Document Dreams:
Patient-Centered Records versus Practice-Centered Records

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Abstract

This presentation explores the challenges and difficulties of using medical information systems to share knowledge across dispersed healthcare settings. I ask why, and with what consequences, do patients have their medical histories taken and retaken repeatedly as they move across healthcare locales? And, why do doctors and nurses choose to record these histories in such a variety of information systems? In addressing these questions I draw on an 18-month, multi-sited ethnographic study in several pediatric health care settings, following patients from primary care clinics, to emergency rooms, to in-patient units. The analysis focuses on the practices that go into documenting patients' care. I refer to these as "documenting practices," and include in this category the recordings on various note cards, on-line systems, preprinted forms, and whiteboards.

By combining the previously distinct lenses of communicative genres (Orlikowski & Yates, 1994, 1998), temporal and spatial dimensions of social interaction (Schultze & Boland, 2001; Giddens, 1989), and trajectories (Bowker & Star, 1999) I identify the documenting practices that doctors, nurses, and secretaries use to manage, not only patients' movements across geographic and temporal settings, but also their own distributed work. I argue that doctors and nurses use medical records/documents as itineraries to organize their distributed work practices. I introduce the concept of "re-localizing" (i.e., the continuous documenting of a patient's care across settings within multiple information systems) as a phenomenon that allows professionals to handle a complex flow of information across distributed work settings. The notion of "re-localizing" has important consequences for both organizational design and information system policies. In particular, it allows one to shift focus, from the pursuit of universal patient information systems, towards establishing specific intersections among documenting practices (both organizational and technological) that facilitate patient care across distributed settings. More broadly, the research has implications for our general understanding of, first, how organizational members manage their distributed work, with consequences for information system design, and secondly, the organizational impacts of IT.

Introduction

As the title suggests I would like to discuss a technology dream that one finds in healthcare and is most clearly articulated in the medical informatics community. It is the dream of the universal patient-centered record -- placing all relevant information about a patient's history at doctors' and nurses' fingertips. Medical informatics researchers often use a hypothetical story to justify this dream. The story goes like this: Mr. Jones is on holiday in Florida. His wife goes to the beach and Mr. Jones decides to play golf. At hole three he collapses and is taken to a local emergency room. In the ER the doctors cannot access his medical record and information about his heart condition. Without knowing what medications he takes and his history they cannot help him to the same degree as his own doctor.

So the dream that I am addressing is the dream that one can develop a patient-centered record accessible to healthcare professionals any time -- anywhere. In opposition to this *patient-centered* perspective I will suggest that we take a practice-centered approach to medical records. And that is the practices of doctors and nurses. In the title I talk about this as one view *versus* the other. In doing so I have framed the patient-centered record as a straw man to highlight what I think has been overlooked in medical informatics. I will soften my rhetoric, as we get further into the talk.

This dream speaks to a theoretical question that has motivated my research agenda since I worked at Xerox PARC and Berkeley. There I was exposed to Jean Lave and Lucy Suchman's notion of situated knowledge (Lave 1988, Suchman 1987). Their research suggests that some types of knowledge are tied closely to specific social situations. That is the how to knowledge. Jean Lave (Lave 1988), for instance, demonstrated that supermarket shoppers in LA were able to perform very complicated mathematical calculations in a shopping situation, but could not master the same skills when the problem was posed in formal mathematics. Their knowledge was socially and contextual embedded. Along the same lines Suchman showed that the mastery of Xerox copiers was embedded in the social organization of work around the machines (Suchman 1987).

More recently one finds an increasing interest in knowledge within the organizational field and a push to differentiate different types of knowledge. For instance, Organization Science has a special issue on knowledge coming out in their May/June issue this year. In this debate situated and embedded knowledge seems to be accepted as one type of knowledge among others. At least two views of knowledge can be found in the organizational literature. One treats knowledge as abstract representations, a perspective that has informed studies of managerial cognition (Walsh 1995, Walsh & Ungson 1991). In the medical field this represents the abstracted, explicitly represented and codified knowledge taught in medical school. The other viewpoint approaches knowledge as situated, i.e. context dependent and emerging from interactions and practices in particular situations. In medicine this involves the knowledge involved in the practice of medicine in specific healthcare settings with changing collaborators and unfolding care for particular patients. A number of scholars have described the importance of situated knowledge for organizational and IS research. Among them I can mention Brown & Duguid (Brown & Duguid 1998, Brown & Duguid 2000), Boland & Tenkasi (Boland & Tenkasi 1995), Wenger (Wenger 1998), Carlile (Carlile, Forthcoming), Nonaka (Nonaka 1994, Nonaka & Takeuchi 1995), and Orlikowski (Orlikowski 2002).

My work with this situated knowledge framework, however, raised the question: *if knowledge is situated how do people share situated knowledge across settings?* To put it differently, I hope to gain a better understanding of this particular type of knowledge, situated knowledge, by taking a closer look at how people share such embedded and local knowledge across settings.

The medical field provides a particularly interesting case for exploring this question. For the last two decades the field of health care informatics has worked on developing "universal" patient-centered records linking distributed healthcare providers across organizational and departmental divisions. To date these efforts have proven remarkably unsuccessful. Researchers on the American Medical Informatics Association mailing list regularly have discussions on the topic of failure rates in healthcare information systems (IS). Though impossible to verify, some quote 80% failure rates for the implementation

of medical information systems. Today one finds that individual settings, departments, and sub-disciplines have implemented their own information systems. For instance, emergency departments will often have one electronic record system, the Intensive Care Unit (ICU) another, outpatient care a third, and nurses (in some hospitals) yet another nurse-use only online record system; rarely do these systems communicate. This lack of a universal patient-centered record raises the question: how *do* doctors and nurses share their knowledge about patients across distributed healthcare settings?

An answer to this question should inform, not only, our understanding of how situated knowledge is shared across settings but also information system design within the medical field and beyond.

Research Setting and Method

In order to address this question I studied the practices that go into documenting patient's care across several healthcare settings. In the course of an 18-month multi-sited ethnographic study I followed pediatric nurses, doctors, and secretaries in their daily work. I spent time in five primary care clinics, one emergency room, and two hospital wards. I focused on the practices that go into documenting patients' care, and, specifically, the care of asthmatic children. I call these "documenting practices" and they include the recordings made on various note cards, preprinted forms, on-line record systems, and whiteboards. In short, my *unit of analysis* is the work practices of doctors and nurses and specifically the practices that go into documenting patients' care. Doctors and nurses are the actors of my study. They care for patients that move through the locales they inhabit.

My answer to the question, how do doctors and nurses share their knowledge about patients across distributed healthcare settings, falls in three parts. First, I argue that medical records should be approached first as work practice-centered and only secondly as patient-centered. The use of the records does not primarily focus on the patient but the work practices of doctors, nurses and secretaries.

