

Collaboration Requirements for Home Care

David Pinelle and Carl Gutwin

Department of Computer Science

University of Saskatchewan

57 Campus Drive, Saskatoon, SK, Canada S7N 5A9

david.pinelle@usask.ca, carl.gutwin@usask.ca

Abstract. Electronic health records (EHRs) are now being adopted in many regions, in part due to their promise of supporting information sharing between distributed health care workers. This technology allows an implicit form of collaboration by providing information about treatments and outcomes among the individuals involved in the patient's care. However, it is unclear how well collaborative work practices are supported in a standard electronic health record. To investigate this issue, we studied the work and collaboration patterns of a multidisciplinary home care team in a local health district. Home care teams have different collaboration needs than workers in inpatient settings because they are widely distributed, they are mobile, and they maintain separate patient records. Interviews with several home care workers identified five specific areas where team members need to collaborate with one another: scheduling visits, disseminating information, finding answers to questions, short-term treatment coordination, and longer-term treatment planning. For each of these areas, we consider how an electronic health record would support worker collaboration. We identify ways in which EHRs as currently conceptualized are insufficient for meeting collaboration needs, and outline design approaches that would help to support collaboration in distributed health care.

Introduction

Electronic health records (EHRs) are computer-based records of a person's interaction with a health system, incorporating such information as medical history, diagnoses, care plans, laboratory results, and records of treatment sessions. An EHR is intended as a central and comprehensive source of information that gives healthcare providers

“complete and accurate data, alerts, reminders, clinical decision support systems, links to medical knowledge, and other aids” (Dick and Steen 1991). One of the promises of electronic health records is that they will better support information sharing between health care workers, which will in turn improve collaboration among the people who are involved in a particular patient’s care.

This support is not an explicit support of collaborative practices, but rather an implicit means of cooperation through provision of access to information about treatments and outcomes. Therefore, it is not clear whether an EHR alone—at least as these systems are commonly conceptualized in the health informatics industry—will be enough to sufficiently support the collaboration that goes on in health care teams. The problem becomes more focused by considering the collaborative requirements of only one type of healthcare team, and we are particularly interested in home care, where the patient remains in their home and several different health professionals visit the patient to provide treatment. Home care teams have different collaboration needs than workers in acute care, because they are widely distributed, mobile, and because each discipline maintains a separate patient record, in addition to the central records that serve as archival storage.

To investigate collaboration requirements for home care, we studied the work and collaboration patterns of a multidisciplinary home care team in a Canadian health district. We interviewed ten home care workers from seven different disciplines to determine when, how, and with whom each team member needs to collaborate. The interviews identified five areas where team members collaborate with one another: scheduling visits, disseminating information, finding answers to questions, short-term treatment coordination, and longer-term treatment planning. These areas, and collaboration in general, are difficult problems for the home care workers. The complexities of delivering care in the field (as opposed to in an inpatient setting) make effective collaboration difficult. Currently, home care workers’ collaborative needs often go unmet, and they must carry out their jobs without the benefits of the information and insight that could be available to them through more complete collaboration.

After exploring these five areas of collaboration with the home care workers, we considered how well each type would be supported by an electronic health record. Although there are several ways in which the EHR will greatly aid the workers in the dissemination and retrieval of information, it is clear that an EHR that provides only the patient’s health records will be insufficient to address the collaborative needs of this group, and that without accounting for the work processes involved in providing patient care, EHRs will fall short of their full potential. The inadequacies of the electronic record for representing the subtlety and complexity of health care provision have been recognized in prior studies (e.g. Fitzpatrick 2000, Greene 1997), but in addition to adding weight to their arguments, the present research determines specific areas of collaboration and awareness that should be supported in EHRs for home care, and also suggests design approaches for providing this support. Including support for

collaborative processes within health information systems will not only improve the match between EHRs and the real world, but may also provide for significant process improvements in an area that is currently difficult in the real world.

In the next sections, we provide background for some of the basic concepts in the research: first, a description of the contents and organization of patient health records; second, an overview of collaboration in home care; and third, a look at how home care services operate in the local health district that we studied. After this background, we look at the five areas of collaboration in more detail.

