open-ended and not readily available for use.

As previously mentioned, a common characteristic of EPRs is that they are constructed from a series of hierarchical categories organized as main, sub-, and subordinated categories. This organization provides a means to make visible the ways in which the categories are related to one another and how they fit into the hierarchical order. The structure with sub- and subordinated categories also systematically organizes data and results from different observations. In the system used in this particular study, all of the main categories for the nursing staff have the prefix care (omvårdnad in Swedish), which functions as a way of linking the data to the nurses’ patient module. Similarly, data stored in the physicians’ patient module has the prefix medical. The most common way of relating documentation from different professions to each other in the EPR is to divide it into separate modules for each particular profession. Even though the members of a particular profession are able to read the records of the other professions in the EPRs from this study, they are not permitted to create new entries. When accessing the EPR, the professionals initially have to choose records either from all professions or from just a particular selection. Moreover, EPRs regularly include a wide range of primary functions as well as complementary functions, such as the management of text, laboratory readings, referrals, and the results of examinations, tests, and x-rays.

A contested issue that is prominent in the research on information technologies for health-care purposes is whether or not such technologies should be regarded as determining what counts as relevant knowledge or if technologies are shaped by the social context in which they are used. Proponents of the first perspective have suggested that EPRs are based on a logic of standardization that functions as a form for organizing knowledge (Ericson & Haggerty, 1997; Rowley & Hartley, 2008). These researchers lean on Giddens (1990) in their argumentation that decision-making instruments, such as EPRs, tend to formalize knowledge-creation processes, and that built-in categories and classifications prescribe how topics and items should be related to one another and understood by professionals. In a similar vein, Postman (1993) claimed that there are ideological biases embedded in
technologies of this kind because their structures, categorizations, and classifications attempt to construct and value skills and knowledge. This kind of argument has been taken even further by scholars such as Lyotard (1999) and Franko Aas (2004), who argued that, due to their category and classification systems, technologies maintain a certain logic that prescribes what knowledge is. Hylland Eriksen (2001) adopted an opposing position, arguing that technologies are nonacting tools for generating actions and activities. From this perspective, the foci of analyses rarely lie on the technology itself or its use but, rather, on social aspects of health-care work. The technology is thus seen as a highly flexible instrument available to be used in any number of different ways.

In the current study, based in the tradition of workplace studies (Heath & Luff, 2000; Luff, Hindmarsh, & Heath, 2000), a third perspective is adopted: a technology-in-practice approach. From this point of view, technology is analyzed as one of many actors at play in any given activity. Understanding the logic of decision making is thus based upon how, as used in everyday work, the categories are understood by the participants. Such an understanding can emerge only as a result of studying the practical use of such categories; it is not to be found embedded in the categories themselves. Rather, understanding depends on the knowledge of the professionals involved in making sense of the relations between categories and the information they embrace (cf. Bowker & Star, 1999). This means that a specific, locally relevant meaning cannot come into being without knowledgeable interpretative work by the professionals involved. Such work presupposes knowledge about how information is structured in the system (Winman & Rystedt, 2011), and, of particular interest in the present study, the specific meaning of categories and their relations in a particular context, that is, what Garfinkel (1967) referred to as the indexicality of categories.

The aim of the current study is to explore how access to structured information from multiple professions in EPRs features in the process of making decisions about patient care. More specifically, we wanted to closely examine the ways in which staff members make use of EPRs to retrieve information about their patients and how this subsequently is factored into the negotiations involved in collaborative decision-making processes. Further, we discuss the implications that the introduction of digital formats might have on decision-making process and the reconfiguration of the
needs for professional knowledge inherent in such work. In addressing these aims, three questions have guided the analysis:

- How is information provided by EPRs selected and organized in the preparation for patient briefings?
- How do staff members transform information in EPRs into argumentative resources in the processes of decision making?
- How is the logic of decision making established when using EPRs in team rounds?

DATA COLLECTION

The data collection took place in a hospital ward at a medium-sized hospital in Sweden, where care was provided for patients suffering from stroke-related disorders. Both the data collection and data analysis were guided by qualitative ethnographic principles (Agar, 1986; Hammersly & Atkinson, 1995). In order to gain a grasp of the workflow and the ways in which the work was organized (Jordan & Henderson, 1995) approximately 190 hours of observations were carried out. The observations, which were conducted by the first author over a period of 6 months, were documented in field notes. These field notes were transcribed the same or the following day and were used to guide subsequent observations.

After an initial observation period, the focus of the observations was changed from a general observation of the workflow, to a focus on team rounds. These events were revealed as an activity where the EPRs played a critical role in organizing and coordinating work and where the staff on the hospital ward regularly met to form a holistic understanding of needs of further care. In other words, team rounds were arenas for interprofessional decision making. The data corpus includes video recordings of the nurses’ preparatory work prior to the team rounds. Here, a video camera was placed beside the nurse in order to capture how she interacted with the computer and how she made use of a notepad. A second video camera captured the occurrences on the screen. The purpose of this strategy was to capture the user interface and show how the nurse assembled information from the different modules and sections in the record.