Secondly, by taking this approach I found that doctors and nurses use medical documents as *itineraries*. I have chosen the term itinerary very carefully as it implies people's coordination across *time* and *place*. Hereby, I want to emphasize the temporal and spatial structures guiding the doctors' and nurses' work. If one has ever spent any time in a hospital you will know that doctors and nurses constantly move around. Their movements are not random but patterned by their use of documents.

Third, I introduce the notion of a *re-localization* to describe the process of sharing across distributed healthcare settings. I argue that the patients moving across settings are continuously made part of the *local* work practices of doctors and nurses.

Let me turn to Sophie's case, an actual example from my data, not a hypothetical scenario such as Mr. Jones' heart attack.

Empirical Findings

Sophie is a 10-year-old girl with a bad asthma attack. When I meet Sophie for the first time, she is lying in a hospital ward bed with an oxygen tube in her nose. It's 10:30 on a Thursday morning. Two doctors and a medical student are simultaneously leaning over her, three stethoscopes pressed to her chest listening, eyes turned to the ceiling. The medical student and the two doctors, an intern and a senior resident, take notes as they interview Sophie and her mother about her asthma attack and previous history. Among other things, they learn that Sophie has been hospitalized once before, two years ago. As a toddler, Sophie frequently suffered from bronchiolitis, which was later diagnosed as asthma. However, this is not the first time Sophie has her history taken. Actually, she has had her history taken repeatedly.

Figure 1. – Repeated Histories

Sophie's current asthma attack started the previous afternoon. Sophie's mother called their primary care clinic and talked with the nurse, who took her history and asked them to come and see the doctor. In the clinic the secretary and a clinical assistant briefly

interviewed and recorded Sophie's history, then sent her to see the doctor. By this time, it was late in the afternoon and the doctor's clinic was about to close. The doctor gave her a nebulizer treatment and suggested that Sophie and her mother go to the emergency room. The treatment helped a little bit, but on their way to the ER, Sophie sitting in the back seat, was still wheezing heavily. They arrived in the ER. At the front desk the triage nurse interviewed the mother and Sophie and documented this information in a flow sheet, then sent the mother to the registration desk. After an evening in the ER the doctors decided that they wanted to admit Sophie to the hospital. She required nebulizer treatments more than every 2 hours.

By the time the three doctors (including the medical student) enter Sophie's room, Sophie and her mother have described Sophie's medical history 11 times, and each time, the doctor, nurse, clinical assistant, or secretary documented this history at least once. If Sophie had suffered from a more complicated or less familiar disease her history would have been taken even more times.

Based on Sophie's case, it is not difficult to motivate the dream of the universal patient record. Healthcare is an immensely complicated social system. Hundreds of nurses, secretaries, and physicians are constantly on the move. They collaborate with colleagues within one clinic, across departments, and across institutions. They coordinate their activities across the *places* that the patients, like Sophie, travel. They coordinate their activities across *time* to make sure that there always will be somebody to care for Sophie and patients like her. Having all the information they need, at their fingertips, would presumably save them and the patient from reporting and documenting their histories again and again. Nevertheless, a closer look at work activities of doctors, nurses and secretaries, and in particular, the practices that go into documenting the patient's histories, ultimately questions whether the universal patient record should be the ultimate goal. Let me return to the three doctors interviewing Sophie.

Documents serve as itineraries

After they have examined Sophie and interviewed her mother the three doctors all go to the doctors' conference room in this medical unit. The medical student grabs a clean Progress Note sheet at the nursing station. Behind two glass walls, known as the aquarium, the intern and the senior each find a computer terminal. The intern logs on to the HOSO, an on-line system. HOSO stands for "House Officer Sign-Out." The senior resident logs into the senior resident note system. They each start documenting Sophie's case. The intern will never read the senior resident's notes and vice-versa. To understand the rationale behind these repeated documenting practices let me elaborate a little bit more one how the intern uses her document. Let us call her Donna.

Donna writes her notes in an on-line document shared with only four other interns. She records the vital signs, O2 level, and makes a list of tests and other procedures needed. The rest of the day Donna attends to patients and documents in the HOSO what tasks she has completed and what tasks lay ahead. She uses the HOSO as an *itinerary* for her activities -- where does she need to be and at what times? The same can be said for her fellow interns. The on-line document serves as the backbone for the coordination among these five interns.

In the late afternoon, just before going home Donna signs-out her patients to one of her fellow interns staying in the hospital overnight. The interns use the HOSO to structure their conversation. Overnight the on-call intern uses the HOSO as an *itinerary* for his activities. And if anything happens to Sophie, he will add the event to the HOSO.

This collective on-line document summarizes all the team's patients and in what departments they can be found. It helps this small group of interns to structure where they need to go within the hospital. It also structures their use of *time*. The HOSO gives the times and places where tests should be taken, procedures preformed and patients seen. As

an itinerary it is more than a mere list.[1] The interns use the HOSO to capture both the times and places where they need to be in relation to each other.

Figure 2a, 2b, and 2c depict how the HOSO serves as an itinerary. First, the HOSO helps the interns demarcate a flexible space for their collaboration. As illustrated in Figure 2a one can think of the HOSO as a kind of map, a flexible one that is. Patients like Sophie are distributed all over the hospital. The itinerary must change as new patients arrive in one department and other patients are discharged. So when Sophie gets admitted, Simon who suffers from Sickle cell disease is discharged after 10 days in the hospital receiving intravenous painkiller. Clara who suffers from a heart condition deteriorates and is transferred to the ICU.

Secondly, as portrayed in Figure 2b the HOSO is also a temporally structured map in constant flux, depending on how much work each patient requires. When Donna records Sophie's case in terms of the tasks completed and pending she creates an itinerary of temporally structured activities, which can be seen in relation to the tasks associated with other patients. For instance, she writes that today we need to order a chest x-rays for Sophie, organize a meeting with the pulmonary consultant, and call her primary care doctor. Tomorrow we have to make sure that we evaluate her status to see if we can decrease her steroids dose.

Third, the itinerary helps Donna and her fellow interns navigate in their shared space and coordinate their activities. A glance at the HOSO allows Donna to plan her moves for the day and quickly redistribute her activities in relation to another intern when signing-out or in case their workload changes. So, when Clara deteriorates and require the attention of two interns Donna can quickly reorganize her moves and care for the other interns' patients as they focus all their attention on Clara and her quick move to the ICU.

[1] I use the notion of itinerary as opposed to a map de Certeau M. 1984. *The Practice of Everyday Life*. Berkeley: University of California Press. The latter describes different elements spatial position in relation to each other. The map implies stable positions of elements. In contrast, the itinerary, takes time and movement into consideration. The itinerary takes into consideration vectors of direction, velocities, and time variables. An itinerary helps its users move in a field of interrelated mobile elements.

