Achieving Continuity of Care: A Study of the Challenges in a Danish and a US Hospital Department

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Abstract. Continuity of care is a central topic for healthcare practice and is closely related to issues of collaboration. Thus, studying continuity of care from a CSCW perspective can help us understand what makes continuity of care in practice. In this paper, we show how collaborative technologies are appropriated differently in two cases, one in Denmark and the other in the US. We illustrate how this appropriation is dependent on challenges particular to the organizational context of work. Studying the practices in two different hospital departments we found that in practice achieving continuity of care depends on two main characteristics in the organization of work, namely 1) the constitution of roles and 2) the responsibility for care linked to the appropriation of collaborative technologies. These characteristics of the organization of work create different solutions to the challenges of discontinuity when physicians appropriate mundane collaborative technologies: patient records and pagers. To understand how continuity of care is achieved in practice we have to study the appropriation of technologies, the paper argues, and by comparing across cases we may begin to discern challenges that cut across context – and their different origins.

Introduction

This paper focuses on continuity as a central aspect of clinicians' work and a topic for CSCW research (Ellingsen and Monteiro 2006; Fitzpatrick and Ellingsen 2012). Continuity of care is regarded as a principle that applies in different

clinical settings despite the various contexts through which collaborative technologies for support of continuity of care are appropriated (Denmark's Board of Technology 2006; US Office of the National Coordinator for Health Information Technology 2010). When continuity of care has to be enacted in practice, the challenges of context-dependent discontinuity become apparent in how technologies are appropriated. To support continuity of care we thus need to understand what characterize these challenges to continuity in different contexts.

Consequently, previous research has pointed out how, for example, the particular characteristics of private healthcare in the US challenge continuity of care when patients move between various providers (Cebul, Rebitzer et al. 2008). Or, how in a Danish context of public healthcare continuity becomes a challenge when the provider forms one tremendously variegated organization that physicians have to maneuver within (Mønsted, Reddy et al. 2011). The challenges experienced in relation to computer support of continuity of care still imply technical issues; however, the context-related issues in terms of the sociological, cultural, and financial challenges are equally important (Fitzpatrick and Ellingsen 2012 citing Kaplan and Harris-Salmone 2009).

Context is traditionally rendered important in CSCW-studies: Continuity of care is considered in relation to the appropriating of technologies and artefacts in the particular context of work where they are used (Bardram 2004). Context, this research shows, is highly relevant for how clinicians' appropriate technologies. For example, a comparative study across two oncology clinics in Austria shows how practices diverge due to the differences of the organizational context determined by the organization of work spatially and by the information systems (Schmidt, Wagner et al. 2007). To handle the challenge of differences in a design context, the study suggests a focus on higher-order commonalities in the coordinative practices:

> "Here the focus is not on the rationale of specific practices in order to determine what is 'essential' and what is 'accidental', but to identify, if possible, the elements and rules of combination out of which coordinative artefacts and protocols are or could be combined and recombined" (Schmidt, Wagner et al. 2007: 9).

Meanwhile, commonalities have been explored mainly from the perspective of technologies and artefacts focusing on, for example, clinical documents and how they are generally used for several purposes (Schmidt, Wagner et al. 2007) or how repositories of clinical information are made relevant in the particular context (Winthereik and Vikkelsø 2005). Few (Schmidt, Wagner et al. 2007; Balka, Bjørn et al. 2008) have paid attention to what commonalities characterize the organization of hospital work in terms of the higher-order challenges that are embedded in these artefacts and technologies.

The importance of understanding the organization of work is illustrated in a comparative study of clinical work in Canada and Austria suggesting that 1) the

political – and policy-making – context, 2) the institutional/organizational context, and 3) the system and workplace design context are all relevant for understanding how technologies are appropriated (Balka, Bjørn et al. 2008). Within each of these levels of context, a range of interdependent and interlinked factors inform the understanding of the use of technology, including, for example, staffing and how relationships with external services are managed throughout the clinical work (ibid):

> "Here the wider organizational issues that directly frame the space for systems design and that in turn are responses to policy and administrative measures taken by municipal and state agencies are negotiated and implemented" (Balka, Bjørn et al. 2008: 518).

Addressing continuity of care from this perspective we need to investigate the *linking practices* by which technologies are appropriated in local contexts to handle challenges of discontinuity. By studying continuity of care in terms of linking practices across empirical settings in two different contexts we are thus able to conceptualize the broader commonalities. This paper in this way extends and contributes to the line of previous CSCW-research (Schmidt, Wagner et al. 2007; Balka, Bjørn et al. 2008; Boulus and Bjørn 2010) that brings about broader aspects of healthcare (e.g., in terms of commonalities) by studying context-dependent issues (e.g., staffing and relationships with external services) of in-depth empirical cases.