The Health Record

In this section we describe the contents and organization of both traditional paper health records and existing and proposed electronic health records.

Paper-based health records

The traditional paper based patient record is an important collaborative tool in most healthcare settings. Healthcare workers who treat a patient regularly document evaluations, treatments, and outcomes, and the paper record provides healthcare workers with a single access point for comprehensive multidisciplinary records. This promotes information sharing and communication between all individuals treating a patient.

Although there is no definitive organizing concept in health records, the current common practice is to structure the record according to the expertise and role of those creating record entries (Tange 1996). It is common to divide the record into subsections that contain all the documents generated by a given discipline. For example, a section might exist for physiotherapy notes and another for lab results. Within each subdivision, a record of a discipline's contact with the patient will exist.

The content of the paper record, then, is potentially varied. Chart content can include laboratory tests and procedures, medication orders, treatments, and histories (Tang et al. 1994). Additionally, discipline-specific care plans, assessments, problem lists and daily treatment notes are often included.

Electronic health records

In the past quarter century, health organizations have increasingly begun investigating replacing the paper record with an electronic health record (Coiera 1997). Potential benefits of such a transition are improved decision-making, better medication management, and improved resource utilization (Mount et al. 2000). Likewise, by computerizing health records, timeliness, accuracy, and information access may be improved (Benson et al. 1996).

In some cases, the electronic health record is seen as a simple replacement for the paper record. These systems are often oriented towards meeting the organization's data needs without consideration for supporting the methods whereby health care is delivered (Coiera 1997, p.282). Although different products have different appearances, most organize data in tabular or database formats, with tools for querying and sorting the data.

A variety of additional features have been envisioned for EHRs; however, most of these still tend to be data-centric. For example, Dick and Steen (1991) see the EHR as encompassing access to "data, alerts, reminders, clinical decision support systems, links to medical knowledge, and other aids." As suggested by Fitzpatrick (2000) "if we seek to replace existing paper systems with computerized systems, albeit improved on many counts, without understanding how paper systems are currently embedded in the practice of health care, not just as information repositories, then implementation is guaranteed to be problematic."

In contrast to the data-centric approach is use of the EHR to encompass "the totality of information and communication systems that could be made available in the support of clinical activities" (Coiera 1997, p.60). This type of system should include the patient record and other features needed to support clinicians. Fitzpatrick suggests that the development of this type of technology should "be about designing a good underlying data infrastructure, and designing a good clinical application environment that integrates support for data processes, activity processes, communication and coordination processes."

Collaboration in Home Care

The cost benefits of treating patients in their homes rather than in acute care facilities have led to large increases in home care utilization in many health districts across North America (HSURC 1998). By providing home based maintenance and preventive services, patients who would otherwise be forced into a long-term care facility are able to remain at home (HSURC 1996). Home care services are provided by a distributed set of health care professionals, each of who visit the patient's home on a regular or as-needed basis. Patients often receive home care services from multiple home care disciplines including nursing, home health aides, occupational therapy (OT), physiotherapy (PT), dietetics, and social work.

The distributed nature of home care presents several problems for team collaboration. Home care workers are mobile, work out of different locations, and often keep their own records, making it difficult for the various disciplines to communicate care plans, to discuss treatment goals, and to coordinate activities and visits. Home care delivery requires clinicians to travel between patients' homes and at times to cover a large geographic area. Traditional methods of collaborating within health care such as case conferences are not always practical within this setting. Workers are often left to make decisions on their own, without access to the full range of information that may

be available regarding the patient, and without the benefit of consultation and collaboration with others.

We carried out a study of collaboration practices in a home care department of a local health district. The next section provides a brief overview of home care delivery in the health district and the current methods for collaboration among these home care workers.

Case Study: Home Care at Saskatoon District Health

We carried out our study in a local health district, Saskatoon District Health. Health care in Saskatchewan is delivered through geographically defined health districts; each health district oversees administration and delivery of health care services within a city or region. Each health district is typically divided into multiple departments, of which home care services is one.