The same argument can be made for the documenting practices of nurses, senior residents, and secretaries. The senior resident examining Sophie, documents her history in the senior residents' on-line system. He shares these notes with other seniors, only. The senior residents work with interns during the day and share their work practices to the degree that they listen to the same kids' chests at the same time. Nevertheless, the interns and senior residents do not move in the same places nor follow the same rhythm. In the evenings senior residents will cover for other senior residents across the hospital. The group of patients they care for does not completely overlap with that of the interns, nor do the temporal rhythms of their daily and monthly rotations coincide.

In short, documents serve as an itinerary for doctors and nurses' collective activities. Where should they go and when? How long should they spend on each patient in relation to the other patients? But, doctors and nurses do not only maintain one itinerary. In fact, Sophie's 14 histories get documented more than 30 times.

Figure 3 – Multiple documenting practices

Multiple and Intersecting Documenting Practices

Donna, for instance, records Sophie's history multiple times. One document, the HOSO, she shares with her fellow interns, another, informally known as the Brain Notes, serves as her individual notes, a third, called Progress Notes, she records for nurses, secretaries and physicians in Sophie's unit, and a fourth document, the discharge summary, she writes for physicians and caregivers outside the hospital.

Each of Donna's documents serves as an itinerary shared with specific other caregivers. The same can be said about nurses, senior residents, and secretaries both in hospitals and in primary care clinics. They all maintain multiple documenting practices that facilitate their collaboration with particular other constituencies.

Each of these documents do not live isolated lives. Physicians and nurses carefully make them intersect through their daily work. For instance, when doctors and nurses make

rounds in the ER they do not walk from patient to patient. They walk from flow sheet to flow sheet, to a pile of emails from primary care doctors, to a rack of test results, to a large whiteboard. By intersecting all these individual documents they develop a picture of the overall flow of patients through the ER and what bottlenecks they can expect in the near future.

Figure 4 – Intersecting documenting practices

In a similar manner, if a doctor or nurse wants to get a sense of patients' care trajectories across several medical settings, no one document satisfies this need. Donna and the other doctors and nurses do not record Sophie's history with all its details. They only document what is needed for them to make an itinerary and maintain their collaboration with a particular set of other colleagues. If Donna wants to learn more about Sophie's care trajectory that she cannot learn from interviewing her, she will create intersections among multiple documents (i.e. itineraries). In some situations Donna will walk from document to document as the ER doctors. In other situations she will flip through Sophie's medical record. The medical record compiles some of the many itineraries describing Sophie's case. By selectively intersecting documents in the medical record Donna constructs a longer-term yet imperfect representation of Sophie's trajectory.

Re-localization

Taking a step back one may ask what happens to Sophie when she moves from primary care, through ER and inpatient unit, to outpatient care. As she wheezes her way through one history after the other, she gets, what I call, *re-localized* again and again, through *multiple* and *intersecting* documenting practices. By re-localization I mean that patients are made part of the work routines of each local setting. As illustrated in Figure 3, patients are made part of the local work practice where doctors and nurses care for not only Sophie, but many other patients. In order to do their work they use documenting practices to coordinate their distributed work with specific other caregivers. The documents serve as itineraries for their coordination and they need an itinerary for each group of people with whom they collaborate. Some the collaborators work in the same

department; in other cases they work in different institutions. To put it differently, Sophie gets re-localized through the itineraries used by numerous groups to organize their distributed work. If Sophie does not get mapped onto these itineraries she does not get care, she falls off the map.

In brief, medical documents are not so much dealing with patient-centered records as with work practice-centered records. Nurses and doctors often use their documenting practices as itineraries that help them manage their work in and across multiple times and places. To coordinate patients' care across settings nurses and doctors create intersections among multiple documents. To understand Sophie's trajectory one must understand how she gets re-localized. What become pivotal are not individual documents, but their intersections. Situated knowledge is shared through the intersections of multiple itineraries. That is a re-localization process.

Nevertheless, if we want to better understand this local-local relationship implied by the notion of re-localization we must look at the use of documents in and across each setting. We need to be more precise and specific about the local work practices that patients get localized into. We need a framework that allows us to distinguish the practices that go into documenting patients' care.

Discussion

I find Orlikowski & Yates' notions of "communicative genres" and "genre systems" (Orlikowski & Yates 1994b, Orlikowski & Yates 2001, Yates et al 1999, Yates et al 1997) particularly helpful in distinguishing between medical documents, and understanding their role in the overall re-localization process. The genre framework, I will argue, helps me differentiate the work practices that go into documenting patients' care.

Orlikowski & Yates (1994) define a *genre* as a socially recognized type of communicative action habitually enacted by organizational members to realize particular communicative and collaborative purposes. For instance, most people know the genre of

the memo, meetings, expense form, or CV. Doctors in this particular hospital all know the HOSO, progress note, and flow sheet genres. Most genres can be identified by their purpose and form, which are habitually enacted by members of a community.

More recently, Orlikowski & Yates has introduced the notion of "genre systems" to describe the complex interconnections among genres in activity systems (Orlikowski & Yates 1998). They characterize genre systems as socially enacted structures that "serve as institutionalized templates for social interaction." A genre system is a series of interdependent genres that comprise a social activity. For instance, the dissertation chapter draft genre and advisor-meeting genre that structure a Ph.D. student's work with his or her committee chair can be typified as a genre system. A genre system, as an organizing structure, connotes expectations among the actors about the interaction's purpose, content, form, participants, time, and place (Orlikowski & Yates 1998). That is, the why, how, what, who, when and where the interactions take place.

For example, Donna's documenting of the Sophie's history in the HOSO forms a genre system in relation to her work and communication with the four other interns. The use of the HOSO interconnects with the morning round genre and afternoon sign-out genre. Their sequence marks important times in their daily and weekly rotation cycles. In a similar fashion, Donna's documenting in the progress notes form a genre system in relation to her coordination with other doctors and nurses in Sophie's unit, their daily rounds, check-ups, and their division of labor. Similar analyses can be made of Donna's other documenting practices.

Donna writes four different documents, as mentioned earlier. A more precise way to articulate this is to say that Donna engages four distinct genres. Each of these genres is part of distinct genre systems. In other words, the genre system framework allows me to specify the different practices that go into documenting patients' care. But how do we distinguish the four times Donna records Sophie's history as well as the 30 other recordings of Sophie's history?

In the medical setting I found that the last three aspects of genre systems to be particular helpful in differentiating the many different recordings. The who, when, and where were the most helpful tools categorizing these different documents. Based on that I could better understand the purpose, the form, and content.[2]

For instance, it was interesting to observe that in her practices Donna made clear distinctions between her four different documenting practices or genre systems. However, when I asked her, she had a hard time distinguishing between them. I experienced the same with other doctors and nurses. To Donna the overall purpose of her four versions of Sophie's history remains the same: to record Sophie's history and care. The same can be said about the content and form. Donna records, for instance, her history on note cards, on-line systems, and preprinted forms. I had a hard time finding variations in the forms until I asked questions about the participants, times, and spaces.