This paper brings empirical observations from a Danish and a US hospital medical department, both of which deploy electronic patient records (EPRs) and pager technology to support continuity of care. However, the appropriation of these technologies, we show, is quite diverse and different across the settings. The research question explored in this paper is: How is continuity of care achieved in everyday practice, and what are the commonalities that characterize the challenges of discontinuity across the two settings? In this way, the contribution of the paper is two-fold: To provide empirical observations of how continuity of care is achieved in two different contexts as well as to conceptualize the basic characteristics of technology use in continuity of care as the way responsibility of care and constitution of roles are performed in healthcare practices.

The rest of the paper is organized as follows: We begin with related research addressing the interrelationships that characterize clinical work in studies of collaborative technologies, focusing in particular on EPRs, phoning, and pagers (section 2). The research method follows, including the Danish case and the US case (section 3), before turning to the analysis (section 4) that forms two narrative stories of how continuity of care is achieved on a particular day as part of everyday use of EPRs and pagers in the Danish and the US cases. Next, we discuss the challenges to continuity of care (section 5), but from a comparative perspective so that issues that cut across the two cases on a)

responsibility of care and b) constitution of roles become visible. Finally, the paper is concluded (section 6). Here, we end with suggestions for a conceptualization of broader conditions and challenges for continuity of care that drive the technology use as well as the required technology support of practice.

Related research

To support continuity of care is a matter of ensuring coordination and effective communication so that tasks are not disintegrated in the complex organization of clinical work (Strauss, Fagerhaugh et al. 1985). Therefore, collaborative technologies are also central for support of continuity of care (Meum, Monteiro et al. 2011). By linking the clinical specialties through collaborative technologies such as the EPR, it becomes possible for clinicians to handle complex issues (Berg 1998). Continuity of care is a social practice of appropriating technologies and the various interrelated artefacts within the situation where they are used (Bardram 2004). To achieve continuity of care is particularly important where several specialties get involved in the care of a patient (US Institute of Medicine 2001). This means that when specialties collaborate around a certain organization, as, for example, teams, this shapes the hospital clinical work and how coordination and effective communication is achieved in practice (Strauss, Fagerhaugh et al. 1985).

The effort to support continuity of care in hospitals is documented by studies of EPRs (Hartswood, Procter et al. 2003; Heath and Luff 1996; Berg and Winthereik 2003). These studies show that it is difficult to support electronic sharing of subtle nuances of clinical work between the various clinicians involved in the care of patients (Cabitza, Simone et al. 2009). In fact, clinicians (still) rely on informal documentation to handle tasks such as "abstracting" to get the big picture of the status of their patients and planning within their particular context (Heath and Luff 1996; Hartswood, Procter et al. 2003; Park, Pine et al. 2013). Previous CSCW-research also found that physicians translate rather than transfer clinical information sent electronically between providers for it to be useful in the specific context of work (Winthereik and Vikkelsø 2005; Meum and Monteiro 2011, Mønsted, Reddy et al. 2011). When new care providers have to make sense of other physicians' entries, the correct interpretation of a patient's record can be hard to decipher (Mønsted, Reddy et al. 2011).

Consequently, phoning and consults supported by pager technology play a crucial role for how clinicians link their individual and yet interrelated activities (Brown and Randell 2004; Bardram and Hansen 2004; Scholl, Hasvold et al. 2007, Lee, Tang et al. 2012). The pager technology enacts the assignment of roles, and previous research of a hospital emergency department (ED) points out how pagers are effective for interrupting or getting a hold of a particular specialist

or type of staff (Lee, Tang et al 2012). Clinicians typically perceive this type of interruption as a problem causing errors in hospital clinical work (Brown and Randell 2004; Bardram and Bossen 2005). To make a positive difference to the care of patients within the larger organization of work, including letting clinicians prioritize between tasks and patients, it is crucial that interruptions are qualified, for example, by providing text messaging as an integrated part of the pager design (Lee, Tang et al. 2012). This allows the clinicians to make judgments about the urgency of the call relative to the particular task or patient being treated while taking into consideration the larger organization of work.

