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# Sociotechnical Changes Brought about by Electronic Medical Record

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## ABSTRACT

This paper provides analysis of a 3-year longitudinal ethnographic study following the gradual adaptation of an Electronic Medical Record (EMR) in a community health centre in Canada. Adopting a sociotechnical perspective, I follow the EMR and the work practices as they undergo continuous modifications and I identify changes that are brought about by the EMR. Findings from this research show essential differences between types of sociotechnical changes and their implications. I distinguish between the initial changes that occurred and their implications which I characterize as having straightforward, direct, and immediate effects; and the emergent changes and their implications which I characterize as being broader and having a deeper level of impact in the long term. Furthermore, I illustrate how some of these changes reflected realizations of the visions behind the dream of implementing an EMR; while other changes enabled new practices and illuminated issues that were invisible before. Finally, drawing upon insights from actor-network theory, I show how the EMR is becoming more than just a tool; it is participating in creating new practices and gradually transforming the medical profession.

### Keywords

Electronic Medical Record; hospital information systems; technology adaptation; sociotechnical changes; qualitative research, actor-network theory.

## INTRODUCTION

Over the past decades, we have been witnessing the spread of Information Communication Technologies (ICTs) in various sectors. The health care sector, however, has been criticized for lagging behind other industries when it comes to adopting technological innovation. In President Bush's technology agenda, it was said that health care practitioners have to manage complex 21st century medical information with a 19th century paperwork system. A similarly simplistic tone envelope the views about ICTs both in debates in the media and in various policy discourses. An illustration of this can be found in a commentary in the Canadian newspaper the Globe and Mail, which expressed a very clear request in its title *For health's sake, trash those paper records* (Picard, 2007), followed by strong normative statements about the existing paper-based practices:

> Health care institutions and health practitioners who are still using paper medical records rather than electronic ones are much like those people with their behinds hanging out: vulnerable and *undignified*, and the very thought of them should leave us *embarrassed* and *ashamed* [italics added] (Picard, 2007, para 4).

These debates in the media and policy discourses have been accompanied by the inevitable promise that such technologies will provide overall enhancement and sustainability of health services. Accordingly, ICTs in general and Electronic Medial Records (EMRs) in particular, are often viewed as both a facilitator and a measurement tool for success reinforced in the slogan 'more IT for better health care.' In an editorial published in the Wall Street Journal, President Barak Obama proposed a national adoption of EMRs, and explained that EMRs would save $80 billion a year (Groopman and Hartzband, 2009). Furthermore, EMRs, Obama repeatedly promises, will improve efficiency, save money, and save lives (The White House, 2009). The last sentence which portrays the EMR as a vehicle to saving lives illustrates nicely the tremendously high level of expectations towards this technology.

There are various cost-benefit studies of EMRs (e.g., Wang et al., 2003). In this paper, however, I wish to move beyond simply summarizing the impact of the EMR in terms of measuring efficiency/cost, and rather open a space for reflection upon the contested and ambiguous nature of such technology. I draw upon a sociotechnical view (Berg, Aarts and van der Lei, 2003) whereby technology and health care practitioners affect each other and transform one another. To better understand the intermeshed relationship between the technical and the social elements, I draw upon actor-network theory (ANT) which views these elements as part of heterogeneous or sociotechnical networks constituted by human as well as nonhuman

(technical and material) actors. ANT can be a powerful tool for the information systems (IS) field as it can provide better theoretical conceptualization of the IT artifact (Grisot, 2008; Hanseth, Aanestad and Berg, 2004).

This paper can be positioned among studies within the research field of ICT in healthcare that draw upon different insights from ANT (e.g., Grisot, 2008; Jensen and Winthereik, 2002; Vikkelsø, 2005). It provides analysis of a 3-year longitudinal ethnographic study of the gradual adaptation of an EMR-system in a community health centre in Canada. This study traces the continuous development, modifications and configurations that the technical system and the work practices underwent. The empirical case illustrates how the transition process was not linear and did not follow a pre-defined script. Rather, the different abstract visions behind implementing an EMR were deconstructed into many small concrete goals which were continuously changed and redefined to accommodate the existing reality. Findings from this research led me to distinguish between two types of changes and their implications: the initial changes which I characterize as having straightforward, direct, and immediate effects; and the emergent changes which I characterize as having a deeper level of impact with broader implications in the long term. Finally, I will illustrate how some of these changes were realizations of shared visions by, for example, enabling formal protocols to become situated actions, while other changes enabled new practices and brought forward issues that were invisible.