Figure 5 a & b – Donna's four documents

Let me illustrate the importance of the participants, time, and place of each genre system with Donna's recording in the HOSO and the Progress Notes. For the HOSO the participants are five interns and their use is structured by the daily and monthly rhythm of their rotation cycle. They access and share the HOSO on terminals found in the doctors' conference rooms across the hospital. The Progress Notes' participants include doctors, nurses, and secretaries in Sophie's unit. Staff members time their use of the Progress

[2] In my dissertation I compare this way of differentiating documents to the work of the Russian literary theorist Bakhtin Bakhtin MM. 1986. The Bildungsroman and Its Significance in the History of Realism (Toward a Historical Typology of the Novel). In *Speech Genres and Other Late Essays: M.M. Bakhtin*, ed. C Emerson, M Holquist. Austin: University of Texas Press
Bakhtin MM. 1996. *The Dialogic Imagination: Four essays by M.M. Bakhtin*. Austin: University of Texas Press. Bakhtin distinguish literary genres based on their temporal and spatial structure. Introducing the notion of "chronotope" he provides a framework to explicate the temporal and spatial dimensions of documents. Furthermore, I compare this notion of documents temporal and spatial structure to number of social scientists' analyses of the temporal and spatial organization of everyday work practices. Here, I draw on scholar from sociology Giddens A. 1985. Time, Space and Regionalisation. In *Social Relations and Spatial Structures*, ed. DGJ Urry. New York City: St. Martin's Press, social geography Harvey D. 1996. *Justice, Nature, & the Geography of Difference*. Oxford: Blackwell, and IT research Schultze U, Boland RJ. 2000. Place, Space, and Knowledge Work: A Study of Outsourced Computer Systems Administrators. *Accounting, Management, & Information Technology* 10: 187-219.

Notes to the morning rounds and before and after they see patients. The Progress Notes can be found outside patients' rooms.

To these genre analysis I will argue that there is another side to the temporal and spatial use of the records, that of the itinerary. The use of the HOSO provides a flexible coordinative structure creating expectations about, on the one hand, when to do tasks in relation to other interns, and on the other hand, where patients are located within the hospital. In a similar fashion, the Progress Notes create expectations about when to do tasks in relation to other occupational members and where to find patients and collaborators. In other words, where the genre system framework highlights the temporal and spatial structure of the communicative actions (i.e. when and where we use the documents), I suggest that we also take into consideration how these genre systems are used to structure the participants' general work practices in time and space. The genre system concerns not only a string of communicative actions, but informs us about how people structure and coordinate their non-communicative actions in the activity system.[3] In short, the genre system allows me to distinguish Donna's different documenting practices. Now that we can differentiate the various documenting practices it also becomes easier to understand how they intersect. Let me return to the example of ER rounds to illustrate the point.

[3] The fusion of the notion of itinerary into the genre system framework allows one to address the issue of "expertise coordination." Faraj and Sproull propose that "expertise coordination" consists of socially shared cognitive processes that require differentiated knowledge and skills processed by team members and patterns of heedful interactions that support the application of these skills and knowledge where needed Faraj S, Sproull L. 2000. Coordinating Expertise in Software Development Teams. *Management Science* 46: 1554-68. They argue that expertise coordination involves 1) knowing expertise location, 2) recognizing the need for expertise, and 3) bringing expertise to bear. Doctors and nurses use of documents as itineraries relate to these three aspects of expertise coordination. First, Donna uses the progress note to find not her patients but also who are the consultant and where they can be found, that is, the when and where of expertise location. Secondly, Donna and her fellow interns use the HOSO and Progress Note in part to recognize when their own or others' expertise is needed. When and when do we need to do what? Third, Donna and the other interns use the HOSO to bring their expertise to bear as they integrate their individual activities, and problem solving through an emergent process of informal interaction and sharing of expertise around the use of the HOSO. In short, the documenting practices of doctors and nurses play a key role in their coordination of expertise, which goes beyond their more administrative coordination. More importantly, by integrating the notion of genre system with the idea of the itinerary we can differentiate different types of documenting practices, or types of expertise coordination.

Intersecting documenting practices

Most of the documents involved in the ER rounds serve as itineraries for specific doctors and nurses treating each patient. By intersecting them the ER staff creates a new temporal and spatial framework for their interactions. Each flow sheet used in the ER helps a nurse, two doctors and maybe a consultant to guide their "when and where to do what" in relation to each other in regard to one patient. During rounds staff intersect many flow sheets and other documents, and in the process create a new itinerary with a different configuration of participants, time and place. As they intersect the documents during rounds staff members create a new genre system involving all staff members in the ER and pointing to the when and where to do what in regard to the entire patient population in the ER. Their intersection of multiple documents creates an itinerary for the overall flow of patients through the ER. In other words, by intersecting documents doctors and nurses create a new itinerary helping them to determine when and where to focus their activities within a larger activity system, the entire ER. In this way a document (i.e. specific genre) can be part of more than one genre system.

In this manner the patients constantly get re-localized into each setting as they travel through, and in the process become part of many intersecting genre systems enacted by doctors, nurses, and secretaries. Some of these genre systems and their itineraries concern the coordination in the limited space of one patient's room. Other genre systems stretch across several medical settings.

A number of these intersecting documents comprise socially recognized genre systems. Many others are more loosely related. Often doctors and nurses improvise intersections among particular documents as part of their reactions to a constantly changing environment. Donna could request records from the outpatient asthma nurse related to Sophie's primary care clinic and thereby create an intersection one normally does not find in the hospital.

Conclusion

How do the three points I developed in my analysis of Sophie's case contribute to theory development and practice; and how does theory contribute to my three points. First, if we understand medical records as documenting practices we can apply a genre system lens to differentiate documenting practices. I find that in healthcare the who, when, and where categories of genre system analysis serve as the best tools in classifying different documenting practices.

Using this approach I find four types of documenting practices based on types of genre systems. These are the individual-specific, as in the case of Donna's notes cards; the group-specific, as in the case of the HOSO; the locale-specific, as in the case of the progress notes; and the trans-locale specific, as in the case of the discharge summary. Nurses and other doctors typically use some or all of these four types of documenting practices characterized by their particular configuration of participants, times, and places.

Equally important I find that documenting practices generate itineraries guiding actions across time and place. That is the when and the where to do what. It is based on these types that we can understand the format and content of the different documents. We can understand what patient information is included and what is left out.

The notion of itinerary adds to the analytical power of the genre system framework. A genre system does not only create expectations for the temporal and spatial structure of the communicative actions but also the general guide to the activities of the participants, that is, the when and where to do what. To put it differently, we are dealing with an account but also accounting, a document and documenting, a guide and guiding, a practice and practicing.

