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Running head: Variations and commonalities in processes of collaboration

Title: Variations and commonalities in processes of collaboration: the need for multi-site workplace studies

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Abstract: Workplace studies have made a major contribution to the field of CSCW, drawing attention to subtle practices that enable effective collaboration. However, workplace studies typically focus on a single setting, making it difficult to assess the generalisability of the findings. Through a multi-site workplace study, we explore a specific collaborative process, that of the handover which occurs when a patient is transferred from one hospital or ward to another. The study demonstrates that the term 'handover' captures a variety of collaborative practices that vary in both their form and content, reflecting aspects of the setting in which they occur. Multi-site workplace studies are shown to be essential for CSCW, not only generating findings that have relevance beyond a single setting but also focusing attention on aspects of work practice that may otherwise go unnoticed.

Keywords: Workplace studies, ethnography, healthcare, handover

1. Introduction

Workplace studies are concerned with the practical accomplishment of workplace activities and the ways in which tools and technologies feature in work and interaction within organisational environments (Heath and Luff 2000). While workplace studies have emerged from within various disciplines, such as sociology, anthropology and cognitive science, predominantly they are naturalistic, ethnographic studies (Luff et al. 2000). Similarly, while a number of analytic orientations, such as Distributed Cognition and Activity Theory, have informed such studies, ethnomethodology has arguably had the greatest influence on workplace studies.

One of the initial motivations behind the use of workplace studies within Computer Supported Cooperative Work (CSCW) came from recognition that rejection of systems by their intended users typically results from lack of attention to the social context of work practice (Forsythe 1999). Thus, workplace studies have typically focused on a single setting, gaining an understanding of the detail of work practice as an essential precursor to design. Despite this acceptance within CSCW of the importance of such studies for design, the exact relationship between workplace studies and design has been much debated (Plowman et al. 1995; Schmidt 2000; Dourish 2006).

In this paper, we contribute to these debates by considering what multi-site workplace studies can offer to the CSCW community and how they might inform design, using a study of clinical handover as an example. Such studies would mean a move away from focusing on a single setting, in order to understand the commonalities and variations across a range of settings, thus increasing the generalisability of the

findings. In the following section, we explore the generalisability of workplace studies, reviewing arguments about generalisability within CSCW and considering workplace studies that have taken a multi-site approach. We then introduce the topic of patient transfer, the collaborative process that our study was concerned with. We then describe the study we conducted and, for each setting, we describe the process of handover for the transfer of patients into the setting. In the discussion section, we then reflect on how the handovers vary across the settings and the aspects of the setting that this variation could be related to, as well as considering the ways in which the handover process is consistent across the settings. We conclude by discussing the implications of this research for both technological support of handover and the study of collaborative work.

2. Generalisability of workplace studies

Workplace studies in CSCW have predominantly focused on a single setting. A consequence of this focus on single settings is that it can be difficult to assess the generalisability of the insights that workplace studies provide, to determine the extent to which they apply to new settings. For example, while Bjørn and Rødje (2008) provide an in depth analysis of the work of triage in a paediatric emergency department (ED), we do not know to what extent the work practice observed is unique to that particular setting. Nor do we know how the work practice observed compares to triage in an adult ED or to triage in other areas of first contact care, such as in walk-in centres (Dowding et al. 2009) and via telephone (Johnson Pettinari and Jessopp 2001). Such a comparison may help to highlight those features that are common across different types of triage and those that are unique to triage in the paediatric ED.

Generalisability is a concern for qualitative research generally and is certainly not limited to workplace studies and CSCW. However, what is interesting is the lack of attention that has been given to this topic in relation to workplace studies. A focus on single settings can be regarded as a result of the role workplace studies have played in CSCW. Workplace studies gained their prominence in CSCW by being seen as a way of gathering detailed accounts of work practice in a particular setting in order to inform the design of a system for that setting. For such studies, the generalisability of findings to other settings is not an issue as the findings are not intended to be generalisable beyond the particular setting. Rather, such studies are judged on the relevance of the findings for design, in terms of the extent to which they explicate the work that the system must support (Crabtree et al. 2000).