Home Care at SDH

At SDH, home care is delivered by a group of multidisciplinary workers who provide healthcare services to patients in their homes. When a new patient enters the home care system, a client care coordinator evaluates them and establishes patient-specific treatment team goals. The goals commonly focus on increasing a patient's level of independence or on improving a patient's health status. Once team goals have been established, the client care coordinator issues referrals to appropriate disciplines, thus forming a mobile treatment team that will provide care to the patient and will work toward achieving the team goals.

A home care treatment team can consist of several people including occupational and physiotherapists, nurses, social workers, home health aides, and dieticians. Team members are functionally independent, and each member is responsible for conducting their own individual evaluation of the patient and then for setting discipline-specific goals and a treatment plan to reach these goals (except for home health aides). Individual goals within the group are interdependent, with each member's actions potentially impacting the goals of other team members.

In SDH, the purpose of home care services is typically either maintenance or rehabilitation. Patients who are offered maintenance services may receive assistance with housekeeping, dressing, or meal preparation from home health aides. These patients usually have conditions that are chronic in nature, and improvements in their health and independence are not expected. Other patients may be seen for rehabilitation purposes. These individuals are considered to have potential to improve in either health status or level of functional independence. For this reason, they often receive treatments from a number of disciplines.

Many of the collaboration problems that are common to home care settings also affect SDH. Currently, the offices of the disciplines responsible for delivering home

care in SDH are divided between two separate buildings across the city from one another. This decreases the likelihood of face-to-face collaboration between the treatment team members and makes it more difficult for home care workers to share documents and leave notes for each other. In addition, there is no common repository for patient records in the department. Each discipline maintains their own set of records, and the documentation for patients that are currently receiving services typically stays with the home care worker responsible for providing the services. These documentation practices create a situation where the paper record is not available as a means for communicating and collaborating.

Study methodology

We conducted meetings and interviews with health care workers and administrators involved with home care delivery in Saskatoon District Health. Interviews were semi-structured and approximately one hour long; the interviewer attempted to identify current sources of information used by home care workers over the course of the day including documentation practices, collaborative practices, collaborative difficulties, and collaborative needs. Home care clinicians interviewed included nurses, home health aides, social workers, a dietician, an occupational therapist, and a physiotherapist. Interviews were audio-recorded and then transcribed to facilitate analysis.

In our analysis, we focused on determining collaboration patterns among home care workers. While we also investigated collaboration between home care workers and other information sources (i.e. clinicians who may have treated a patient within a hospital before they were discharged to home and into home care services), we will focus here on collaboration among teams of multidisciplinary home care workers who treat a given patient.

Findings: Five areas of collaboration

In this section we describe five areas of collaborative activity that were identified by the home care workers. These are: scheduling of visits, disseminating information to other members of the team, finding answers to questions, short-term treatment coordination, and longer-term treatment planning. In each of the following sections, we state the collaborative problem, describe how home care workers at SDH see the problem and attempt to solve it, and then consider how the problem would (or would not) be addressed by the existence of an electronic health record system. As we will discuss later, two design principles recur in our considerations of collaboration support: asynchronous group awareness, and communication that is tightly integrated with the health record.

Area 1: Scheduling

Problem: it is difficult for home care workers to coordinate their schedules so that unwanted conflicts are avoided, and so that desired meetings are possible.

The method used for scheduling in home care in SDH varies with each discipline. With the exception of the home health aides, all of the disciplines self-schedule; that is, they make their own appointments for visits with the patients. Home health aides are scheduled by the home care office and this schedule varies little from week to week. Regardless of the discipline, there is no formal procedure for sharing schedules, and they are generally only accessible to the individual worker. A further complicating factor is that schedules for most of the disciplines are not always precise. Variations in caseloads and the unpredictability of treatments and travel lead to daily revisions of schedules, although the home care workers can usually make reasonable estimates of when they will visit a patient.

There is currently no good way for workers to determine others' schedules with respect to a particular patient. In some cases, visits by one discipline are fairly regular (e.g. a nurse visiting every morning to give insulin) and this information becomes known to the other workers on the team; however, other disciplines do not follow a regular schedule. In other cases, it is possible for a home care worker to determine the schedules of other disciplines by asking the patient. However, the patient as information holder is not always a successful strategy. Various patients may "tidy up" professional calling cards that were left as an indication to other disciplines, or may give incorrect or unreliable information about other planned visits.