Although originally five team rounds were observed, an additional nine team rounds were included in our observations in order to capture more detailed aspects. The team rounds collective involved approximately 90 patients.
Each round lasted about 45 minutes and was audio recorded, and all of the field notes and audio recordings were transcribed the same day.

All data, including field notes from observations and transcriptions from audio recordings, were used to form the basis for analysis of the staff members’ use of information as part of their decision making. The initial analyses from the observations showed that the technology was very concretely integrated in construing and juxtaposing crucial information concerning patient care. Therefore, field notes and the transcribed video recordings of the nurses’ preparatory work were examined repeatedly in order to scrutinize how the nurses selected the information presented in the EPRs when preparing for patient briefings. The analytical focus was put on which pieces of information within a complete EPR were selected and how this information was organized in the subsequent briefing.

Our analysis also involved repeatedly listening to the audio recordings of the team rounds and reading through the transcriptions. Re-readings and notes in the margin of the transcriptions (Hammersly & Atkinson, 1995; Silverman, 2000) guided the further analysis in order to understand how arguments in the decision-making process were related to information provided by the record. Here, the focus was on structures and interactional patterns in the team rounds. In our initial analyzes, we discerned a pattern of discrete phases in the process, which seemed to be sequentially ordered. This directed our focus toward the relations between the phases in the team round how information from the different modules in the EPR impacted typical reconstructions of cases. The latter involved an analysis of the knowledge inherent in transforming the information into argumentative resources in the progression of decisions.

TEAM ROUNDS AS AN ARENA FOR DECISION MAKING

The team rounds were held once a week in a meeting room on the ward for the purpose of coordinating and organizing work activities. The staff of the ward (registered nurses, various physicians, physiotherapists, occupational therapists, auxiliary nurses, and psychologists) held such meetings as a means of making decisions about patients’ future care. For each patient, the team was obliged to decide what can/shall be done with this patient; for
instance whether the patient should be discharged or if she/he would still need further rehabilitation.

The team rounds were held in a meeting room located at the end of a long corridor of the ward. The meetings were held primarily in the morning, and participants sat around a large oval table. Participants from the same specialty, if more than one attended, usually sat together. Following a welcome by the doctor and a patient-consideration prioritization, each patient was discussed by order of bed number. The first step involved the nurse from the ward making a short presentation to the group about the patient. This patient briefing had to be succinct to fit the time schedule, but it also had to include enough information for the staff to develop a general view of the case. Thereafter, the group started their discussion, with the goal of reaching a mutual agreement of the past, present, and future care and status of the patient, and make decisions about the patient’s future. Viewed in this way, a team round consists of two phases: the patient briefing and the decision making. Analytically, these phases are inseparable from each other because they both are parts of an overall process of team round decision-making process, even if very different logics are in operation. By illustrating these processes separately, though, it becomes possible to reveal both their common and divergent features and to show how medical decision making is bound up with the EPR in use. Moreover, it shows how the technology constitutes a resource that can enable staff members to achieve collective understandings and to frame and formulate decisions in relation to their own profession-specific obligations.

Therefore, to make this analytical point, the results below are divided into two sections. The first section illustrates how the EPR is used in presenting a patient in a briefing. The multiple steps in the second section illustrate how categorized information in the EPR is used in the medical representation (i.e., how to understand the case), and how this serves as a means in a process of negotiation.

The general pattern in the team rounds comprises five phases: (a) presenting the case, (b) framing the main problem, (c) elaborating the case, (d) agreeing about the case, and, finally, (e) making the final decision. In order to illustrate the reasoning of the staff members in each of these steps, one case at a team round will serve as an example. The chosen case is typical of a general pattern that was found in the analysis of all 90 cases dealt with in the team rounds. Below we will follow the case of Bertil (a pseudonym) from
the nurse’s briefing until the point where the team has recast his problems into a solvable case and aimed at a final decision. As will be demonstrated in the section immediately below, carrying out a patient briefing demands that the nurse knows what the other team members expect and need for meeting the objectives of the team round.

Presenting the Case

The case presented here concerns a relatively new patient (Bertil), whom several of the participants at the team round had not met. This implies that the nurse could not assume that her colleagues knew anything particular about the patient in advance, or, at best, that she must assume that such knowledge would vary among the staff members involved. As we will show by analyzing Excerpt 1, the nurse tried to present Bertil’s case in a way that was relevant and comprehensible to everyone present.

By looking more closely at the preparation for the team round (Excerpt 1), it is possible to see it as a process of making information intelligible. During the preparatory work, the nurse looked for relevant information in the EPR and she knew where in the modules for the different professions the information sought was located. In addition, she knew how the information within these modules was organized into different categories.

The data available in the EPR about this specific case corresponded, overall, to eight printed pages of information created by the professionals. By selecting and reorganizing the information available, the nurse ended up with a small selection of notations on her notepad.