What is not clear from this previous research is how context-dependent challenges in terms of the wider organizational issues matter for how technology is appropriated. Previous CSCW-research illustrates how clinicians' interlinked activities are carried out across specialties, and why studies of collaborative technologies often address the interrelationship of clinical specialties as a basic condition in how clinical work is organized and carried out. Yet how clinicians make relevant the collaborative technologies in everyday practice to handle challenges to continuity of care that are specific to their particular context remains unclear. This paper will explore how mundane collaborative technologies: EPRs and pagers are appropriated to achieve continuity of care in two different contexts, and by comparing across cases we may begin to discern the broader commonalities of challenges – and their different origins.

Research method

To explore how continuity of care is acted out across different contexts, two workplace studies were conducted in hospital medical departments between August 2009 and December 2011 – one in Denmark and one in the US. By studying this subject across settings, and by also relating it to previous studies (Strauss and Corbin 1998; Schmidt 2000; Schmidt, Wagner et al. 2007), the paper contributes to a better understanding of challenges to how continuity of care is achieved in practice.

The US medical department is located in a large teaching hospital (university hospital). The hospital employs more than 3,500 personnel serving more than 300,000 outpatient visits to the hospital and nearly 17,000 inpatient visits per year. The medical department, which this study focused on, is organized into six teams. Each team consists of an attending physician (specialist), a senior resident, two residents, and two medical students. During weekends an attending physician and a resident cover for a team. Each team admits up to 20 patients, and the teams are usually on-call 2 days a week. While the team is located on a particular floor of the hospital, patients are spread out on different floors. Teams of physicians, however, are not sub-specialized within the field of internal medicine – only wards are organized by sub-specialization. At each of the wards located on the

different floors a "nurses' station" is placed on the ward close to the patients. The medical department staff includes nursing assistants, nurses, tele-monitoring technicians, physicians specializing in internal medicine, and residents who are not yet specialized.

The Danish medical department is located in a teaching hospital that is in the process of becoming a university hospital. The hospital employs more than 1,300 people serving more than 110,000 outpatient visits to the hospital and more than 39,000 inpatient visits per year. The medical department under study is organized into 5 wards. The wards are sub-specialized in, for example, initiating diagnosis and treatment of medical patients with general symptoms of disease (AVA), or specialized diagnosis and treatment of gastroenterological patients, endocrinological patients, etc. Each ward counts 1–2 attending physicians (specialists) at all hours, 1 senior resident, 1 resident, and numerous medical students. Patients are admitted seven days a week and at all hours. On weekends, 1–2 attending physicians cover patients that are admitted. The medical department staff includes secretaries (nursing assistants), nurses, physicians specialized in internal medicine, residents not yet specialized, and medical students. All staff of the ward are located in one conference room.

In total, the author spent 51 hours in the Danish hospital medical department and 40 hours in the US hospital medical department observing practices and conducting *in situ* and semi-structured interviews. The data collection and analysis followed an iterative approach emphasizing the ad hoc collection and challenging of data for rigor analysis (Klein and Myers 1999; Ellingsen and Monteiro 2006). The data from these two studies were analyzed through several rounds of analytical writing to identify themes across the cases (Emerson, Fretz et al. 1995). This iterative process resulted in a comparison of the US workplace study and the Danish workplace study focusing on how continuity of care is achieved to handle challenges specific to each context. The process of writing continued until the point where there was only marginal change in the analysis (Eisenhardt 1989).

Analysis: Two stories of how continuity of care is achieved as part of everyday practice

The following two narrative stories, although based on observations across several clinicians and on several days, are told from the perspective of a single day, including the subtleties of how technologies are appropriated as part of everyday practice.

Danish case

The first story begins in the medical sub-section AVA. This section initiates diagnosis before sorting patients to other subs-sections of the medical department that consists of 5 outpatient clinics and 5 sub-sections (wards) - including AVA. The medical department uses a monthly rotation plan resulting in different physicians present at the AVA every day, with the exception of a permanent attending physician. This arrangement means that the larger group of physicians gets time to see patients in the outpatient clinics the days they are not on-duty. The outpatient clinics are of particular interest to the physicians because they allow them to follow patients and treat them for a longer period of time.

Linking clinical information

On this particular morning the permanent attending physician, Dr. V, together with the attending physician, Dr. M, and a senior resident, runs AVA. A resident physician helps out admitting patients. The day begins at 8:05 am with a morning conference together with the rest of the medical department's physicians. An hour later the overall coordination across sub-sections is accomplished and the physicians head back to the ward. AVA operations have a straightforward goal (initiating diagnosis), and all jobs are tied together by the monthly work plan of the medical department prescribing the specific jobs of physicians on every day of the month as a central tool for how work is carried out.