The inaccessibility of scheduling information leads to two undesirable situations. First, more than one home care worker may visit the patient's home at the same time. In this case, one of the home care workers must either wait while the other finishes their treatment, or decide to leave and try to give a treatment at a later time. Either way, a considerable amount of time may be wasted. Second, workers in some cases may want to schedule a visit to overlap with another person. Knowing where another treatment team member is at a given time allows for opportunistic meetings in a patient's home to discuss treatments or other issues related to a patient's care. As stated by one home care worker, "Occasionally I would like to know when they are there so I can be there at the same time."

Even though it would be difficult to represent some discipline's schedules in absolute terms, having general schedule information would prove useful for avoiding conflicts and finding opportunities for face-to-face collaboration. As stated by one home care worker, "It would certainly be nice to know...when they generally see them or how often they generally see them."

Support for scheduling in EHRs

The documents contained in an EHR give an implicit indication of how often and when a particular discipline treats a patient. However, this record is insufficient for adequately supporting the kind of schedule coordination described above. First, the

EHR shows only past visits, and for most disciplines, past visit times may not necessarily be a good indicator of plans for future visits. Second, time of day may not be indicated on documents, which is necessary information for planning visits. Third, the interfaces for typical EHRs are not set up to provide easy answers to scheduling questions (e.g. “when does the social worker tend to visit?”).

Some means of indicating schedules is required in the EHR—not a heavyweight scheduling tool, which tends to be inflexible, but a way for home care workers to signal their intentions. The tool should be able to accommodate a degree of uncertainty in scheduling, and allow home care workers to represent a range of time in which they expect to visit a patient instead of a specific time when the visit will take place. In addition, the system should be able to filter and restrict information so that it is possible to get a quick look at the visiting patterns of a particular discipline, or to find an open space for planning a future visit.

Area 2: Information Dissemination

Problem: it is difficult for home care workers to disseminate information to other members of the treatment team.

Since face-to-face meetings are often rare and unscheduled, home care workers must rely on other means to pass information to treatment team members. Different disciplines have different communication tools: OT, PT and Social Work have voice mail, and Nursing, Nutrition, and Home Health Aides carry pagers while in the field. Cellular telephones are not yet a cost-effective option for the district. In addition to using voice mail and paging, messages are also passed through office staff, and handwritten notes are sometimes left at others’ offices.

Disseminating information becomes more difficult when a message must be given to multiple team members. Since disciplines within SDH are not all housed within a common building, it is not possible to leave handwritten notes for all people. Likewise, voice mail is only available for certain disciplines. This means that home care workers must often use a combination of techniques to disseminate information. This creates a situation where only the most essential information is conveyed, and information that may be useful but not vital is not passed on. As stated by one home care worker, “there have been times where it would be nice if there was somewhere we could put a note where everyone could see it.”

Other communication difficulties stem from differences in office hours among different disciplines and among different individuals. It is not always possible for home care workers to anticipate when they might be able to reach other treatment team members by phone, and in some cases office hours do not overlap between disciplines. For example, nursing typically leaves the office before PT, OT, and Social Work begin their day. When discussing the difficulties of reaching members of other disciplines, a nurse stated, “they are out in the district the same hours we are and sometimes you

can't get a hold of them. We don't know their hours, they don't know our hours, so in most cases it's very difficult.”

One of the common ways of handling information dissemination problems in SDH is through the use of a designated third party. The client care coordinator commonly serves in this role. If information needs to be given to multiple team members, they will share the responsibility with the field based home care worker.

Support for information dissemination in EHRs

An electronic health record, even a data-centric implementation, could substantially improve information dissemination in this setting. Current documentation practices allow home care workers enough latitude to include unusual occurrences or observations, concerns, and revisions in planned treatments. Many EHRs provide a facility for setting a priority flag on specific entries. In this way, a healthcare worker could be reasonably confident that other team members will read a document.