<table>
<thead>
<tr>
<th>(a) Yes, then we’ve got Bertil Karlsson in [room] five two, born [in 19]35.</th>
<th>Physicians´Record</th>
<th>Nurses´Record</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Main category</td>
<td>Sub-category</td>
</tr>
<tr>
<td></td>
<td>General</td>
<td>Other info</td>
</tr>
<tr>
<td></td>
<td>Care anamnesis</td>
<td></td>
</tr>
</tbody>
</table>

Verbatim translation from Swedish

(a) Yes, then we’ve got Bertil Karlsson in [room] five two, born [in 19]35.

(b) Bertil came here on January 14
feeling poorly with a weak left side and lack of vision.

(c) He got the increase here in-- wasn’t it when he was at Kava before he got here, or, well, Ward 4, and then he became substantially worse.

(d) And then it subsided a little..has ..and then--it seems--became worse.

(e) He was in over Christmas too, when he had had a Tia there.

(f) ... is waiting for a reply from Gothenburg [hospital] regarding Carotis; he has a Carotis Stenos.

(g) If there’s something you would operate on--then it is probably the, the thing which blasts the clots then.

<table>
<thead>
<tr>
<th>[feeling] poorly with [a] weak left side and lack of vision.</th>
<th>Contact reason</th>
</tr>
</thead>
<tbody>
<tr>
<td>(c) He got the increase here in-- wasn’t it when he was at Kava before he got here, or, well, Ward 4, and then he became substantially worse.</td>
<td>Admission</td>
</tr>
<tr>
<td>(d) And then it subsided a little..has ..and then--it seems--became worse.</td>
<td>Reason for admission</td>
</tr>
<tr>
<td>(e) He was in over Christmas too, when he had had a Tia’ there.</td>
<td>Care-anamnesis, Health record</td>
</tr>
<tr>
<td>(f) ... is waiting for a reply from Gothenburg [hospital] regarding Carotis; he has a Carotis Stenos.</td>
<td>Care anamnesis, Care experience</td>
</tr>
<tr>
<td>(g) If there’s something you would operate on--then it is probably the, the thing which blasts the clots then.</td>
<td>Status, Admission</td>
</tr>
</tbody>
</table>

Excerpt 1. The source category in the EPR from which the oral briefing information originated.

Note: Kava is ward for surgical emergency care (Kirurgisk akutvårdsavdelning). TIA stands for Transient Ischemic Attack, a transient episode of neurologic dysfunction caused by loss of blood flow. A Carotis Stenos is when the blood vessel in the throat is clogged.

Such a reduction is necessary because a patient briefing is only useful if it is based on a specific amount of relevant information sufficient for the team to use as a point of departure. By sorting out data such as “weak left” and “lack of vision” (Excerpt 1, b) from the EPR, the nurse transformed information about the patient into a shorthand representation that was relevant for the purposes at hand. The complexity of giving a patient briefing and the knowledge that is needed in the preparatory work can be seen by tracing the various data in a narrative based upon its location in the EPR.

The sequencing of talk in Excerpt 1 can be understood in terms of the way a patient briefing is traditionally performed. The overall pattern and the historicity of this activity have a specific sequential order, which is
maintained in the briefings. This well-established narrative pattern (Montgomery Hunter, 1991) is generally used in team rounds as well as in other situations as a means of organizing information when staff members give oral reports to their colleagues. The order of information is generally presented as follows: (a) the patients’ date of birth/registration, (b) symptoms, (c) former health problems, and (d) previous, current, and planned treatments.

The briefing is not a complete description of the patient’s situation, nor is it supposed to be. Instead, it is a way of defining a case that could be acted upon (Timmermans & Berg, 2003). However, knowing what to include and how to actually construct the patient briefing involves not only knowing what data to include for the purposes at hand, but also where and how to look for relevant information. As is apparent in Excerpt 1, the briefing does not follow the structure of the EPR, but comprises different pieces of information in the categories and subcategories in the nurses’ and physicians’ modules. This reconstruction of the case implies an ability to anticipate, from the perspective of the listeners, what will be perceived as relevant content (Montgomery Hunter, 1991). According to Montgomery Hunter, the patient briefing might seem incomprehensible to the untutored listener, but it is nevertheless an essential part of the decision-making process. This briefing, in the form of a narrative, eliminates irrelevances while highlighting what is essential and related to the overall aim of the round, which is what can/shall be done with this patient. This briefing illustrates how decision making is an interpretative activity founded upon the staff members’ understanding of the patient.

The Decision-Making Process

Although the briefing provides a recast version of the patient’s problems, it is nevertheless closely connected to the content of the EPR. It is sufficiently open to provide opportunities for the team members to start their deliberation. The initial phase of the patient briefing is characterized as a story that is comprehensible and sufficiently relevant for the colleagues assembled to engage in the activity at hand. By selecting and sequencing information from the EPR modules for each profession into a locally meaningful narrative, the patient briefing now constitutes a ready tool for the participants to collaboratively formulate what the case is about or, as
Montgomery Hunter put it, to “search for a clue that will unlock the mystery of the patient” (1991, p. 4). This means that there is an inseparable relation between the historical way of reconstructing a case and the way staff members frame and deal with any particular case. In the sections that follow, we will further scrutinize the next phases of team rounds by continuing to follow chronologically the case of Bertil.