Finally, we need to return to the question of situated knowledge and how people share this type of knowledge across settings. My answer is that doctors and nurses share situated knowledge through their use of itineraries and equally important by intersecting multiple documenting practices. That is what I call the *re-localization* process.

The question remains, how could medical information systems best support the sharing of such situated knowing across settings. Let me briefly outline some implications for information system design.

Implications for IT Design

The findings suggest that the design of medical information systems should take as their point of departure the work practices of doctors and nurses, and only secondly the patient. Accordingly, the practice or process should guide the construction of medical taxonomies supporting these systems. Here, I imagine a medical information system built along the lines of the Process Handbook developed at M.I.T. (Kim 2000, Malone & Crowston 1994, Malone et al 1999, Yoshioka & Herman 1999). The relationships one builds are not so much between objects, but rather relationships between processes. It is not so much object oriented programming as process oriented programming.

Given the use of documents as *itineraries* it would make sense to provide many different formats and selections of information (i.e. how and what). In other words, Donna should be able to pull up information in four different ways. One would help her coordinate with the four interns, another would serve as her individual notes, and so forth. In the design process each of these types should be classified according to the *who*, *when*, and *where*; the participants, time, and space.

Last but not least, the notion of re-localization suggests that we should not build centralized and universal medical information systems, but rather decentralized systems developed and implemented at the level of individual departments and sub-disciplines. This would make the work of intersecting these different decentralized systems crucial. Here, data mining and natural language processing would provide helpful tools in facilitating the connections among multiple decentralized systems and allow different constituencies (i.e. participants) to retrieve the information that supports their work practices across time and space.

In order to realize these capabilities one would need to give IS professionals a central role in the daily work of individual healthcare settings. As it is now IS professionals are more marginal than janitors. In one of the hospitals I studied the IS professionals lived in a trailer literally at the fringes of the hospital. They could barely have been more marginal to the daily workings of the hospital. This seems incongruous when looking at the amount of time other healthcare professionals use to discuss how best to intersect existing information systems. In each medical unit and clinics I observed I participated in regular, if not by weekly, meetings where doctors, nurses, and secretaries discussed how better to intersect existing information systems and documents. Few of these participants had the capability to engage in changing the electronic information systems, and changes they could implement most often simply involved changes in paper forms. In order to implement decentralized changes in information system use one would need to have IS professionals participate in these meeting and be able to contribute to the discussions. It would also be helpful if doctors and nurses came out of medical school with a least a basic comprehension of these issues. An integration of information system management into the medical curricula or offering elective IS courses targeted to the medical field would serve as a first step in this direction.

In summary, I am arguing that in order to reduce the number of times Sophie has her history taken and recorded one would have to build medical information systems from the bottom up. Such an endeavor would involve supporting doctors and nurses use of multiple and intersecting information systems at the level of local departments and sub-specialties. Slowly, by focusing on the intersections among these many documenting practices I expect that one would be able to start cutting the number of times Sophie's history is recorded and maybe in the future the number of times her history is taken.

Future Research

One of my primary future research goals is to collaborate with colleagues in the design of practice-centered medical information systems. Apart from this more applied effort my research agenda falls in three parts. The first part continues my line of research within healthcare; the last two apply my conceptual framework to other industries.

Within the healthcare field I hope to strengthen my conceptual framework of my dissertation through a US-Europe comparison. Here, I would draw on my contacts in Scandinavia and Europe. A comparison of findings across the different institutional settings of American and European healthcare systems would test the limits of my US based research findings and thus sharpens the conceptual framework outlined above. This work will combine 1) the comparative analysis of documenting practices, 2) and the use of case studies of selected pediatric care settings.

Secondly, within other industries I hope extend my investigation of the role of documents as a framework to understand IS related work practices. Do we, for instance, find that professionals in the financial or accounting industries use documents as itineraries to manage the temporal and spatial aspects of their unfolding work practices, or is this unique to the medical field?

Thirdly, I hope to extend the concept of re-localization to non-medical industries (i.e. accounting, financial, or media). I expect to develop a comprehensive understanding of the 're-localization' of knowledge in distributed work settings. For instance, do we find that globally distributed accountants or financial specialists share their situated knowledge about specific companies or transactions through multiple and intersecting documenting practices? To address this question, I would study the sharing of knowledge within a globally distributed company. Through shorter field studies in a number of settings I would focus on how individual employees share information. Do the professionals draw on a centralized source of information or do they re-localize specific customers into their local management of work practices.[4] In short, I hope to contribute

[4] Analogues, I conducted a study of sales people while at Xerox PARC, which related to the development of a large information system for the sales force. The system defined sales people as the hunters and gathers of information about the customer. The idea was that the information kept in this large customer-centered system should be accessible to all the other groups involved in the sale, such as finance people, technical support, service technicians, managers, et cetera. Comparable to the patient-centered record the hope was to develop a universal repository within the organization build around the customer. Still, to the salespeople it was too much information to gather and enter into the system. For all others, the information compiled by the salespeople was too little. Returning to these old data with my new concept of re-localization I find that the different groups involved in the sales process did in fact re-localize the customer again and again in order to conduct their work.

to our general understanding of, first, how organizational members do work, with consequences for information system design, and secondly, the organizational impacts of information technology**.**

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Figure 1.