However, some information that should be disseminated may not lend itself to inclusion in an EHR due to its informal nature. For example, one type of information that home care workers regularly need to share with others is information about problems with patients' pets or family members. A tool for disseminating information in a way that is separate from the legal record would prove valuable. It is possible that this type of solution could still be tightly integrated with the EHR; by storing this communication separately from more formal patient data, and by automatically removing it when it reaches a certain age, informal dissemination could be supported without raising legal and policy concerns.

Area 3: Finding answers to questions

Problem: it is difficult for home care workers to get questions answered by other group members in a timely fashion

When home care workers are in the field providing treatment to a patient, it is often necessary to request specific information from other individuals on the treatment team. The needed information may have direct relevance to how the provider carries out a patient's treatment, so it is important that the information is retrieved quickly. Unfortunately, it is usually not possible in the current setting to gather needed information in a rapid fashion. As previously discussed, it is difficult for home care workers to catch each other on the phone while in the office. Pagers offer a more immediate option, but they are not always very effective either. They require the person issuing a page to wait by the phone, while the page recipient must find a phone. Often a page arrives while a worker is either driving between patients' homes or performing a treatment in a patient's home; in both situations it is difficult for the worker to respond to the page. Some treatments, such as changing a wound dressing, cannot be interrupted; also, holding a conversation on a patient's phone that concerns a different patient is a potential breach of confidentiality. As stated by one home care worker, “It

is hard to call a nurse from a patient's home and discuss another patient over the phone, so sometimes we have to make a point of coming back in here (to the office) so that we can call a nurse.”

Most of the delays inherent in retrieving information from other home care workers are similar in nature. Two delays typically occur before the questioner receives an answer. First, a delay is introduced once the question is asked. The question recipient must retrieve the message and then respond to it, which can take widely varying lengths of time. The second delay is introduced once a message containing the response has been produced. The questioner may not immediately realize that the answer to the question is available, so a delay is introduced until the answer is retrieved. This is typical of voice mail. The question recipient does not receive the question until they check their voice mail, and the questioner does not get the response until they in turn check their voice mail. Similar delays are introduced with handwritten notes and messages passed through third parties. A home care worker summarizes this process: “We do a lot of messaging back and forth. Here is my question—call me back with the answer.”

Considerable delays can be introduced by these limitations on communication. A nurse, in describing the way she typically handles the issue, illustrated the extent of the delays that are inherent in this process. “It’s basically leaving messages with people and determining a time when you can return to them. That’s basically your only recourse... It is basically just calling over to their office and saying ‘Please call me at 8:15 tomorrow morning at such-and-such number.’”

Support for making requests in EHRs

Obviously, EHRs would be useful in helping team members to get their questions answered if the needed information were contained in the EHR. However, if this is not the case, the basic EHR does not facilitate this type of communication between home care workers.

Due to schedule variability between home care workers, it can be assumed that practical communication to address this issue should be asynchronous. E-mail or instant messaging systems are potential solutions. However, even though these solutions make it easier to send a message to a person, they do not address the problem of getting a reply in a timely fashion. Although this will remain a problem (e.g. some treatments still cannot be interrupted), mobile computer systems can at least ensure that requests are available to workers when they have the time to respond to them, and can address the confidentiality issue.

By incorporating this type of communication into an EHR system, message context can be preserved. Through associating these messages closely with the patient's EHR, the sender and recipient both have access to information that is potentially useful in composing and interpreting messages.

Area 4: Short-term treatment coordination

Problem: it is difficult for home care workers to coordinate treatments with each other so that the treatments are complimentary.

When multiple home care workers treat a given patient, their activities may cause a change in the patient's health status, functional status, or environment. Even though treatments are separated by time, the changes brought about by treatments make the goals and actions of all home care team members interdependent. This interdependence necessitates short-term coordination in order to guarantee that actions taken by all home care workers work together toward outcomes that are beneficial to the patient.

Actions taken by one treatment team member often have direct impacts on the treatments of another team member. For example, if an occupational therapist performs exercises with a patient in the morning, the physiotherapist who treats the patient later that morning may find that the patient is too fatigued to participate in therapy. The physiotherapist could adjust their actions accordingly if they had an indication that the occupational therapist had recently visited the patient. This example illustrates what we will call loosely coupled coordination, in which it is beneficial to know actions that have recently been taken by treatment team members. In this case, home care workers are not actively coordinating resolution of a specific issue, but are coordinating treatments so that they are complimentary and do not interfere with each other.