It could also be argued that another reason for the focus on single settings is the predominance of ethnomethodology as the analytic approach within workplace studies. It is in describing an ethnomethodological approach to workplace studies that Crabtree et al. (2000) argue that the findings of workplace studies are generalisable on the basis that the practices used within a particular setting are not limited to those observed within that setting. They give the example of a library, stating that 'the machinery discovered in one library […] is neither restricted to the members observed nor that particular library'. Yet this attitude of 'generalisable until proven otherwise' ignores the way in which local work practices develop within particular locations and how the context can influence and limit processes of collaboration. Others argue that ethnomethodology is concerned with generalities but restricts its concern to those generalities that those in the setting are aware of and take into account (Sharrock and Randall 2004).

Despite this focus on single settings, various authors have considered how the findings from different workplace studies could be brought together. Erickson (2000) presents the idea of using pattern languages to allow the results of workplace studies to be used in new and different situations, with generalisation being one outcome. The intention is not to automatically apply the findings of one setting to another but to use patterns to direct inquiry in a new setting. If such a pattern is found, the pattern language designed for the original setting can become a source of questions and hypotheses. Over time, generalisations can be built up as similar patterns are found across multiple settings. Crabtree et al. (2002) present a pattern language framework as a means of structuring the analysis of data from studies of multiple domestic environments to identify key activities, interactions and technology uses for the elaboration of the design space. A bricolage of patterns is developed through identifying patterns that occur in the same place, such as the kitchen or the living room, but potentially in different homes and which use the same technology. Through this, important sites for design are identified. Similarly, Martin and Sommerville (2004) present 'patterns of cooperative interaction' as a tool for bringing together findings from workplace studies undertaken in a variety of settings. Patterns of cooperative interaction are 'regularities in the organisation of work, activity, and interaction among participants, and with, through, and around artifacts.' Findings are presented in a uniform framework to allow comparison of studies while still providing access to the 'rich descriptions'. A pattern is composed of specific vignettes, which contain a textual description of the configuration of people and artifacts in the setting and a description of the practices through which work is achieved, and a 'front page'

which highlights the commonalities and variations in the vignettes. These patterns are intended as a tool for reflection, rather than attempts to create generalisations.

Despite this interest in drawing together findings from different settings, it is only recently that arguments explicitly in favour of multi-site workplace studies have emerged. For example, in discussing the contributions that workplace studies can make to design, Dourish (2006; 2007) distinguishes between empirical and analytical contributions, empirical contributions being those that provide the detail of what happens within a particular setting while analytical contributions 'provide us with new ways of imagining the relationship between people and technology' (Dourish 2006, p. 548). Drawing on work in the anthropological literature (Marcus 1995), Dourish posits 'multi-sited ethnography' as one means of moving to the analytical level and encourages us to think more broadly about what constitutes a 'site', suggesting 'the global technology culture itself, or the intersection between cultures of technology production and consumption' as possible sites.

Schmidt et al. (2007), in presenting an analysis of work practice in two oncology clinics where they sought to capture both the commonalities and the differences across the two clinics, also distinguish between different types of contributions: studies of specific settings for the purpose of developing specific systems for that setting, and studies for the purpose of developing 'more or less generic or standardized technical building blocks' that can form the basis of systems across a range of settings. In the first case, they point to the need to analyse the rationale of observed practice and to include ultra-practical issues such as advantages and disadvantages of different approaches. In the second case, there is a need to identify

the ‘deep commonalities’ that exist across settings despite variations in work practice. While emphasising the different roles of such studies, they also acknowledge how they can benefit from each other, the studies of particular settings providing a corpus of data for identifying the commonalities across settings.