Framing the Main Problem

All reconstructions of cases in patient briefings can be seen as selections and transformations of information from patient records which, in turn, not only reconstruct the case, but also the patients’ needs and the team’s responsibilities and tasks. As will be seen in this particular example, there is coherence in the topics between the patient briefing and the outcome that follows, that is, the process of decision making.

It is not possible to have a fixed answer regarding what to do in a context of deliberation, which is the essence of the team round. Therefore the main characteristic of the team round is its interactional nature, where interprofessional teams arrive at joint decisions. By analyzing Excerpt 2, we further examine the ways in which the physician recycled the information retrieved from different professional knowledge domains provided in the patient briefing. Here it becomes clear how information originating in the EPR is picked up and used for formulating arguments.

Excerpt 2. The first sequence in the team round following the patient briefing.

The physician’s first utterance in lines 158–160 can be conceived as anticipating a response to the overall question of the team round—what can/shall be done with this patient—which is embedded in the situation and
was clarified during the patient briefing. Thus, the first utterance in this part of the team round works as a preliminary reconstruction, providing a relevant description upon which to proceed.

These introductory utterances from the physician function as a part of a continuing chain of reformulations of information. They derive from the Consultants subcategory within the Registration category in the EPRs cited in the nurse’s patient briefing, “is waiting for reply from Gothenburg regarding Carotis” (Excerpt 1, f), to the physician’s first utterances, “Well, then there is not much to say about—Bertil—then. We’ll have to wait for [name of hospital]. We haven’t had any response yet” (Excerpt 2, lines 158–160). These reformulations impact the direction of the subsequent elements of the decision-making process in that they constitute a starting point for subsequent reasoning.

The physician’s conclusion, in line 162, that “We can’t really do anything at all until we know more” constitutes a formulation of the patient’s problems in relation to the staff/hospital’s responsibility. Although the patient may have been experiencing severe problems in day-to-day life, the institution was not obliged to do anything with its available resources, methods, and knowledge at that particular instant. This matter was pointed out by the physician in line 162, when she emphasized we, referring to the team, and, until, which specified the then-present point of time. As can be seen, the physician almost formulated a preliminary decision, which means that she framed the situation as an administrative question relating to the institution’s obligations and the possible discharge of the patient. This first sequence in the team round presumed access to information from various professionals and from different activities. When paper-based records were used, each profession kept its own records, which meant that if the records were drifting (if someone had taken the record out of the archive), the information was drifting as well. In this particular case, and in all other cases when EPRs are available, staff can easily access patient records from all of the participating specialties. So, even though the utterances in Excerpt 2 might seem trivial or self-evident, they presume access to information that is independent of place and time, that is, information provided by the EPR.
Elaborating the Case

The activity of the team round cannot be reduced to a matter of merely sharing information. To simply share information would not, in itself, make transparent the implications that the information might have for a particular course of action in terms of how, why, and when to act. In other words, the range of options that are possible or appropriate may not always be exhaustively encapsulated by what is officially prescribed. Moreover, sharing information also involves providing professionals with opportunities to discover the current state of care, namely, the particular circumstances of each individual patient and issues concerning how to respond to present and future institutional responsibilities. Because the team round took place at a ward for stroke rehabilitation, the staff members had the additional responsibility to account for ongoing/future rehabilitation, and this also influenced the ultimate response to the question of what can/shall be done with this patient.

The institutional responsibility and its inclusion of a rehabilitation perspective are clearly evident in Excerpt 3. Here the physician continued to elaborate the case, by turning to the physiotherapists and asking “Or do you think there’s something that you can see?” (line 163), which can also be seen as an indication of concern to abide by institutional obligations.

The main question is still what can/shall be done with this patient and, by reformulating the case, the physician is expecting to clarify both the nature of the problem and possible courses of action. Therefore, this question does not stand by itself but, rather, is a followup based on the physician’s own conclusion, articulated in lines 158–160 and 162 of Excerpt 2. By reconstructing the case in this way, the physician clarified both problems and possible courses of action. In posing the question in line 163, the physician addressed and defined two possible ways for the physiotherapist to respond: to concur with or to distance themselves from the proposed course of action. And just as the questioner’s interest is revealed in the formulation of the question, the response can be seen as an answer to the physician’s embedded stance (Hurley, Birch, & Eyles, 1995).

The physiotherapist’s utterance in Excerpt 3, lines 164–165, was both a response to the pronounced question (Excerpt 3, line 163: “Or do you think there’s …”) and to the implicit embedded question, “Do you agree or disagree with my preliminary conclusion?” In the clause that follows, “…but
it’s nothing that can be worked on, …” (Excerpt 3, lines 164–165), the physiotherapist made clear that she understood and aligned herself with the position taken, which also correspond with her entries in the EPR.