In other cases, home care workers' individual plans and goals are tightly coupled and their treatments must be closely coordinated in order to resolve a specific treatment issue. When this is the case, a higher level of awareness may be necessary to guarantee that specific team members know the patient's status and the actions that have been performed by others.

A physiotherapist cites a specific situation in which this discipline must coordinate plans and treatments with nurses in a tightly coupled fashion: "A lot of it would be about cardio-respiratory patients where we are both in to see the patient a fair amount. They are in there fairly regularly giving them their meds or monitoring their blood pressure or things like that. We are in there maybe less frequently, but they will be monitoring maybe the status of their chest and they let us know if things have changed and whether we need to see the patient today, not Thursday, that type of thing."

Most disciplines were able to cite specific situations in which they must use tightly coupled coordination with other disciplines. For example, OT often works closely with nursing on pressure relief and positioning issues. Many of the situations that were mentioned are acute and emergent in nature; therefore, coordination in this context seems to be utilized to resolve problems that demand intense scrutiny. This is perhaps unsurprising since the collaborative overhead required to coordinate treatments can be time consuming.

Support for short-term coordination in EHRs

The information sharing that takes place in basic EHRs would be helpful in facilitating both tightly coupled and loosely coupled coordination. The record contents can provide

up-to-date information about the actions that have been taken by other treatment team members as well as the patient's response to treatments.

However, it is often difficult to retrieve this type of information from current EHR interfaces. Approaches from information visualization could provide useful solutions for both loosely coupled and tightly coupled interactions. For loosely couple coordination, home care workers should be able to easily discern the treatments that have recently been carried out by other team members. A visualization technique to show recent visits by time and discipline, for example, would provide the home care worker with enough information to decide when their own treatment would be most optimal. In the case of tightly coupled coordination, the information in the EHR will likely only be a partial solution, since the interacting clinicians will require more information than is normally communicated through the electronic record. At some point, the home care workers may need to communicate directly on the phone or in person; however, the EHR can still provide a rich information base as a context for these conversations.

Area 5: Long-term treatment planning

Problem: it is difficult for home care workers to formulate shared treatment goals and care plans for particular patients.

When patients are admitted to home care, they are evaluated by a client care coordinator who establishes the initial treatment plan. However, when the treatment team has worked with a patient for a period of time, the common plan and common goals often need revision. In an inpatient setting, treatment team meetings allow healthcare workers to “communicate care plans, common goals, and progress milestones (Warner 1996).” However, this joint process of goal and plan formulation and revision does not often occur in home care due to scheduling difficulties.

Formulating a comprehensive care plan requires input from all treatment team members since each discipline tends to focus on specific aspects of health and function. This many-to-many style of communication helps each team member to understand issues they might otherwise overlook, and this allows the treatment team to develop common plans and goals. Similarly, communicating in this fashion helps the individual healthcare worker to develop specific plans and goals that work toward common group goals.

Since home care treatment teams do not regularly meet and since none of the methods of communication available in home care (as previously discussed) are conducive to two-way group communication, comprehensive care plans and team goals are not typically maintained in a collaborative group fashion. Instead, home care workers are prone to focus on individual discipline-specific goals as time passes instead of on shared treatment team goals. In response to the difficulties of understanding the actions of other disciplines, a home care worker stated, “It would be very useful to

know what’s going on (with other disciplines) because we sort of look at the whole picture and everything impacts on what we do with this person.”

Support for long-term planning in EHRs

Since developing and revising comprehensive treatment team goals and care plans requires an understanding of the actions and insights of other treatment team members, the EHR can serve as a repository for much of the needed information. However, the EHR does not provide for the multi-way communication that is needed to discuss and develop the plan and goals. A group communication tool is perhaps the most appropriate way to facilitate comprehensive care planning. Again, the schedule variability among home care workers makes synchronous tools impractical; asynchronous tools, however, are able to accommodate all team members.

However, group communication tools, if text based, have limitations. Typing substantial contributions would require a time commitment from each team member. Integrating a group communication tool into an EHR could provide a substantial reduction in the typing time required. Instead of re-typing information from the EHR into the group communication tool, quoting or hyperlink functions could be supplied to allow indexing of extant documents.