While it is only recently that explicit attention has been given to the relevance of multi-site workplace studies to CSCW, a number of such studies can be found within the literature. There are those which consist of workplace studies conducted across multiple similar settings. An early example is Bowers et al.’s (1995) study of the print industry, with data collected at three UK sites of the same organisation. As well as reporting the different responses to the introduction of workflow technology in the different sites, they describe the elements of the context that impact how work gets allocated and the order in which jobs are completed. They also describe features of the context that support the monitoring of each other’s work. Another early example is Mackay’s (1999) study of Air Traffic Control (ATC). Following an in-depth, four month ethnographic study in Paris, visits were made to another seven ATC centres in France and the Netherlands, with between several hours and two days of interviews and observation being undertaken in each setting. This and other studies of ATC (Rognin et al. 1998; Berndtsson and Normark 1999) were attempts to do comparative work after the Lancaster studies (Bentley et al. 1992).

There are also workplace studies across multiple settings where the researchers sought variation in the context in which the process of interest takes place. For example, O’Neill et al.’s (2007) study of digital colour production print shops included six settings in the US and Europe which varied in size, customers, core business and

workflow organisation. Such an approach enables an understanding of the impact of context on the processes of collaboration that the researchers seek to understand. There is also the study of two oncology clinics by Schmidt et al. (2007), described above, and work by Balka et al. (2008), who draw together findings from multiple studies of healthcare settings to identify possible sources of local variability in work practice, alerting designers to factors that they need to consider.

3. Patient transfer

Handovers occur frequently, in a wide range of settings, with varying levels of formality. Within health care, handover forms a major part of processes for the coordination of patient care (Junior Doctors Committee 2004). Successful handover is essential for patient safety and failure in this process can lead to errors and harm to patients (Petersen et al. 1994; Grayson et al. 2005).

While previous studies of handover (Strange 1996; Lamond 2000; Payne et al. 2000), as well as recommendations for handover (Junior Doctors Committee 2004), often focus on the verbal handover report, we characterise handover as a collaborative process that involves the relinquishing of responsibility for a patient or group of patients by one person or group, acceptance of responsibility for that patient or group of patients by others, and sharing of information about the patient or group of patients (Wilson et al. 2009). These components of the collaborative process of handover occur over a period of time and in a variety of orders. The sharing of information may involve a verbal report, written documentation, or both, and may happen in a number of stages.

Within the hospital setting, there are two main types of handover: shift handovers and handovers that occur when a patient is transferred from one setting to another, whether inter-departmental (e.g. Accident and Emergency to a ward, an intensive care unit to a high dependency unit) or inter-hospital (e.g. to access specialist facilities not available at the current hospital).

In this paper, we are specifically concerned with patient transfer. The topic of shift handover has been explored in CSCW over recent years, both in studies that focus on the process of handover (Wilson et al. 2006; Tang and Carpendale 2007; Wilson et al. 2007; Randell et al. 2008) and in broader studies of collaboration in healthcare (Bossen 2002; Reddy and Dourish 2002; Munkvold and Ellingsen 2007; Østerlund 2008). By contrast, the topic of patient transfer has received little attention, despite the fact that transfers between hospitals and wards are becoming more frequent due to changes in the organisation of hospital care, particularly increased specialisation. Abraham and Reddy (2008) looked at patient transfer but this focused on the transfer of information to non-clinical staff in order to support the allocation of beds, as opposed to the relinquishing and accepting of responsibility by clinical staff to enable ongoing patient care.

4. A multi-site workplace study

We have undertaken a multi-site workplace study of handover in hospital settings over a two year period. Data was collected in eight settings, across five UK hospitals. Settings were selected to ensure variation not only in the types of handovers that were observed – we wished to observe both medical and nursing shift handovers and patient transfers – but also in the context. The settings vary in size (i.e. number of

beds), clinical specialty, severity of patient condition, and patient population (i.e. adult, paediatric).