As the physicians return from the morning conference to AVA a little before 9 am, the rest of the staff (nurses and secretaries) have already prepared status reports for patients that are ready to be seen by a physician. AVA's conference room is located on the ward and works as both a nurses' station and physician and secretary workspace. Patients are distributed between the two attending physicians and the senior resident, all of whom are preparing to do rounds at patients' bedsides. AVA admits patients on all days, and whenever a patient is transferred to one of the other sub-sections new patients are admitted. This means that there is typically a constant flow of patients in AVA.

The hospital requires that an electronic form, the "continuation" (Figure 1), be filled out as part of everyday practice to prevent the slip in responsibility that could occur from the organization of work around clinicians' specialties. This organization of work is further complicated by the fact that hospitals in the local health region divide responsibility between them on different levels of specialization and specialties. The distribution of responsibility between public hospitals is regulated by the national government and managed by the regional government to ensure that standards of care are high. The principle of organization is that practice makes perfect; the rare conditions are therefore only handled by a few hospitals.

The continuation form can be accessed from all regional hospitals. As part of the EPR, the continuation provides information on the patient's admissions

described chronologically, one after the other, and information on the patient's anamnesis, dispositions, and allergies. The continuation also includes what clinical activities have been initiated during a particular admission. In principle the provider is the public, but in practice the patient moves between various providers of healthcare that will depend on what the chief complaint of the patient is, how critical it is, and which hospital treats this condition. Therefore, AVA may also receive patients from other hospitals and/or transfer patients. Although the referring physician is expected to decide what hospital the patient is sent to, in practice this is a negotiation with the receiving hospital department.

Figure 1. Ex. of continuation form in the Danish case

Dr. M's first patient of his morning rounds is an 83-year-old woman, and the continuation indicated she most likely has a lung infection. The patient was previously admitted to a different hospital in the local health region, Dr. M notes, at which time she was also quite ill. He turns to the list of medications. As he prepares to the patient's bedside he consults the nurse responsible for this patient. The nurse record (kardex) with the patient's vitals (e.g., the pulse and the patient's general condition) is on the desk in front of them as they discuss the patient. The patient keeps having water in the lungs.

The monthly schedule often results in patients potentially seen by the same physician only once: with the exception of the permanent attending physician, the physicians typically rotate to other jobs the next day. For example, the monthly rotation plan assigns the job of "front-line" physician to residents and the job of "backup" to attending physicians. Because the attending physician is seeing this patient for the first (and maybe last) time, reviewing the patient's records (electronically and on paper) takes time. The free-text in the continuation is made

up of sections up to 35 lines in length separated by headings; the text is a uniform typeface and size that makes it challenging to get the overall picture of the relationship between previous admissions.

Both of the attending physicians are rather busy as 21 of AVA's 24 beds are occupied, and they work through their patients without interfering with each other. Dr. M notes down a few details from the patient record on a piece of paper before finally going to the patient's bedside. He keeps the paper with the extract of clinical information in his pocket all day. During the day Dr. M takes out the paper several times, crossing out and adding things, for example, as the change of a patient's vitals requires that his first calculation of medication is adjusted. While the continuation assembles clinical information about patients from a long-term perspective, the piece of paper that he keeps in his pocket visualizes to Dr. M his interpretation of what is done presently.

Back in the conference room Dr. M calls the hospital's general acute care section that admitted the 83-year-old woman to discuss with them her previous admissions because he believes there is a problem of co-morbidity (multiple diagnoses). The patient's condition does not get better because she cannot tolerate diuretics. Dr. M. realizes this when carefully going through the continuation where it was stated that the patient was previously admitted to the nephrology department for kidney problems. The acute care section agrees on his analysis and they decide to change the patient's treatment.

Linking clinical specialties

A third attending physician, Dr. J, shows up in the AVA conference room. He is the attending physician responsible for consults that day. Physicians in the medical department carry a pager that is assigned to them in the monthly rotation plan of the medical department along with a specific responsibility (e.g., backup). Since there is a new team each day, the pagers specifically facilitate these shifts so that getting a hold of a particular type of specialist is straightforward. A small display shows the phone number of the ward that paged the physician.

As the attending physician, Dr. J, begins his round, he carries with him a pager corresponding to the role of "backup". He leaves AVA to carry out a consult for a patient in one of the wards of the surgical department. Consults may be requested electronically or by calling the pager number, or by contacting a specialist personally in cases where this person is known to have a certain experience. The office of the attending physician, Dr. J, is located a little away from the ward; he does not spend much time there but just checks that no one has left any messages for him.