Repeated History Taking

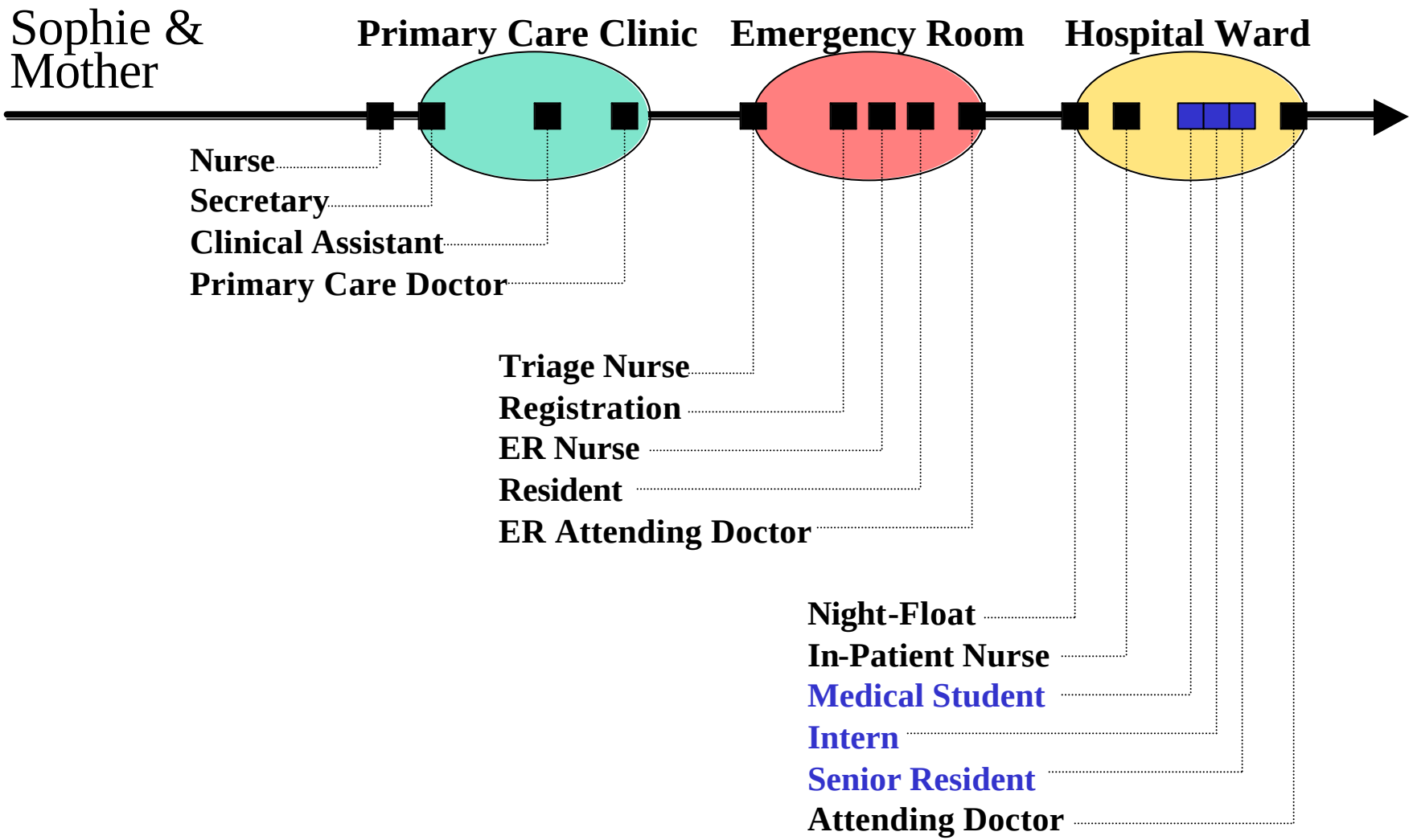
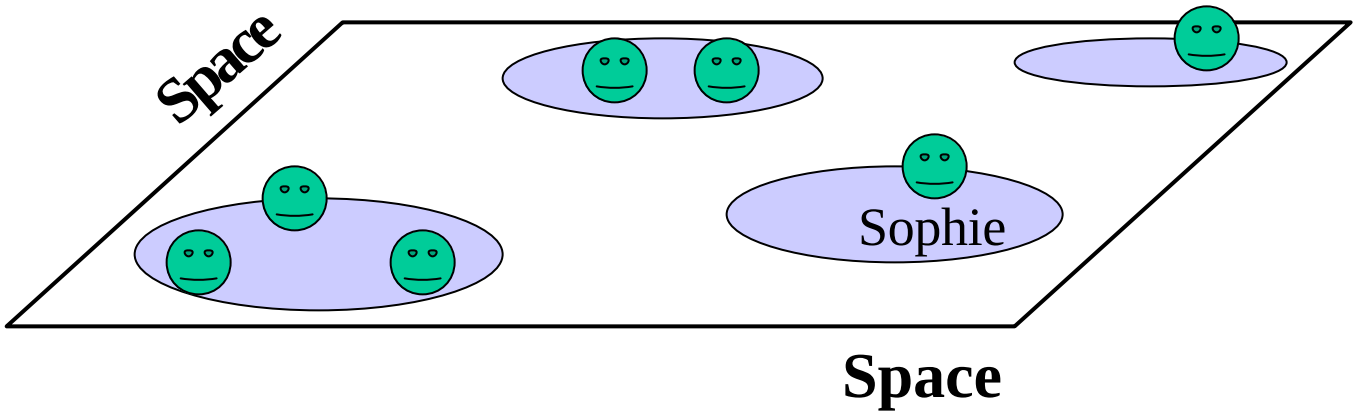


Figure 2a.