4.1 Data collection

Data collection involved observation of handovers, with audio recording where appropriate, as well as time spent in the setting in order to understand how handovers fit within the ongoing work. Previous studies of handover point to the importance of activities that immediately precede and follow the handover (Kerr 2002), so we were careful to record the details of such activities. Informal interviews were conducted with staff members. Examples of artefacts used to support handover were gathered, and photographs of the settings were taken. In this paper, we draw on data collected in four varied settings. Across these four settings, a total of 479 hours of observations, over 47 days, were conducted between May 2007 and July 2008. A total of 138 handovers were observed, 75 of which were patient transfers. Research Ethics Committee approval was obtained for this study and written consent was obtained from both staff and patients.

4.2 Analysis

Following each period of observation, fieldnotes were written up and audio recordings transcribed. These were entered in to Atlas.ti. Initially, data from each setting was analysed individually, so as to allow themes that were unique to a particular setting to emerge. All handovers were carefully read and annotated by hand, asking questions of the data and paying attention to what was occurring and in what order, what was being accomplished and what strategies were used to achieve this on the basis that handover is a practical accomplishment (Emerson et al. 1995).

From this, a series of codes were developed, capturing different aspects of the handovers, such as who was involved, the location, the content and the ordering of the content, the nature of the communication, and the artefacts that were used. These codes were then applied to the data within Atlas.ti. Indexing the data was treated as a way of engaging with the data on a line by line basis, using the constant comparative method to enable similarities and differences within settings to become apparent (Glaser and Strauss 1967). From this, for each setting, we produced a rich description of the different processes of handover that were observed. Our analysis can be described as ethnomethodologically-informed (Crabtree et al. 2000), maintaining a commitment to the preservation of the detail of work practices within each setting.

Having undertaken this initial analysis, we returned to the data, again using the constant comparative method but this time identifying similarities and differences between settings.

The analysis presented in this paper focuses specifically on patient transfers. Elsewhere, we have reported findings from our study relating to shift handover (Randell et al. 2008; Randell et al. 2010). We observed transfers of patients both into and out of the four settings but in the following analysis we focus on those handovers that were received by staff when a patient was transferred into the setting. This focus is due to the fact that we have more information on such handovers; being based within the setting where the handover was being received, we were able to gather data on the subsequent patient care as well as the perspective of those who would provide that subsequent patient care on the handover process.

4.3 The settings

Setting 1: General medical ward

Setting 1 was a 20-bed general medical ward in a District General Hospital (DGH). Patients principally come to the ward from the emergency assessment unit (EAU), although on occasion a patient may be moved to the ward from another ward, be admitted directly from an outpatient clinic, or be transferred from a different hospital. The majority of patients on this ward are elderly and many require palliative care.

Setting 2: Emergency assessment unit

Setting 2 was a 28-bed EAU in a DGH. Patients come to the ward mainly from Accident and Emergency (A&E) but may come via a General Practitioner (GP) referral. The EAU is a short-stay ward where patients are assessed and either discharged from hospital or transferred to an appropriate ward. Due to the nature of the ward, patients of a wide range of ages and with a broad range of conditions are seen.

Setting 3: Paediatric surgical ward

Setting 3 was an 11-bed paediatric surgical ward in an inner city teaching hospital. The ward takes both elective and emergency paediatric surgical patients. Patients are transferred from the ward to theatre and then transferred back to the ward following their operations.

Setting 4: Paediatric acute retrieval service

Setting 4 was a paediatric acute retrieval service that transports, by ambulance, critically ill children from DGHs in the south east of England to paediatric intensive care units (PICUs) in a number of hospitals. While all patients are acutely ill, a range of conditions are seen.