However, the problem with the hand brought up by the physiotherapist was not new information to the physician because it was entered into the physiotherapy module in the EPR. In addition, a loose translation of the physiotherapy’s EPR module noted, “Moving fingers: The patient experiences that the left hand’s digits [fingers] 3–5 are a little difficult to control.” Therefore, when the physician asked “Is that objective …?” (Excerpt 3, line 166), it can be seen that the question is a reformulation of, and has its starting point in, the EPR. The question can be traced back to the physiotherapist’s earlier notation in the EPR, “the patient experiences that the left hand’s digits 3–5 are a little difficult to control.” The question formulated by the physician can be understood as an evaluation of the remaining problems in the use of the hand. Objective, opposite to subjective, reporting is a positioning used to classify the information and, thereby, to recast the understanding of the case and classify the information. Here, objective simply provided the clinicians’ observations, while subjective was used for something that the patient told the clinicians that he had experienced.

| 163 | Physician | Or do you think there’s something that you can see? |
| 164 | Physiotherapist | Well, he, he could feel a bit under his hand but, but it’s not something that can be worked on, like-- |
| 165 | Physiotherapist | Is that objective or is he--? |
| 166 | Physiotherapist | When he did like this [clenching her fist] he was a bit slow with these two fingers here. |
| 167 | Physiotherapist | But there’s no obstruction there [points at fingers]? |
| 168 | Physiotherapist | No. |

**Excerpt 3.** Elaboration of the nature of the problem and continuation of team round evaluation.

---

5 Underlined terms means that they are emphasized
The predetermined path of outcome is pursued by asking, “Is that objective ...?” (Excerpt 3, line 166), in that the question itself selects the information that is in line with the implicit position in the previous question. If the information is objective, the institution now has a responsibility and, consequently, something needs to be evaluated. If, on the other hand, the information is subjective, it is likely to create a problem in relation to the obligations of the rehabilitation ward.

Berg (1992) argued that quotations, question marks, or the addition of information of a subjective nature to medical records is a way of downgrading the importance of the data. By referring to subjective domains, the physiotherapist indicated that she had noticed that the patient experienced a problem but, simultaneously, stated that she herself could not see the problem. While the notation can be seen as an instance of downgrading, it can also be seen as a way of positioning hospital obligations in relation to the emergent findings. If the patient (Bertil) drew attention to the fact that there was a problem with his hand, it would be the physiotherapist’s responsibility to evaluate the complaint and enter her observations into the EPR because such a problem might be of importance at some future point in time.

From this point of view, it is therefore reasonable to add in the EPR that “the patient experiences that...” (a in the EPR made earlier by the physiotherapist). At the same time, the additional information can be seen as a way of questioning its relevance for further rehabilitation notation in the EPR made earlier by the physiotherapist). At the same time, the additional information can be seen as a way of questioning its relevance for further rehabilitation.

This elaboration of the case is a typical example of how information from different sources is used and combined in novel ways in new situations. The information, which originated from the nurses’, physicians’, and the physiotherapists’ separate modules (see Excerpt 1), as well as from the primary patient briefing, was linked together to constitute a more comprehensive foundation than any of the separate modules in isolation could have. Indeed, it is the transparency between different professions’ submodules in the EPRs that made it possible for the physician to even ask the questions in the way that they were posed in the Excerpts.
In line 169 (Excerpt 3), the physician once again asked a question with an anticipated answer: “But there’s no obstruction there…?” By posing these questions (lines 166 and 169), the case had been recast and all of the necessary information was at hand for the reformulation of the initial concluding decision (Excerpt 2, line 162)—now, additionally, with the extended argument that the symptoms were subjective and not relevant for the institution.

**Agreeing on the Case**

In Excerpt 4, the physician once again suggested a consensual conclusion to how to understand and frame the case and how to proceed with it. This was made possible by the physician’s cohesive positioning of information derived from different categories and submodules in the EPR and by utilizing the physiotherapists’ own conclusions.

<table>
<thead>
<tr>
<th>Line</th>
<th>Physician</th>
<th>Physiotherapist</th>
</tr>
</thead>
<tbody>
<tr>
<td>173</td>
<td>Hmm no, so in terms of rehabilitation, he doesn’t really need to remain here either... We can’t help him with anything either... so this thing</td>
<td>It is more of working with his motor coordination and stuff--</td>
</tr>
<tr>
<td>174</td>
<td>here either... We can’t help him with anything either... so this thing</td>
<td>--that which works.</td>
</tr>
<tr>
<td>175</td>
<td>his loss of vision--</td>
<td>Hmm</td>
</tr>
<tr>
<td>176</td>
<td>Physician</td>
<td>Physiotherapist</td>
</tr>
<tr>
<td>177</td>
<td>Hmm</td>
<td>Hmm</td>
</tr>
<tr>
<td>178</td>
<td>But he copes.</td>
<td>Hmm</td>
</tr>
<tr>
<td>179</td>
<td>Physiotherapist</td>
<td></td>
</tr>
<tr>
<td>180</td>
<td>Hmm</td>
<td></td>
</tr>
</tbody>
</table>