HOSO as Itinerary:
flexible space map



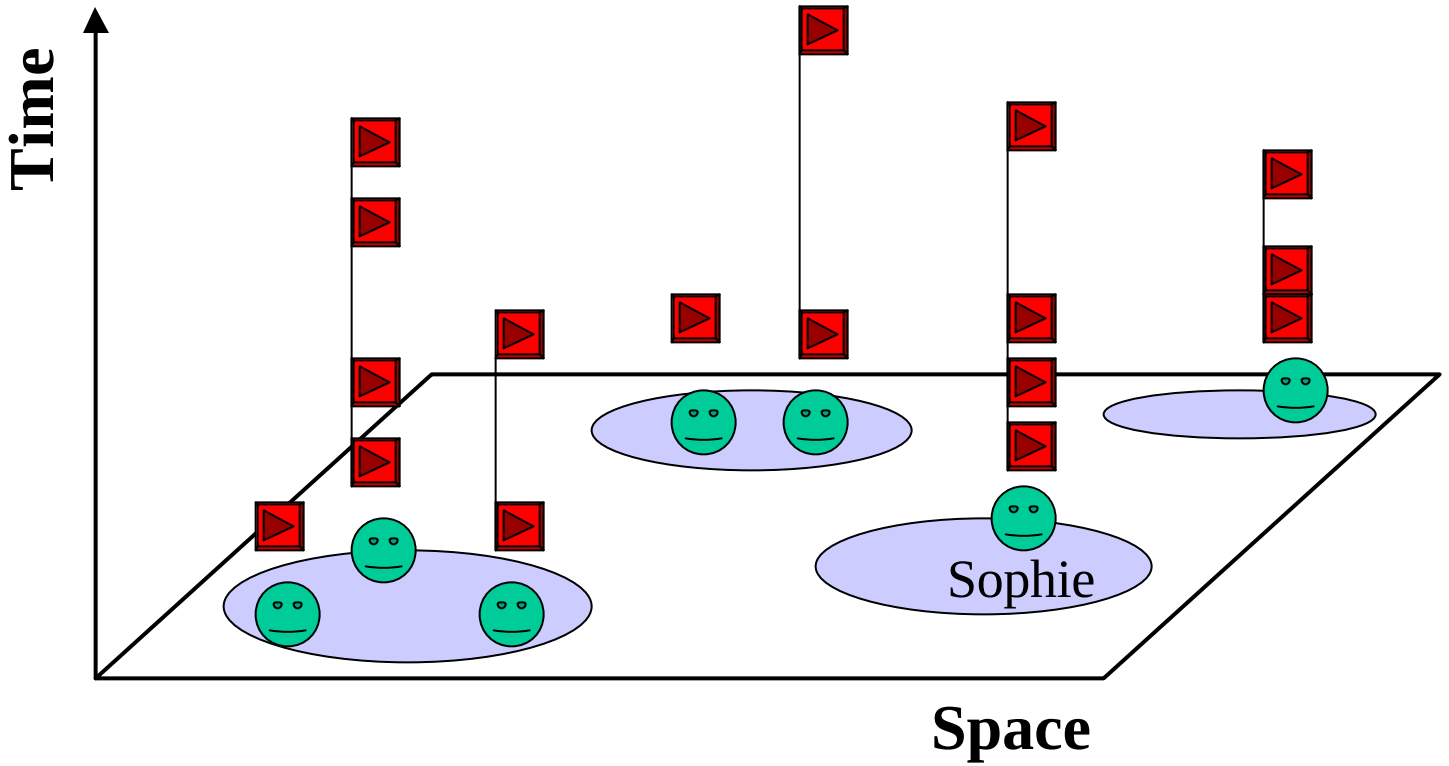
Patient

Hospital ward

Figure 2b.

HOSO as Itinerary:

flexible time and space map



Things to do

Figure 2c.

HOSO as Itinerary:

Donna's moves

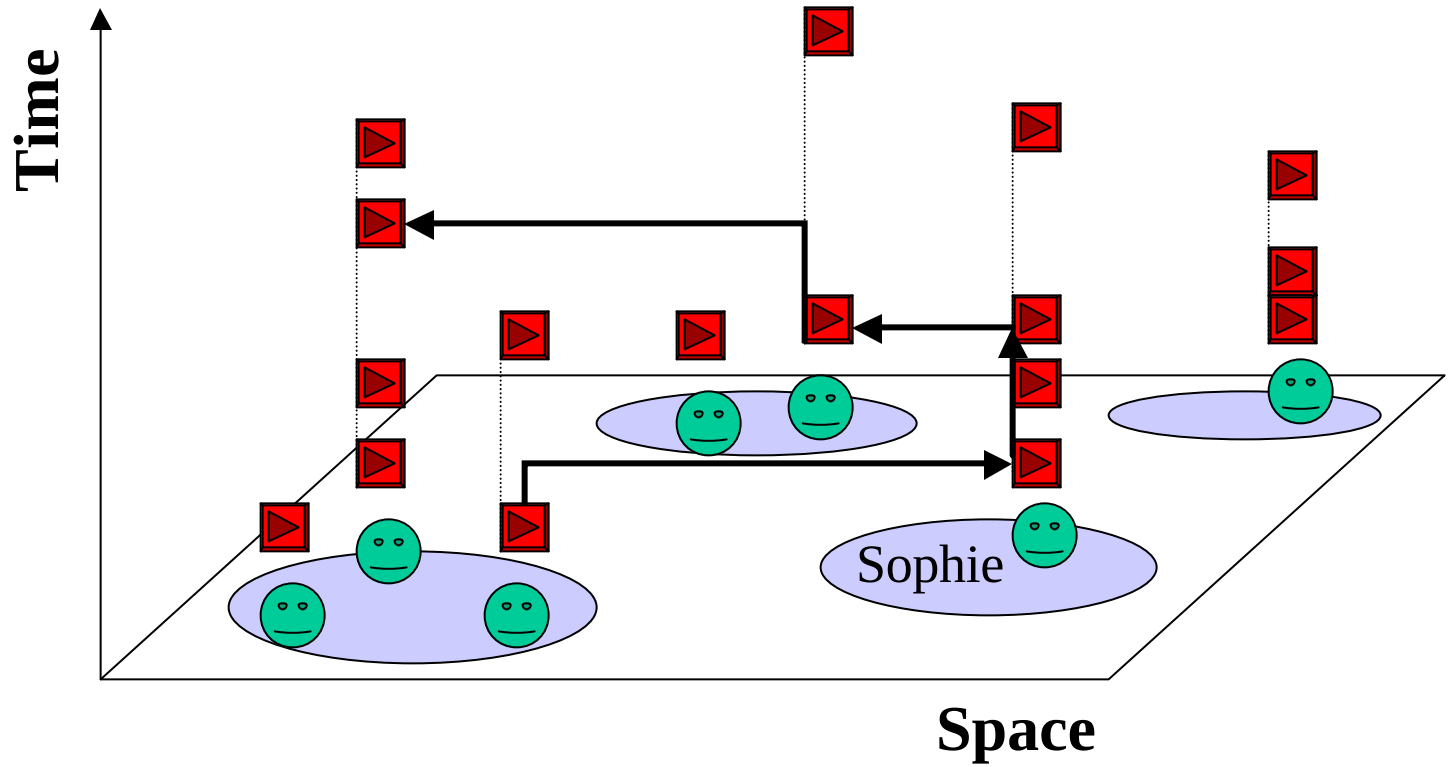


Figure 3.