Whether a physician carries a pager or not depends on his or her assignment. It is crucial that there are no "stray" pagers if the system is assigning roles by pagers and the monthly rotation plan is to work securely. When Dr. J arrives at the surgical department he walks straight to the conference room, which is also the

nurses' station. The senior resident there is worried about a patient, a 17-year-old boy that had surgery in the colon recently, who now has dark stool, which may suggest bleeding from the colon. The patient was referred for surgery by the medical department.

Dr. J is the backup but he is also regularly seeing patients in the outpatient clinic specializing in gastroenterology, and Dr. J in this case remembers the patient from a previous admittance. To confirm to himself that it is in fact the same patient that he saw previously, Dr. J recalls details about the patient from memory and has the resident confirm them from what is stated in the patient's record. Together they flip through the paper record. The attending physician confirms the medication of the patient and they agree to have the patient's colon checked again. Dr. J then returns to AVA to see what the next consult is.

The pager technology reduces the interruption of the larger group of physicians. However, for Dr. J carrying the pager work becomes slightly more cumbersome, it appears, when the pager goes off several times in a row and he is not able to trace the call – or return it while the line remains busy. The simplicity of the pager design, which does not support texting, means that there is never any doubt whether a call was followed-up when the pager shifts hands. However, to the physician carrying the pager (Dr. J), it is cumbersome to make judgments about the particular call.

Dr. J is paged several times within a short time, which makes him worried when he cannot tell from the information displayed by the pager who might be calling him. To mitigate this he walks to the information desk located centrally in the hospital. The information desk is able to trace all in-house numbers, including this one. When Dr. J arrives at the ward paging him, he learns that a resident there simply got confused about the system of paging and the procedures for requesting a consult. And while Dr. J in this case is not interrupted in his work, he feels that he has to investigate the matter straight away.

What the Danish case shows is how physicians achieve continuity of care by appropriating patient records and pagers as they go about their everyday work: The patient record requires some appropriation to be useful in the context where inquiries are listed continuously. The relation between the inquiries is not clear for the physician that has to visualize this on a piece of paper that he keeps in his pocket and edits throughout the day; it takes some linking across cases before he actually sees the reason why the patient continues to have water in her lungs (her previous admittance to the nephrology department reveals to him that she has kidney problems). The challenges to continuity of care are thus interdependent with the context and how EPRs are shared between different clinical specialties sometimes located at different regional hospitals depending also on their level of specialization.

The complex organization of work where a different team of physicians runs AVA every day (and the other wards as well) also makes the linking of care

across specialties rather complex. To keep responsibility clear within this complex organization of work, the pagers only provide simple forms of communication. However, where possible the particular physician still tries to link previous acquaintance with the patient in the consults as he goes about his work and also to use his personal acquaintance with the patient when deciding what the next step should be.

We will now turn to the story of how physicians achieve continuity of care as part of daily practice in the US medical department by appropriating patient records and pagers so that challenges in the particular context are met.

US case

The story in the US case begins with Team B in the medical department. Six teams run the medical department that admits patients in a rotation; two days a week each of the teams is responsible for admitting patients. Team B is one of these teams. The teams run for a month each before another team of physicians takes over while the old team rotates to other activities and departments. Team B resides in one of the six conference rooms off the ward, separate from the nurses' stations. During the two days of their rotation the team admits patients within all areas of internal medicine. The days where Team B is not admitting patients it focuses on following up on patients' conditions and on discharging patients that are ready either to return home or to a nursing facility.

Linking clinical information

Team B consists of the attending physician, Dr. A, whose specialty is internal medicine; the senior resident, Dr. G, training to become a specialist in internal medicine; 2 resident physicians, Dr. J and Dr. M, and 2 medical students. These physicians form Team B for a month. When the attending physician arrives in Team B's conference room at 8 am, the rest of the team has already been at the hospital for a while checking on their patients. Either one or the other of the two residents is responsible for each patient. Yet should an acute situation emerge, the attending physician has to be available at all hours.

The conference room is, in general, central for Team B's work practices. The team meets here for the morning rounds. As part of the morning rounds the residents, Dr. J and Dr. M, prepare "follow-up notes" (Figure 2) for all patients, assembling the medical values (e.g., blood pressure), medications, and the plan for the patient. The hospital requires that a follow-up note is filled out each day of the admission for each patient and signed by the attending physician by the end of the day. The note forms a kind of patient résumé similar to that found in the EPR of the hospital, but focusing on the patient's condition on that particular day.

The follow-up note has an important relationship to the patient's health insurance because it is the hospital's documentation to bill procedures and to potential patient lawsuits because it sums up the patient's condition and the steps

taken. How patients are covered depends on their health plan (Medicaid, Medicare, or by health insurance as part of their employment). The interpretation of the patient's insurance conditions is an integrated part of the work of Team B's physicians throughout a patient's admission.