**Excerpt 4.** Continuing the discussion.

A possible problem arose though when the physiotherapist said the patient’s problem was “--not something that can be worked on--” (Excerpt 3, line 165), that is, not trainable (one should remember that this was a stroke rehabilitation ward). This could appear to contradict both to the other information provided and the preliminary conclusion. When information about the patient is contradictory, questions can be presented in various ways. Thus, by asking, “But there’s no obstruction there?” (Excerpt 3, line
169), instead of asking, “Does this constitute any obstacles for the ability of move?” or “How does this affect the ability of move?” the question itself contains a counteract. As Berg (1992) put it, this can be seen as an attempt to regain alignment in the construal of information. Therefore, the question itself is embedded with a predetermined answer, shaping the exposition of the patient. Then, when the physiotherapist reformulated her first conclusion (lines 176 & 178, Excerpt 4), she actually recast the problem in terms of being trainable. This argument, though, is disregarded by the physician when she said, “But he copes” (line 179, Excerpt 4). This was actually a new argument based on the earlier overall conclusions and on information from the physiotherapists’ module in the EPR. So, even if Bertil was trainable in some respect, he could still manage on his own, which means he was no longer an obligation for the present ward.

Making the Final Decision

Because the institutional perspective prevails in the recasting of this case, the outcome is neither an open nor an unprejudiced process. It is, however, rendered visible in Excerpt 4, in the sense that the physician not only displayed knowledge of how to use information in the EPR and of what to ask, but also demonstrated knowledge about how to reconstruct the problem.

When taking a closer look at the final conclusion in line 183 (Excerpt 5), it obviously was not entirely new. Indeed, it appears as an answer to the very first question that, primarily, was articulated in the form of a statement: “We can’t really do anything until we know more” (Excerpt 2, line 162). The questions during the team round all corresponded well with the predetermined answer to the overall question of what can/shall be done for this patient and, as can be seen, the team round was performed in a way that simultaneously shaped the outcome.

The final conclusion suggested in line 183 (Excerpt 5) was based on both administrative and medical considerations. In lines 185–188 (Excerpt 5), the physician summed up the arguments for the decision by referring to the organization’s routines: the patient’s health status and the fact that necessary examinations had been carried out. The decision was thus firmly placed among the cases of normal procedures in terms of institutional routines and
decision making. In lines 193–194 (Excerpt 5), the physician made it clear that, with the information at hand, there really was nothing the team could, or indeed was obligated to, do. Thus, based on these reasons, she proposed that the patient be discharged. As is apparent in Excerpts 2–5, several arguments were used in the team round, all of which had a substantial impact on the final decision of how to understand this patient, his needs, and the nature of the interventions that should follow. These arguments all originated from the EPR and illustrated how the EPR contributed to structuring and recasting the case into a relevant representation of the patient, as well as the knowledge needed to achieve this.

| 183 | Physician | …No because then he really ought to be able to go home. |
| 184 | Physiotherapist | Hmm |
| 185 | Physician | No… because we don’t normally keep them… only if there is |
| 186 |  | some type of--I mean he’s been in bed here a whole day… We |
| 187 |  | know that he has |
| 188 |  | functions… he has even been on doppler. |
| 189 | Physiotherapist | Hmm He’s got his eyes [examination] next week. |
| 190 | Nurse | Yeah, but-- |
| 191 | Physician | Hmm |
| 192 | Nurse | But there is nothing, nothing more, so without… no, so I |
| 193 | Phys. | suggest that he goes home today. |
| 194 |  | |

Excerpt 5. The final decision is justified with arguments from various perspectives.

DISCUSSION

The results demonstrate the general structure of the decision-making process and how the information originating in the EPR undergoes a series of changes throughout the. The case of Bertil, as originally constituted in the EPR, was first transformed into a brief presentation, which in turn was both counteracted and recast before the team made its final decision (Figure 1).
In contrast to Lyotard (1999) and Franko Aas (2004), our argument is that databases like EPRs do not have a built-in superior logic determining their use. Instead, the logic of decision making is found in the activity itself, not in the information structure. The current study shows instead how standardized information prestructures the ways in which problems are understood, and how it functions as a significant resource in decision making. It is nevertheless apparent how information is flexible in its use and open to different interpretations. Moreover, the idea that the EPR is a complete representation of the totality of information is counteracted by this study.