## RELATED LITERATURE

The implementation of EMRs has been studied by various researchers from a wide range of disciplines. A recurrent theme in the EMR literature is the gap between the actual situated work practice (Suchman, 1987) and the expected practice which is inscribed in the design of the EMR (Goorman and Berg, 2000). Therefore, emphasis has been placed on the importance of having an effective integration of the technology with localized work practices, while allowing space for ongoing adaptations and re-design (Hartswood et al., 2003). Furthermore, space for reflection has been identified as important for creating technology-in-use practices (Boulus and Bjørn, 2008), and allowing communication flow and coordination of work activities that cross organizational boundaries (Nilsson, Grisot and Aanestad, 2002).

Several scholars argue that the EMR will impact the medical profession in various ways (Dick and Steen, 1991), such as by bringing new responsibilities and consequently changing professional roles and relationships between health care practitioners (May et al., 2001; Stanberry, 2000). While some researchers identify specific changes, for example, a shift toward more individualized working patterns (Lundberg, 1999); others describe rather general change patterns, for example, in redistribution of work and of organizational attention (Vikkelsø, 2005).

Several researchers describe how the EMR brings about new charting practices that have to become embedded in the daily clinical practice. Gregory (2000, p. 11, 32), describes the transition from 'free text' handwritten notes to 'structured entry.' While this transition encourages physicians to be more structured and precise in their writing (Berg, 2001), it also imposes new challenges since information that is entered into the EMR becomes decontextualized (Berg and Goorman, 1999). The change in charting practices is just one of the many changes that collectively can affect existing organizational realities.

Other scholars focus on changes in articulation work (Strauss, Fagerhaugh, Suczek and Wiener, 1985), which refers to the informal work that is necessary to ensure smooth coordination and to manage the distributed and contingent nature of work (Goorman and Berg, 2000). Articulation work often tends to be invisible, yet it is essential as it often serves as the glue that holds complex practices together. Therefore, there has also been an emphasis on the important roles that various artifacts play in articulation work (Luff, Heath and Greatbatch, 1992; Lundberg and Tellioglu, 1999; Svenningsen, 2002). The importance of material artifacts has also been stressed by ANT which strives to move away from the exclusive focus on the social and look at the way in which the social and the material/technical are simultaneously co-constructing and co-shaping each other. ANT offers a very different view on the technical artifacts as these become activated as nonhuman actors that have the ability to produce effects on the world, transform our actions, and redefine our understanding (Latour, 2005).

## FIELDSITE, METHODS AND DATA COLLECTION

This research project takes place in a community health centre in Canada which received transition funds from the health authority to implement an EMR, as part of the federal government's health reform policy to support renewal initiatives in the primary care sector. The empirical data presented in this paper comes from a longitudinal ethnographic study, where the underlying aim was to acquire rich insight and in-depth understanding of human, social and organizational aspects of the phenomena being studies (Myers and Avison, 2002, p. 4). This method was chosen because of its strength in generating interpretive knowledge when studying social phenomena and actors in their natural settings. In this ethnographic research I follow a constructivist view whereby reality is not pre-determined but rather constructed, and open for interpretations (Petterman, 1998). A significant amount of time was spent in the field to develop a trust relationship with the participants. This, I believe provided me with access to informal practices, hidden assumptions, and/or invisible issues essential for the

phenomena being studied and its interpretation. The overall aim in this case study was to gain a deeper sociotechnical understanding of the existing situated work practices as well as insights into how the new EMR system was actually used by the participants.

The fieldwork began in October 2004, following the implementation of the EMR from the initial phase of installation throughout a 3-year period. Two rounds of formal interviews were conducted: one set of initial interviews was conducted during the initial phase of the EMR-installation, and another set was conducted in the summer of 2007, after using the EMR for nearly three years. I was also gradually given the opportunity to participate in weekly EMR meetings that were organized by a special EMR committee established shortly after the technical implementation. The EMR committee consisted of representatives from each professional group who gathered on a weekly basis to discuss the various challenges and complexities faced, to evaluate the adaptation process and to define new goals. The EMR committee, which functioned as a task force, was part of an enduring collective entity committed to conducting all the necessary changes to make the implementation of this technology successful; all in the name of improving patient care.