Summary

It is important to emphasize that including access to other disciplines’ documentation (which is the basis of most EHRs) within a collaborative system is significant, since this straightforward solution allows implicit collaboration. Healthcare documentation often gives an indication of the actions carried out by a healthcare worker and the observations they have made. This allows collaboration implicitly—there is no specific support for direct collaboration between healthcare workers, but the documentation improves information access and fosters awareness of other treatment team members’ activities and the outcomes of those activities.

Perhaps the best way to improve support for collaboration in home care is by adding collaborative support to the implementation of the electronic health record. The collaborative difficulties outlined in the previous sections are not addressed in basic EHR information systems, so addressing these difficulties as a layer above the basic implementation is a reasonable approach. In the following section, we describe overall design approaches that encompass many of the specific solutions mentioned for each of the five areas.

Design Approaches

When we step back and consider the collaboration difficulties for home care at SDH, and the lack of explicit collaborative support in basic electronic health records, two design principles seem to stand out. These are: helping home care workers maintain

awareness of others in the group, and providing communication facilities that are tightly integrated with the medical record.

Maintaining awareness

It is clear that home care workers need to maintain group awareness—the understanding that each group member has of others’ actions, knowledge that helps them determine how their own actions can best contribute to group goals (Dourish and Bellotti 1992). Home care workers particularly need to stay aware of schedule information, treatment activities, and care plans, but all of the so-called “w” questions (who, what, when, where, why, and how) are relevant in this context. For example, it might prove important to know that the physiotherapist (who) revised treatment goals (what) after the previous visit (when) due to a change in the patient’s weight bearing status (why).

Awareness has recently received considerable attention in CSCW (e.g. Dourish and Bellotti, 1992; McDaniel 1996). However, due to the mobility and schedule variability of home care workers, most of their collaboration occurs asynchronously. Asynchronous awareness involves information about past activities (e.g. “what has been done recently,” “what changes has the physiotherapist made in the record”), and demands presentation techniques that explicitly deal with the age and history of information and with the changes (additions, modifications, or deletions) that have occurred since a worker last looked at the record. Although asynchronous awareness has not received as much attention as real-time awareness, previous research has investigated ways of displaying changes to documents and environments (e.g. Roseman and Greenberg 1996; Sohlencamp and Chwelos 1994; Pankoke-Babatz and Syri 1997). In addition, some EHRs allow for certain types of change information to be represented, such as priority flags on particular entries; however, there is much to be done before these systems are able to truly support the maintenance of group awareness.

Communication integrated with the health record

Disseminating and obtaining information within the team is one of the core collaborative activities in home care, and is also one of the most difficult. Given the nature of the communication (e.g. notifications, updates, and cautions) and the variable availability of home care workers, asynchronous communication facilities such as email and instant messaging seem like a natural fit to this setting. However, it is important that communication facilities are integrated with the information in the EHR, for the record provides two kinds of important contextual information. First, communication may be about a particular artifact in the health record, and it should be possible to have conversations in the context of these artifacts. Fitzpatrick (2000) calls this “conversations about the work at the point of work.” Second, the participants in a conversation are largely predicted by the health record—that is, the people a home care

worker needs to communicate with are generally the other people who have been interacting with a particular patient. Therefore, systems should make it easy to send messages to the current team for the patient, or to regular subgroups (such as the therapists or the nurses) within that team.

Conclusions

As electronic health records become more common in health districts, questions have begun to arise about how well EHRs support various aspects of the health delivery process. This paper has looked at the implications for EHRs in one specific delivery situation: collaborative practices in home care teams. We carried out a small study of home care in a Canadian health district and considered problems and potential support for several types of collaboration in home care teams.

We believe that an EHR is a valuable tool in healthcare collaboration. However, in home care, data-centric EHR implementations do not address all of the collaborative needs of home care workers. Home care workers require support for scheduling visits, disseminating information, finding answers to questions, coordinating treatments, and creating care plans. The EHR does help to address these needs, but only in part. By integrating more complete collaboration support into an EHR—particularly by supporting asynchronous awareness and by supporting integrated communication—we feel that collaboration practices in home care can be supported and even significantly improved.