Even though the EPR functions primarily as a formulation of how things are concerning the patient’s identity, condition, needs, and ongoing treatments, the presentation of the case (Phase 1, Figure 1) nevertheless also leaves the story open for negotiation. Moreover, the analysis points to the professional competences involved in displaying the situated meaning of the different categories. Thus an understanding of the indexicality of categories lies at the core of the team members’ knowledge; they will draw on this understanding in formulating relevant arguments. It is thus of vital importance to capture the characteristics of this knowledge and how it is intertwined with the use of EPRs.
Professional Knowledge

Tracing information back to its source (Excerpt 1) reveals that creating a concise and relevant briefing presupposes various kinds of knowledge. It involves, first, knowledge about how information is categorized and classified in EPRs; second, knowledge about the different professional domains; and third, knowledge about the purpose of the activity itself. In other words, it is not simply a question of stacking information in an arbitrary manner, as suggested by Hylland-Eriksen (2001). Information systems, such as EPRs, cannot be used any which way. Instead, their competent use relies on knowledge about what nurses are accountable for in the team round. When the nurse is preparing for and conducting the patient briefing, she/he knows what the intended audience expects: not a complete reconstruction of the case but, rather, a short and adequate summary structured in a recognized pattern that can be seen as a descriptive, but not a deterministic, reconstruction.

A briefing is thus a construction in which every omission of information, rightly so, leaves room for individual understandings of the patient’s problems. As displayed in both Excerpts 1 and 2, the information in the EPR is transformed into a narrative that is shaped both by the information itself and by the context. In this briefing, the information from the EPR was transformed to fit a certain situation. The nurses’ briefing thus was based on selected and reorganized information, which then was modified in view of other pieces of information and in relation to the purpose of the team round, that is, in arriving at a joint decision.

Making practical use of the information in EPRs, therefore, is hardly a matter of simply computerizing and sharing existing patient record systems. Instead, using EPRs in team rounds demands that practitioners are sensitive both to each other’s perspectives and to the ways in which the activity unfolds turn by turn (cf. Måseide, 2007). In line with the current case, the medical staff knew that their colleagues were actually supposed to draw inferences from the particular remarks in EPRs. Or, as Heath and Luff (1996) put it,

They can rely upon those inferences not only to include information which might otherwise seem relatively trivial, but to exclude particular items (or even categories
of object) knowing that any competent reader would be able to make sense of the entry and retrieve the relevant information. (p. 356)

Figure 1 is an example of how medical conditions, such as coordination and moving fingers, constitute the categories within the EPR that are inherently indexical and thus relate to a specific set of institutional activities. As part of such institutional activities, categories are based on historically generated forms of knowledge and acting. The categories from the EPR (Figure 1) were used by the physiotherapists’ in their examinations and are further noted by the physician in the team round (Excerpt 3, line 169). Although categories mediate information, their specific meanings are construed in situ. Nevertheless, because the categories are invoked in everyday work, they also support norms and routines. For instance, when nurses prepare patient briefings, their experiences from doing team rounds in this setting become resources even before they start to search for information about patients. These activities involve historically established knowledge of what is considered relevant and necessary information, together with knowledge of how to structure a medical narrative (Montgomery Hunter, 1991).

As Mishler (1984) pointed out, categories and remarks can be viewed as re-representations of the professionals’ knowledge. How team members or, in the current case, the nurse reorganizes and restructures information from the EPR into a short oral briefing becomes a reflection of the understanding and knowledge in and about situations. Such knowledge appears in the current case as the use of categorized information in the EPR and implies knowledge about how to handle the technological system in which categories are embedded. Of course, knowing how to handle categories also involves knowledge about the contiguous activities that form parts of the context. From this point of view, categories can be seen as knowledge bearers in that they contain specific information not only about the content, but also how they are interrelated with and are adjusted to other categories.

“Is that objective …?” (Excerpt 3, line 166) demonstrates how categories in the EPRs have a constitutive role for recasting the case. Moreover, it shows how categories are not affixed to specific settings, but instead can be used in new combinations in new situations. This can be viewed as indexicality in the use of categories, which simultaneously constitutes the sensemaking processes necessary to maintain and continue the process of the activity.
A significant aspect of how EPRs work for specific purposes is that the categories that form their structure provide resources for prestructuring a pathological reality. When, for example, a physician asks questions, he/she makes relevant a set of possible answers and therefore also shapes the patient’s historical data (Prottas, 1979, p. 9, 161). This provides an example of how information obtained in a decision-making activity can be recast into pre-embodied patterns that are founded on the predefined structures. The categories that form the basis for EPRs are thus both constitutive and perspective-setting in that they transform the understanding of the problem and how it should be handled. From this it follows that EPRs function as stabilizing factors that create expectations of knowledge and processes recognizable to the actors. In other words, knowledge can be seen as being shaped and transformed by EPRs as it becomes part of such settings (cf. Agar, 1986; Bryman, 1988).