Figure 2. Ex. of follow-up note in the US case

The 3-layered carbon paper of the follow-up note ensures that it is completed in 3 copies: a bluish copy (for the billing department), a yellow copy (for the paper record), and a pink copy (for the attending physician's personal records). The attending physician later explained that the handwritten notes make the clinical process stand out more clearly and, should it come to a lawsuit, the adding and crossing out of text helps give an expression of the process nature of the work done. Over time, through a process of various tests and observations, in most cases it will be possible to decide on a diagnosis.

However, Team B's morning rounds illustrate that the follow-up note is, at the same time, a central part of the clinical work when physicians closely follow the development of a patient's condition on every day of the admission. At the center of the follow-up note the newest medical information is visualized. The current state of the patient is crucial to making decisions about the next step. And, while the follow-up note is formally completed for administrative purposes, it is also a convenient daily visualization of the direction of the patient's condition.

The patient's possible change of provider between admittances means that the residents cannot be sure that the electronic record is complete except for the current admittance. The patient's employment is typically what determines the type of health plan the patient has and therefore at what hospital the patient is admitted. The hospital EPR is one source of the information registered in the

follow-up note. However, by closely analyzing the patients' conditions, the physicians overcome the challenge of discontinuity in the EPR when information is explored by the same person day-after-day.

Morning rounds take place either in the conference room or at patients' bedsides. This morning physicians sit down around the conference table where they admitted several patients the day before, and this makes it convenient to discuss the details of patients' conditions. The attending physician flips through the follow-up notes laid out on the table in front of him until he finds the patient that Dr. J is presenting to the team. He looks at the follow-up note and starts to ask the team questions about the possible reasons for the increase in this patient's ammonia level. They will not begin any treatment until they have all of the lab results, the attending physician concludes, and he makes a few notes on the follow-up note.

Linking clinical specialties

As the morning rounds end, the attending physician leaves to carry out consults that were ordered by other departments. Meanwhile, the residents make sure the next diagnostic steps for Team B's patients are carried out. Two types of consults may be requested: 1) the formal "request for a specialist consult", and 2) the informal "curbside consult", where specialists discuss the diagnosis at the patient's bedside. A third option is family meetings, which is a formal meeting set up with several specialists and the family of the patient.

Consults are requested through the hospital's intranet, which is connected to the system of pagers, or by using the pager number of a certain physician directly. Much of the physicians' work takes place as they are traversing the hospital corridors; pagers make them available for communication while they are seeing patients. The pager also allows the physician to receive a text message and take a quick look at it to decide if the request is urgent enough to disrupt whatever he or she is doing. If the physician is in the middle of a physical examination of a patient, for example, the text message allows the physician to respond later, if the request is not acute.

The pagers are personal and follow Team B's physicians throughout their rotation. In this way the pager allows the physicians to build relationships through both formal and informal consults. The pager provides the physician with the possibility of texting similar to SMS. On her way to see a patient, the resident, Dr. M, stops by the nurses' station to text the senior resident in the nephrology department "Hi, this is M, I have a consult for you regarding patient no _ _ _ _". The resident physician, Dr. M, had already discussed her patient with the senior resident from nephrology several times that week. When the senior resident in the other department responds to her request for a consult that was communicated by paging, they both already know the details of the patient. The senior resident returns the call shortly after and they discuss the details of the patient that concern

whether it is Team B or the urology department that should perform a certain procedure. They quickly come to the conclusion that this must be the responsibility of Team B, and Dr. M writes down a few notes that she later types into the EPR. This formal communication is kept as part of the EPR, in contrast to pager communication.

The pager thus supports the possibility that pager messages can be used as more than just an advanced "alarm" that goes off when someone needs to get in touch with the physician. The option of paging also provides the physicians with a less formalized way of communicating with other specialties about what the next clinical step should be. The pagers, in this way, provide a space for the physicians' informal communication that in the end may seem like detours but are actually important in the process of excluding other possibilities in the patient's condition.

What the US case shows is how physicians achieve continuity of care by appropriating patient records and pagers as they go about their everyday work. The EPR in this case requires some appropriation to be useful in the context where it mainly supports an overview of radiology, lab results, and the record of the current admission. However, it does not support an overview across the patient's admission other than in the particular hospital. The organization of work by month-long teams helps the physician to overcome challenges of discontinuity because it is the same physician that collects and interprets the clinical information throughout the patient's admittance.