Multiple Documenting Practices

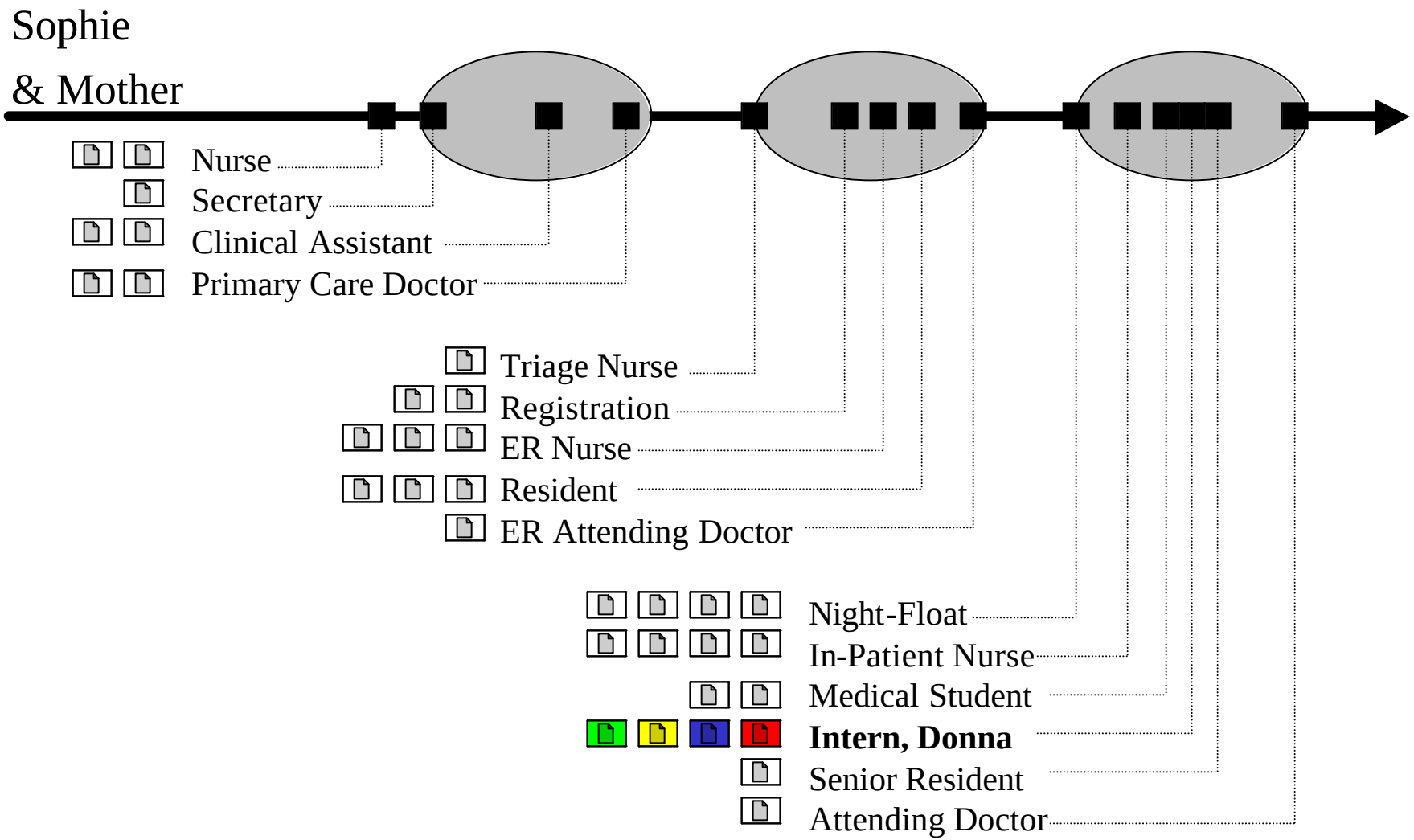


Figure 4.

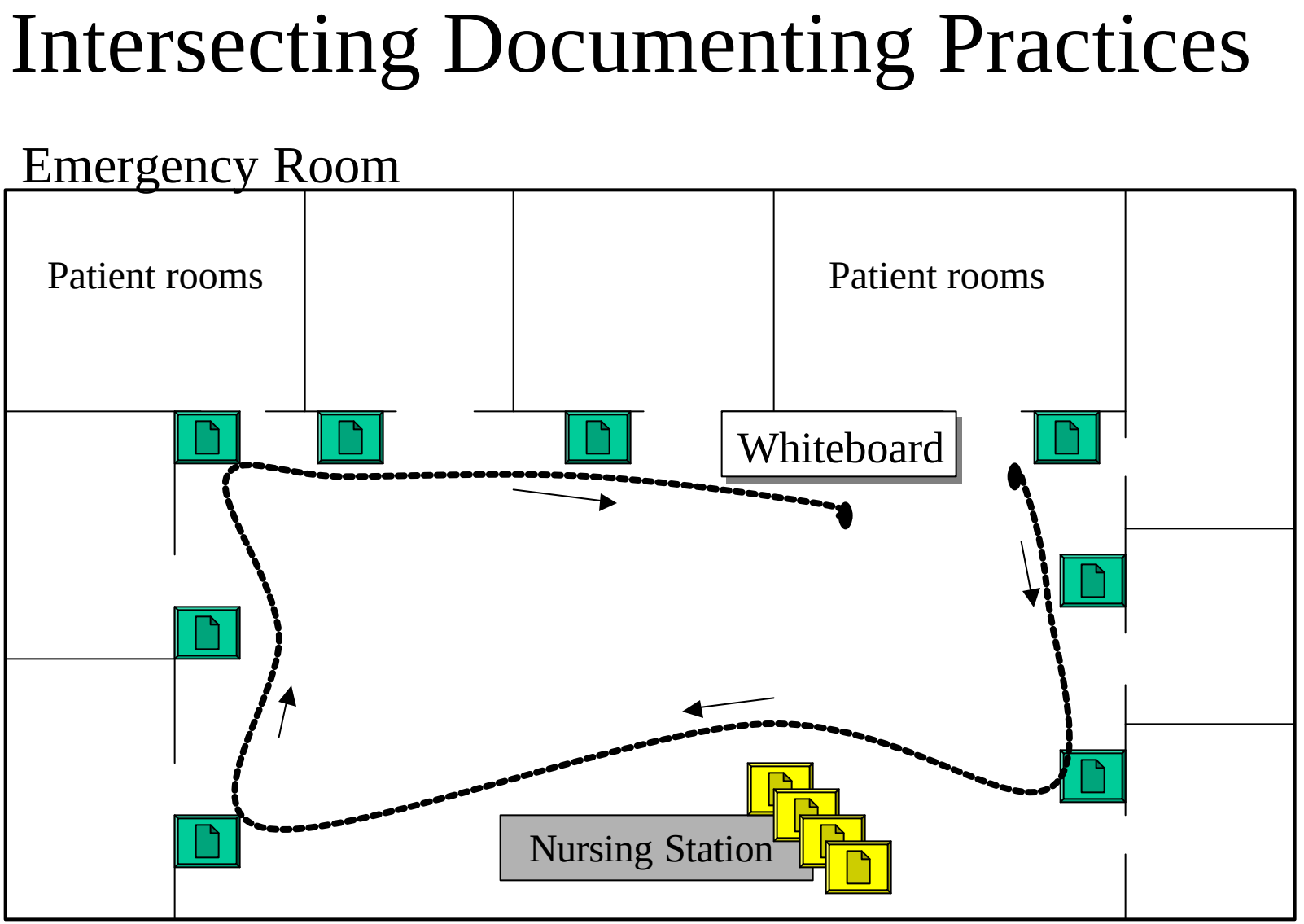

Intersecting Documenting Practices
Emergency Room
Patient rooms
Patient rooms
Whiteboard
Nursing Station

Figure 5a.

Genre Systems:

Two of Donna's Documents

	HOSO		Progress note	
Who Participants	Five Interns		Doctors, Nurses, Secretaries	
When Time	Daily and weekly rotation cycle	*When to do in relation to other interns*	Rounds; Before and after seeing patients	*When to do in relation to other practitioners*
Where Space	Terminals in doctors' conference rooms	*Where to find patients across locales*	Outside patients' rooms	*Where to find patients and collaborators w/in a locale*

Figure 5b.

Genre Systems:

Donna's two other documents

	Note cards		Discharge summary	
Who Participants	Donna		Doctors, Nurses, Secretaries	
When Time	Any time during one shift	*When to do in the course of one shift*	End of care; Beginning of care	*When to do in relation to other practitioners*
Where Space	In Donna's coat pocket	*Where to find patients across locales*	Institutions' central record systems or in ward	*Where to find practitioners across locales*