Table 1 summarizes the fieldwork and the data collected. All empirical data was transcribed, coded and analyzed using NVivo.[1] During this process, the empirical data was grouped in different ways to allow investigation of different phenomena and careful exploration of various repeating and/or contrasting patterns. I began by summarizing the various changes that were brought along by the technology. During this process, I began noticing differences between the changes the informants described in the second set of interviews (conducted nearly three years after the installation of the EMR) and the changes they described in the first set of interviews (conducted in the beginning of the adaptation process). Trying to explain the differences between the changes, led me to focus on the *implications* of these changes.

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|---|---|
| Open-ended, semi-structured interviews | Clinic staff (MOAs, nurses, physicians): 11 (range 1 to 2.5 h)<br>Patients: 22<br>IT vendor: 1<br>Decision maker: 2<br>Practitioners from other clinics: 5 |
| Participant observation in various locations (e.g., behind the reception desk and the charting room) | Sessions: 10 (29 h) |
| Participation in formal and informal meetings | Clinical meetings for clinicians: 1 (1.5 h)<br>Medical team meetings for all staff: 3 (4.5 h)<br>Meetings with the vendor: 2 (4 h) |
| Participation at EMR meetings | 29 meetings (range 1-2 h) |
| Informal conversations | Various health care practitioners<br>IT vendor |
| Seminars (organized by the health authority or the vendor) | 4 seminars (29 h) |
| EMR training sessions | Sessions: 3 (18.5 h) |
| Document collection and analysis | e.g., meetings minutes, emails, memos, report, and project plans provided by the IT vendor and the provincial health authority. |
| Visual contextual representation | Photos of different locations and artifacts<br>Flow diagrams mapping activities |

**Table 1. Data sources**

[1] A software for qualitative research

## CHANGES BROUGHT ALONG BY THE EMR

Drawing upon insights from ANT, the EMR is viewed as part of a complex heterogeneous network, which includes shelves, papers, telephones, information systems, standards, health care practitioners, etc. This section will trace the various sociotechnical changes that the EMR brought about, and their implications on work practices.

### Initial Changes in Work Practice

When the EMR was implemented, it brought along many new additional tasks. This was a long and gradual transition period where the health care practitioners were partially using the EMR along side with the paper charts. The medical office assistants (MOAs) began using the EMR for scheduling and billing purposes, and the general practitioners (GPs) started gradually to write a few medical notes using the EMR. Other tasks such as prescriptions renewal and referrals, were conducted using paper documents. There was an increase in the amount of paper used especially since everything had to be printed out from the EMR and filed in the charts. During that period, the MOAs' workload increased dramatically as they were updating (prepping) both the paper-charts and the EMR. The so-called 'chart prepping' practice refers to the retrieving, organizing and storing the various paper documents in the correct place in the respective chart. MOAs were also responsible for scanning different documents, including those that were mailed and/or faxed to the clinic. Backup mechanisms still existed and papers were continuously filed or stored in different locations for a particular period of time. Various notebooks were still in use to keep track of different tasks (e.g., flu shots).

A strategy had to be established to determine a method to enter the information from the paper charts into the EMR. Acknowledging that scanning all charts is immensely time consuming and most likely not feasible, the EMR committee spent a few months discussing and testing various ways to tackle entering the huge amount of information into the EMR. Finally, the EMR committee decided that only some parts of the charts would be scanned and that the decision would be taken by each GP. A detailed strategy was established in order to limit and balance the amount of documents that would be scanned, and to layout a standardized labeling mechanism using key words to group the various types of documents. GPs were therefore requested to go through each chart and select the most prominent documents they wanted to be scanned. It is important to keep in mind that the clinic has approximately 5000 active patients (patients seen within the last 18 months). Many practitioners in the clinic said that transferring the information from the paper charts into the EMR was what made the first year difficult.

GPs were already spending longer time on charting activities (e.g., documenting patients' encounter and ordering laboratory tests) using the EMR when compared to paper charts, and while some were still struggling with a lack of familiarity with the system, others struggled with poor computer literacy and/or typing speed. These were in addition to the many technical challenges that were faced—some of which related to lack of knowledge about the system while others were related to technical problems identified in the system—all of which were very difficult and distracting to the consultation with a patient. As one of the GPs described it, comments such as "talk to me not to the computer" (Dr. Ashley[2]) were expressed by some patients. Another GP described the first year as a challenging period:

> "Just getting used to having a keyboard in front of you and screen at all times…and to be able to use that with enough ease so it didn't interrupt the flow of communications with patients, was a real challenge. And then there were multiple other challenges in terms of understanding how the system works, there were glitches in the system. So I remember that period as extremely stressful" (Dr. Georgina).