We recognize, however, that there are many other potential problems with the introduction of an electronic record: for example, losing the flexibility of paper documentation (e.g. Fitzpatrick 2000), concerns over whether informal information will become assimilated into the formal record, problems of timely data entry by the home care workers, and even concerns over data entry issues such as typing ability and speed. Nevertheless, this paper does provide direction for one facet of the problem of making EHRs into truly useful tools that support collaborative health care delivery.

This research was part of an ongoing project with the health district. Future work will include further field-based investigations to expand on these findings, and the design of a prototype system for providing point of care information access and collaboration support for the home care workers.

References

- Benson, J.A., Michelman, J.E., Radjenovic, D. (1996). "Using Information Technology Strategically in Home Care." *Home Healthcare Nurse*, 14(12), 977-83.
- Britton, B.P., Engelke, M.K, Rains, D.B., Mahmud, K. (2000). "Measuring Costs and Quality of Telehomecare." *Home Health Care Management and Practice*, 12(4), 27-32.

- Coiera, E. (1997) *Guide to Medical Informatics, the Internet, and Telemedicine*. London: Chapman and Hall Medical.
- Dick, R.S. and Steen, E.B. (eds.) (1991) *The Computer-based Patient Record - An Essential Technology for Health Care*. Washington, DC: National Academy Press.
- Dourish, P. and Bellotti, V. (1992). "Awareness and Coordination in Shared Workspaces", *Proceedings of the ACM 1992 Conference on Computer Supported Cooperative Work*, 107-114.
- Fitzpatrick, G. (2000): "Understanding the Paper Health Record in Practice: Implications for EHRs", in CD-ROM *Proceedings of Health Informatics Conference (HIC'2000)*, Adelaide, Australia, 2000. ISBN 0 9585370 5 4.
- Greene, M. (1997). "Health Care Collaboration on the Information Highway." *IEEE Technology and Society Magazine*, 16(3), 22-5.
- HSURC (1998). "Hospital and Home Care Study," summary report 10, from Health Services Utilization and Research Commission, March 1998. Available at <http://www.sdh.sk.ca/hsurc/>.
- HSURC (1996). "The Cost-Effectiveness of Home Care: A Rigorous Review of the Literature," background paper 2, from Health Services Utilization and Research Commission, September 1996. Available at <http://www.sdh.sk.ca/hsurc/>.
- Horsch, A. and Balbach, T. (1999). "Telemedical Information Systems," *IEEE Transactions on Information Technology in Biomedicine* 3(3), 166-175.
- McDaniel, S.E. (1996). "Providing Awareness Information to Support Transitions in Remote Computer-Mediated Collaboration," *Proceedings of the ACM CHI '96, Conference on Human Factors and Computing Systems*, 57-58.
- Mount, C.D., Kelman, C.W., Smith, L.R., and Douglas, R.M. (2000). "An integrated electronic health record and information system in Australia?" *Medical Journal of Australia*, 172, 25-27.
- Pankoke-Babatz, U. and Syri, A. (1997). "Collaborative Workspaces for Time Deferred Electronic Cooperation," *Proc. ACM SIGGROUP '97*, 187-196.
- Roseman, M. and Greenberg, S. (1996). "TeamRooms: Network Places for Collaboration", *Proceedings ACM CSCW'96*, 325-333.
- Sohlenkamp, M. and Chwelos, G. (1994). "Integrating Communication, Cooperation, and Awareness: The DIVA Virtual Office Environment," *Proceedings of ACM CSCW'94*, 331-343.
- Tang, P.C., Fafchamps, D., Shortliffe, E.H. (1994). "Traditional Hospital Records as a Source of Clinical Data in the Outpatient Setting," *Proceedings of SCAMC*, 575-9.
- Tange, H. (1996). "How to approach the structuring of the medical record? Towards a model for flexible access to free text medical data," *International Journal of Biomedical Computing*, 42, 27-34.
- Warner, I. (1996). "Introduction to Telehealth Home Care." *Home Healthcare Nurse*, 14(10), 790-6.