Physicians in the US case operate within a context where the course of events can mean a lawsuit. The process nature of the follow-up note and pagers provide them with a way of communicating effectively about a patient's condition. Support for this process cannot be taken for granted within this particular context. Yet the appropriation of patient records and pagers in this way is only possible because of the limited reach of the organization to other specialties within the same hospital.

Teams constituted for a month at a time (also in other clinical specialties) means that physicians' linking of the clinical work may rely on a certain degree of recognition in relation to the specific patient. This is clear from how the pagers allow physicians in Team B to link their work across their formal job title (e.g., senior resident), but also by their experience with the patient in question, when the same senior resident has given advice concerning a particular patient over a period of time.

Discussion: Challenges in continuity of care

Continuity of care is a central aspect of clinical work suggesting that it is collaborative by nature when several specialties get involved to handle patients' various conditions. By linking across the organization of work in terms of the

clinical information and the clinical specialties it becomes possible to handle complex issues – which has also been a main driver for support of clinical work by collaborative technologies, for example, EPRs (Berg 1998). Thus, from this perspective continuity of care defines a practice of linking so that tasks are not disintegrated in the complex organization of clinical work (Strauss, Fagerhaugh et al. 1985).

Continuity of care is achieved in the Danish and the US hospital medical departments through addressing similar concerns for providing the best possible care under the particular circumstances. Both departments accept patients with a wide spectrum of symptoms that are handled routinely in morning rounds where the patients are discussed in relation to the change in their condition to decide on the next step.

The technologies that the two medical departments deploy are also similar. EPRs offer an overview of radiology and lab-results, inquiries of the patient, and the plan for what ought to be done next. The pagers in both cases work by the roles of physicians depending on their level of specialization (e.g., senior resident) and clinical specialty (e.g., nephrology). Pagers support the linking of specialties by providing a way that consults may be requested.

However, there are significant differences between the two cases. The staffing (continuous vs. shifting physicians), spaces (off the ward vs. on the ward), and interrelationships with services outside the hospital (defined vs. distributed organization) make the US case and the Danish case different in essential ways. The challenges of achieving continuity of care are thus different in the two cases, despite their common medical aim. Nonetheless, they both illustrate how continuity of care is accomplished.

The major difference lies in how roles are constituted around the responsibility for care. In the US case the roles of the physicians are continuous over a period of a month, which makes the extra effort of handling roles in clinical work less cumbersome. The same people seeing the same patients make hand-over less of an issue. This is quite different in the Danish case, where the change in responsibilities places more focus on the work of handling roles, which is illustrated by the physicians' use of pagers as mainly connecting "functions" rather than facilitating interpersonal communication.

Continuity of care is challenging in the US case in the way that the patients might have quite discontinuous admittances depending on their healthcare coverage. This means that the entries on the patient's admissions are often incomplete and there might be aspects that are overlooked in the clinical work. In contrast, in the Danish case the entries across the patient's admissions are continuously added within the region's hospitals, increasing the length of the continuation document. Because of the shifting physicians in the Danish case the written documentation becomes critical in the hand-over between physicians from day-to-day, but also when patients move between hospitals.

In this way, continuity of care is handled by the appropriation of the EPR in the Danish case and by pager communication in the US case to overcome the challenges specific to the different contexts of work. Only by comparing the appropriation of technologies in the two cases from the perspective of context, the broader commonalities across the Danish and the US case becomes visible. Here we see how physicians' appropriation of EPRs and pager technology is different across cases. The comparative analysis of the workplace studies makes visible how in the Danish case and the US case the challenges that make physicians appropriate technologies are context-dependent.

In the US case the responsibility of physicians is evident in the hospital's documentation practices, but links back to the general individual responsibility of physicians in the US in case of lawsuits. This is illustrated by how the hospital and the individual physician both keeps a copy of the follow-up note, because, according to the attending physician, the adding and crossing out of text helps give an expression of the process nature of the work done. The follow-up note is thus crucial both formally and in practice when physicians decide on the direction of a patient's condition.

In the Danish case only the hospital keeps a copy of the patient's record. The collective responsibility of a patient's care is evident in how the hospital organizes the clinical work, as illustrated by the listing of one admission after the other in the continuation, which makes the physician extract information to understand the nature of the patient's current problem. The responsibility of the patient's care is thus linked through the entries in the continuation, and is made relevant by the attending physician on a day-to-day basis.

Previous CSCW-research on how Danish hospital physicians decipher the entries of other physicians (Winthereik and Vikkelsø 2005; Mønsted, Reddy et al. 2011) supports this finding on challenges of clinical entries into EPRs in the Danish case, which are, however, context dependent. The challenges to physicians' work making entries in the EPR relevant to their particular context are not simply a matter of the nature of that clinical work (Heath and Luff 1996), this paper and previous CSCW-research illustrate, but are also a matter of politics and the organization of work in which the EPR is used.