Another practitioner described this period in the following way:

> "When we went on to electronic records, within a couple of months we were exceeding the doctor budget by like $10,000 a month…and all that admin time…it was really a huge amount of time spent looking at the papers, struggling with software issues trying to figure out how to message somebody…they [the health care practitioners] used urgent message for a while, and then had hundreds of messages…So it was like trials and error…they try to find ways to replace old systems that has been in paper and they tried to replace them electronically" (Jenny).

Gradually as the EMR contained more information there was a significant decrease in the 'chart prepping' practice and in the GPs' requests for pulling charts, and this in turn resulted in a clear reduction in the MOAs' workload. GPs' workload, on the other hand, continued to increase as they were now responsible for additional administrative tasks and articulation work, such as retrieving and storing information in the EMR as well as following the previously existing monitoring mechanisms (e.g.,

[2] Fictional names were assigned to all informants to preserve their anonymity.

checking that clinical notes were signed). In addition, GPs gradually started using the EMR for writing prescriptions, referrals, and billing. Since the GPs' workload was already high, a new strategy was implemented to delegate tasks and balance the workload. Accordingly, the MOAs became responsible for updating the EMR which implied going through each patient record and updating the height, weight, blood pressure, the narcotic agreement, the allergy record and smoking status.

The EMR brought along various initial changes. In the next section, I further reflect upon the immediate implications of these initial changes.

### Initial Changes and their Immediate Implications

One of the most obvious changes that the EMR brought about was in performance of tasks, especially in relation to documentation activities which were now conducted using the computer. This implies that all information became traceable as the EMR kept a continuous electronic audit of all activities. More importantly, the change in documentation activities had implications on the amount and type of information entered, as well as the presentation and format of information. The EMR included a Subjective Objective Assessment and Plan (SOAP) note which is a template for writing progress notes for patients' encounters. This was a radical change when considering the fact that prior to the EMR no particular form or template was used for documenting patients' encounters. A new charting practice had to become embedded in the daily clinical practice (Berg, 2001), and there had to be a transition from 'free text' handwritten notes to a more structured content approach (Gregory, 2000).

The EMR also decreased the amount of tasks, especially those related to articulation work. GPs were now increasingly involved in activities previously conducted by the MOAs related to coordinating tasks and sorting information. The EMR also decreased the number of staff involved in a particular activity. For example, prior to the EMR, when a lab result would come to the clinic, the MOAs would open the various letters, sort them in different piles, and then place them on different shelves depending on which GP was responsible for ordering the lab tests. The GP would then see the lab result and place a post-it-note on the document requesting the MOAs to pull out the chart. Assuming the chart was not misplaced, it would be found and placed on the GP's shelf. The GP would then assess the situation and describe actions to be taken. As we can see from this example, the EMR also altered the workflow and the chronological order in which tasks are carried out.

The EMR had a major impact on the division of labor and distribution of work. During the transition period, MOAs were responsible for most of the articulation work. Gradually, as more information was available through the EMR, there was a significant decrease in the practice of updating paper charts. Since the MOAs' workload was reduced they started gradually to exercise a higher degree of responsibility for advanced tasks, such as updating narcotic agreements, allergy records, medication renewal, etc. GPs' workload, on the other hand, continued to increase as they were becoming responsible for additional articulation work.

The representation of workload was also altered, and while different folders and shelves with piles of papers used to represent the workload status, these were now replaced with different electronic lists of appointments, lab results, etc. Contrary to electronic lists, paper-based documents has the ability to represent workload and support both synchronous and asynchronous collaboration (Luff, Heath and Greatbatch, 1992). It can, therefore, be said that the workload became invisible as stacks and piles of papers previously visible became subsequently masked behind the screen.

The EMR also redefined responsibilities and interdependencies between the GPs and MOAs. Prior to the EMR a buffering mechanism was established to assist in planning the workflow. For example, when lab results were sent to the clinic these were sorted by the MOAs into two piles distinguishing between normal and abnormal results. It is only when the sorting mechanism is completed that the GPs would review the labs that are most important. While lab results used to be buffered before reaching the GPs, the EMR routes all lab results directly to the GP's electronic inbox.