The abilities of team members to recognize and ascribe locally relevant meanings to categories indicate how competent use of EPRs is bound up with the indexicality of categories (cf. Garfinkel, 1967). This is rendered visible in this case through the physiotherapist’s notation about the patient’s experience of a problem in moving his fingers, which is stacked under the Coordination subcategory. From one perspective, this category mediates expectations connected to the responsibilities of the physiotherapist and points to the activity where the patient is examined. The notation can then be seen as a status report which, simultaneously, is also a response to the expectation of examination. Moreover, as can be seen, it was picked up from the EPR by the physician and used in the team round. The notation then was used to formulate an answer to the question what can/shall be done with this patient. One specific goal of the team round is to come up with a plan for further action. So the Coordination category had, at least to some extent, affected the physiotherapists’ actions in the past (sufficiently enough to require notated information), which in turn was picked up on by the physician in the then-present situation in addressing activities in the future. This means that the open-endedness of categories also involves time, referring both to previous activities and in projecting future consequences. Moreover, EPRs, and the category system they are built on, bring together multiple activities conducted by various staff members for different purposes and which constitute the necessary coordination for making decisions decisive for patients’ future care.
Institutional Implications

The ways in which categorized information is brought to life and becomes rational has to be understood in relation to the institutional context in which it is to be used (Sacks, 1992). This means that the logic of decision making can be found at the intersection of the ongoing activity and the EPR (the categorized text about the care work). This is evident in line 169 (Excerpt 3), where the physician replicated and asked, “But there’s no obstruction there…?” when the physiotherapist framed the understanding of the situation into an administrative question of whether or not the patient should be discharged (cf. Mäkitalo & Säljö, 2002).

It is widely accepted that there is a need for standardized terminologies and information structures to enable different health-care professionals to share information (Timmermans & Berg, 2003). Even though we concur with this assumption, we nevertheless argue that working across professional boundaries also presupposes knowledge of the tasks and responsibilities of others, as is illustrated, for example, by the nurse’s use of information from multiple modules in the briefing studied here (Excerpt 1). It is in the process of knowledgeable conduct that information in EPRs is brought to life in a way that makes it accurate, available, accessible, effective, and, most importantly, usable (Berg, 1996). In doing this, no fixed hierarchy exists, meaning that a certain category of information does not necessarily count more than another. Nor does information in the EPRs, in principle at least, necessarily overrule contextual factors.

The results demonstrate how the process of decision making within a particular institutional setting presupposes extensive knowledge of the indexicality of categories, something that originates in the participants’ shared institutional history. This indicates the possibility that making sense of standardized information by professionals in different institutions—with different professional languages, obligations, duties, routines, and so forth—may be a much more demanding task than has previously been perceived (cf. Mäkitalo, 2002). Our contention is that the efforts to facilitate information sharing need to account for the local interpretative work needed, and for the knowledge embedded therein.
On the one hand, the increasing attempts to formalize and standardize terminology and categories can be seen as a way to remove ambiguous information that could otherwise undermine overall usability and reliability. However, on the other hand, the meaning of information is socially and temporally situated. Because categories are bound to activity (Sacks, 1992) and embody predicates for obligations and rights in specific institutional contexts, participants not only use categories to make sense of and progress with activities, but also use them as waypoints for action. This implies that personal knowledge about the context in which needs for information and understandings arise is also of consequence for the possibilities of EPRs to support interprofessional decision making (cf. Tjora & Scamnler, 2009; von Krogh & Nåden, 2008).

CONCLUSION

One major conclusion is that, in comparison with paper-based records, EPRs could serve as an important resource in practices of decision making and provide an additional layer of transparency and accessibility to information. Consequently, EPRs may enhance the possibilities for crossing professional boundaries and facilitate collaboration (Martin et al., 2009). However, EPRs may also support the reproduction of the institutional order. Because the structure of EPRs is maintained by historically established categories, a general conclusion is that they can also contribute to a reification of the institutional history. This means that the structure in the EPRs, to some degree, must inevitably be seen as a historical script through which the past is preserved and a continuation into the future is constituted. This means that EPRs are highly flexible technologies and that the constraints and possibilities for their productive use are dependent not simply on their design. In addition, as suggested in the present study, the staff members’ knowledge about how to bridge the standardized categories with their local meaning is decisive for understanding some of the basic conditions necessary for advocating that EPRs can support interprofessional collaboration.
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All correspondence should be addressed to:

Thomas Winman
University West
461 86 Trollhättan, Sweden
Thomas.winman@hv.se

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Transforming information into practical actions
A study of professional knowledge in the use of electronic patient records

The introduction of electronic patient records (EPRs) into health care organizations changes the conditions for work practices in general, and for work-integrated learning in particular. This thesis reports from three workplace case studies of a Swedish hospital where the staffs’ use of EPRs illustrate how professional knowledge is transformed into categorized and digitalized information, and how this information in turn is transformed into practical knowledge. The results contribute to our understanding of how professional knowledge is involved and developed by professionals when they use EPRs for communication, coordination and organizing of activities in local health care settings.

THOMAS WINMAN
Thomas Winman is a teacher at the Department of Social and Behavioural studies at University West. He is also manager for several projects on work-integrated learning in the public sector. His research interest is focused on professional and inter-professional communication and learning.

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