To elaborate, whereas the key challenge in the Danish case is the hand-over via long-term entries into the EPR and that patients very seldom see the same physician, the key challenge in the US case is the lack of long-term entries into the EPR. These challenges are also accommodated differently in the two cases. In the Danish case the long-term entries into the EPR seek to handle challenges specific to the complex organization, whereas in the US case the instance of creating a short-term linking between physicians and patients means the challenges of incomplete long-term entries lessen.

The pager technology in both the Danish case and the US case relies on different roles for the physicians to link clinical work across specialties when

consults are requested from other departments. Physicians in the US case collaborate as a team constituted for a month at a time, whereas in the Danish case most physicians rotate between tasks of the medical department from day-to-day – but in a steady routine over months. The linking of specialties by consults in the Danish case is thus one of many jobs that physicians are assigned by the monthly work plan to run the medical department.

The linking of specialties in the Danish case takes place as physicians coordinate – and negotiate – what is the right combination of specialty and level of specialization. Different hospitals specialize in different types of patients. In the US case the range of this type of negotiation is restricted to a single hospital. The comparative analysis of the US case and the Danish case suggests that physicians' linking of clinical specialties is dependent on both the organization of work (e.g., the monthly work plan), but also the distribution of responsibility beyond the particular hospital.

The appropriation of the pager technology in the US case thus shows how physicians appropriate the pager technology to support the organization of work limited to the particular hospital. Other hospitals are mainly relevant if patients are transferred there, but then it is more so a matter of the conditions in the patient's health plan. The challenges particular to the context in the US case concern issues of how physicians may also create a space for their informal communication on the process of care, which is not saved in the same way as information entered into the EPR.

The commonalities from both cases that bring forward how continuity of care is achieved in practice are that continuity of care is acted out based upon politics and how work is organized in terms of the responsibility for care and the constitution of roles. Both responsibility and roles are organized differently and provide certain conditions and challenges for continuity of care, which then also drive the technology use as well as the required technology support of practice.

The essential contribution of this paper is the identification of a) responsibility for care and b) the constitution of roles as important elements and rules of combination in relation to how technology is appropriated within the particular context where it is used; the empirical cases illustrate how continuity of care is acted out in practice. These two interdependent and interlinked factors – responsibility of care and constitution of roles – can thus help us understand in broader terms the challenges across context of technologies to support continuity of care.

The challenges to continuity are characterized in essential ways by the patients' circulation between providers, which makes practices of linking across the organization of work part and parcel of physicians' everyday work. This aspect of clinical work is often promoted as a way to politically raise awareness about the provision of healthcare across time, setting, and specialty (Ellingsen and Monteiro: 443). This paper points to the importance of understanding what

continuity of care comes to mean in practice as it is interrelated and interdependent with politics and the organization of work.

Conclusion

This paper explored how continuity of care is achieved through the appropriation of technology as part of everyday practice in a Danish and a US hospital medical department. Comparing these two cases at the level of the broader commonalities (Schimdt, Wagner et al. 2007), it becomes clear how the linking of clinical work is challenged in both cases across lines of responsibility of care and the constitution of roles, although the origin of the challenges is context-dependent.

Our data illustrate how the challenges of continuity of care in the US case concern the lack of long-term documentation of the patient's condition in the EPR, whereas in the Danish case the lack of continuity lies squarely in the parade of changing physicians for each patient. While the challenges are different in the two cases, they both mirror the broader political and organizational structure of healthcare provision in a Danish and a US context and the challenges that are addressed by different appropriations of technologies.

To accommodate challenges of lack of documented care for a patient over time due to conditions of private healthcare where patients move between providers depending on how they are covered by their health plan, the relative continuity between the patient and the physician becomes central in the US case to support the clinical work. Differently, to accommodate the challenges of public healthcare where there is one provider but the patient still moves between hospitals depending on their condition, physicians rely on the long-term documentation of the care of a patient in the Danish case.

It is not up to this paper to promote either of these approaches. Rather, the paper attempts to shed light on how continuity of care is achieved as part of everyday practice – and what role context plays. In both in the US case and the Danish case valuable lessons can be learned from the ways technologies are appropriated to accomplish continuity of care in practice if the goal is new, improved practices. These lessons concern how exactly responsibility and roles are organized differently in the US case and the Danish case and provide certain conditions and challenges for continuity of care, which then also drive the technology use as well as the required technology support of practice.

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