### Emergent Changes

During the first year of the implementation, the health care practitioners were too occupied with trying to understand how the technology worked and they focused merely on finding ways to use the system in order to accomplish their tasks (e.g., how to create a follow up or review lab results). As time went by, the practitioners acquired more knowledge and experience in using the EMR. There was a sense of stabilization in the adaptation process and the number of challenges decreased significantly. The new issues that were discussed in the EMR meetings were more advanced and sophisticated (e.g., how to search for a particular patients' population). Most of the informants describe this period in terms of increased comfort and confidence that is related to the growth of the technical knowledge about the EMR. This is how one of the GPs described the first period:

> "It was just a learning curve. So there were lots of frustrations. Cause if you're not instructing the computer in the right way, it won't do what you need it to do. So you just ran into the blocks. But over time, it's actually a really good program if you understand how it works. It's just learning how to drive the program better" […] "You can't take in all the details when you're just learning where the screens are. But as you get more comfortable with the basics, then you can start to appreciate the shortcuts" (Dr. Maya).

The various clinicians started using advanced functions, such as 'practice search' with which one can run complex queries to get an overview of a particular patient population (e.g., retrieve all female patients over the age of 15 who did not have a PAP exam in the last two years). Other advanced functions used by the clinicians were the creation of rules for reminders (e.g., flag all diabetic patients that did not have a visit in the past six months), or the creation of graphs that allow visual representation of numbers over time (e.g., from electronic lab results, blood pressure, height and weight, and medication lists).

The focus of the health care practitioners in general, and the EMR committee in particular, shifted from 'how to do things' to 'this is how things can be done.' There was a change in the attitude from 'how to adopt existing work practice to the technology,' to a more proactive engagement with the technology—seeking actively possible configurations in the system. Gradually, the technology became so truly integrated in the work practice that it was viewed as a tool for achieving something else. For example, when using the practice search and rules, the EMR was viewed as a tool for enabling preventive care. Finally, a few GPs began accessing the EMR system from home, and some GPs used the internet both during and outside the consultation to look for updated information about new treatment, medication, etc.

As can be seen from the above, beside changes in performance, workload and workflow, there were other emergent changes that together with the initial changes, seem to have a deeper levels of impact and broader implications in the long term. The implications of the emergent changes which appeared after using the system for nearly three years are discussed below.

#### Implications of the Emergent Changes

GPs started using advanced functions that allowed them to run complex queries to get an overview of specific patient populations. Previously, for example, in order to identify all diabetic patients who did not have an examination in the past six months, the MOAs would ask each patient that came to the clinic whether they were diabetic and when they last had an examination. By providing the search function, the EMR ensures capturing all patients in the clinic, including patients who are not 'frequent users' of the system (meaning those who did not visit the clinic in the past 18 months). Furthermore, the EMR allows automation of former coordination mechanism as it provides the possibility to create rules that will remind GPs to call patients for a visit. Another example is the follow-ups which were automated by the EMR. Previously, when the GP requested a follow-up examination be repeated, for example, in 3 years she would note this request in the paper chart and ask the patient to remember. This practice was described as a 'hit and miss' by several GPs. The EMR, however, not only provides an accurate follow-up mechanism, but also altered the responsibilities related to remembering the examination date. While this responsibility was previously distributed between the patient and the GP, it is now delegated to the EMR.

Advanced functions such as the practice search and rules provide an extended overview of a whole population rather than just individual patients. Such a comprehensive and accurate overview was previously unseen or hard to discern. The EMR allows data to accumulate in such a way that it can be used for identifying and monitoring demographics and long-term changes in disease patterns. This was viewed as useful especially since it enables preventive care and chronic disease management.

Furthermore, the EMR allows GPs to create graphs that provide visual representation of patient's progress (e.g., the patient's blood pressure over time). Prior to the EMR, the GP would shuffle through the charts and look for the previous results. The GP would then compare the numbers spread across different papers and would asses the results. There is thus a change in the type of data GPs used to work with, moving away from numbers to working with graphs. In this case, the EMR provides a different mode of data representation. Furthermore, because the EMR translates numerical data into visual information, this format is more comprehensive and can be better understood by patients. In other words, the act of translating numbers and interpreting information for patients has now been partially delegated to the EMR.

The EMR offers many different templates which enforced standardized practices, such as charting and billing practice. The increase in standardization is expected to lead to ensuring performance measures, medical legacy and analysis of health outcomes. Standardize practice is a realization of some of the shared visions behind implementing an EMR. As mentioned earlier, the SOAP template is supposed to improve the charting practice by enforcing a structured content approach. However, this approach has also been viewed as challenging by some of the GPs as it demands different reflection and cognitive skills. Several GPs explained that the template forces them to work in a more accurate and linear manner and does not provide as much flexibility as paper charts. Another GP explained that the SOAP template was challenging because it is

limited to one problem (chief complaint) per patient, while many of the patients in this particular clinic have high needs and risks, and many suffer from multiple chronic diseases. This template, in other words, constrains the GP's ability to analyze multiple problems. Hence, in spite of the fact that with the EMR text about individual patient is entangled within the larger patient population, the text is still limited to one chief complaint per patient.

As mentioned earlier, the EMR brought about a decrease in the amount of tasks related to articulation work and the number of staff involved in a particular activity. This, in turn, increased the speed with which tasks are completed. Quicker task-handling and increased accessibility to information enabled what is called point of care (POC) charting which refers to the expected formal and legal practice whereby charting ought to be done while sitting with the patient. Prior to the EMR, papers would be sent back and forth between GPs and MOAs, traveling through various shelves, desks and folders, and leaving traces in different notebooks before a final decision would be taken. The speed and intensity of the clinical decision making process might be viewed as increasing the efficiency, but at the same time, some GPs felt it was discouraging them from having the possibility to conduct an in-depth analysis. Several GPs described the EMR as a tool that tends to compel them to do more work right away.

Finally, the introduction of the EMR, which required placing computers in the consultation rooms, brought along with it access to the internet. Accessibility to the internet and graphs that translate information, indirectly promoted active engagement of patients in the process of care. In other words, the introduction of computers in the consultation room reorganized patient-provider interactions. In addition, the internet brought about a new role for some GPs—the role of guiding the patients to the most reliable sources of information online.

## DISCUSSION

As can be seen from the case presented in this paper, the impact of the EMR cannot simply be described in terms of success or failure, or measured by standardized factors, such as efficiency and cost. The case illustrates that such simplistic view neglect to reflect on the contested and ambiguous nature of such technology (Vikkelsø, 2005). Adopting a sociotechnical perspective (Berg et al., 2003) where technology is intermeshed with the medical practice, one acknowledges that the EMR brings about the emergent of new effects which makes it harder to single out factors for success or failure (Berg, 2001; Jones, 2003).

Previous research illustrates how EMR implementations can be viewed as a production of distributed and broad visions (Jensen and Winthereik, 2002). This view can indeed be applied to the case presented here where several changes reflected realizations of some of the formulated visions, for instance, moving towards a paper-less clinic and standardizing charting practices. Other changes, however, reflected realization of old standards and formal protocols, or improvements of existing practices, for example, ensuring good follow-up mechanisms, standardizing charting and billing practices as well as enhancing clinical decision making process. Furthermore, previous research found that implementations of new technologies often affect the medical practice in unpredictable ways (May et al., 2001). This was evident in the case presented here where in some situations the EMR brought about unexpected implications, for example, with the internet redefining the roles of GPs, and with the SOAP template which constrained the charting practice, increased speed and intensity of the clinical decision making process, and discouraged GPs from conducting in-depth analysis. In other situations, the EMR brought along new practices and thereby extended the GPs' medical practice by shedding light on patterns and connections that were previously invisible or simply impossible. Graphs that enable visual representation of patient's progress over time, and 'practice searches' and rules that provide an overview of a whole patient population illustrate this feature nicely. Similar to eyeglasses, the EMR selects and magnifies existing practices as well as brings about new practices.

Previous research identify various sociotechnical changes brought about by the EMR, for example, new charting practices (Berg, 2001; Gregory, 2000), changes in representation of workload (Lundberg and Tellioglu, 1999), division of labor and distribution of work (May et al., 2001; Stanberry, 2000; Vikkelsø, 2005). While some of these findings were evident in the case presented here, this research also moves a step further and identifies essential differences between two types of sociotechnical changes and their implications. This includes initial changes which I characterize as having straightforward, direct, and immediate effects and emergent changes, which I characterize as being broader and having a deeper level of impact in the long term. As can be seen from the emergent changes, the research presented here brings forth a more granular/nuanced description of the way in which the EMR is increasingly playing a larger role in the delivery and organization of care. Thus, the EMR does more than simply supporting coordination or increasing/decreasing workload; it is modifying the clinical decision making process (by accelerating its speed and intensity, and limiting it to one chief complaint per patient) and changing the way GPs think (by demanding different reflection and cognitive skills, and enforcing thinking in a linear manner). Drawing upon insights from ANT, the EMR becomes more than just a tool; it is acting on—and gradually transforming—medical practices. As illustrated in this paper, the EMR was not simply taken off the shelf to

automatically replace paper-charts, rather it was participating in creating new practices and gradually transforming the medical profession.

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