5. Findings

5.1 Setting 1: General medical ward

The verbal handovers when a patient is transferred into the general medical ward are usually one to one, involving the nurse who has been looking after the patient on the transferring ward and the nurse who will be looking after the patient on the general medical ward. They may be either face to face or over the telephone, depending on which ward the patient is being transferred from. Patients who come to the ward from the EAU are transferred by a porter following a verbal handover via telephone. Patients who are brought to the general medical ward from a ward other than the EAU are escorted by a nurse, following a brief telephone call, allowing a face to face verbal handover. In this setting, if a bed is available, the ward has little choice in whether or not to accept the transfer.

Co-located verbal handovers take place with both nurses standing at the nurses' station. For verbal handovers via telephone, the nurse receiving the handover is again based at the nurses' station. The verbal handovers, whether face to face or via the telephone, are typically brief but not rushed, lasting a couple of minutes. The content of the verbal handovers is fairly consistent, consisting of name, age, date of admission, presenting complaint, and past medical history where relevant. The amount of information available to hand over depends on how long the patient has

been in the hospital. For example, the following fieldnote extract describes the transfer of a patient from an outpatient clinic into the general medical ward:

6:40 p.m. A patient from the Planned Investigations Unit (PIU) is transferred to the general medical ward. He arrives escorted by a nurse from the PIU and a porter. Once he has been moved into his bed, the PIU nurse hands over to one of the ward nurses. They stand at the nurses' station. Name, 'a young man' (pointing at his date of birth on his medical record - he must be in his late 40s or early 50s), had been for endoscopy and has tracheal mass. The ward nurse asks if he's in pain (no). It takes two minutes but is not rushed at all. The PIU nurse hands over the medical record and notes from the endoscopy - the patient hasn't been 'clerked' yet (the process of being assessed by a doctor and admitted to hospital) because he came straight from the outpatient clinic. They then have an informal chat - the PIU nurse says about the number of patients that have arrived in PIU, the ward nurse says, 'You've just had one of ours' (referring to a patient that was moved to PIU).

Whether the verbal handover is face to face or over the telephone, a limited number of questions are asked by the nurse receiving the handover, focusing on issues that have relevance for nursing care, e.g. whether the patient has a catheter, their mobility, the diet that is required. The following fieldnote extract, which describes a verbal handover via telephone from the EAU, includes more questions than is typical but gives an indication of the types of questions asked:

2:45 p.m. One of the nurses takes a telephone handover from the EAU. She responds with lots of 'okay's and then asks a series of questions: 'Does he have a catheter?'

'He doesn't have a catheter, he's continent?' 'Has he had his bowels open?' 'Do you know anything about his social situation?' 'Is he being nursed in bed?'

In a face to face verbal handover, the patient's medical record gets handed over at the end of the handover, and occasionally the two nurses will together look through the medical record during the handover. In a verbal handover via telephone, the receiving nurse does not have access to the record during the verbal handover and there is a delay between receiving the verbal handover and receiving the written documentation, the medical record arriving with the patient. Whether face to face or via the telephone, the nurse receiving the verbal handover typically makes notes, normally on scrap paper.

5.2 Setting 2: Emergency assessment unit

Before a patient can be transferred from A&E to the EAU, agreement has to be given by the coordinator (a role taken on by one of the nurses for each shift) that there is a bed available. This is done by telephone. During this telephone call, basic information is given: the patient's name, gender and whether they require a 'side room', as opposed to a bed in a multi-bedded bay. As in the previous setting, if a bed is available, the ward has little choice in whether or not to accept the transfer. However, nursing staff may question the appropriateness of the transfer, both in the verbal handover and amongst themselves. What they are questioning is the appropriateness of admitting the patient to hospital, which is what the transfer from A&E to EAU represents.

When it is agreed that a patient will be moved, the patient's name is written on the whiteboard by the appropriate bed number. Patients are then brought to the EAU from A&E, escorted by a porter and an A&E nurse. They will check the whiteboard to see which bed the patient is to be in and move the patient to that bed. Once this is done, a verbal handover takes place between the A&E nurse and an EAU nurse.

The verbal handover is face to face, taking place either by the nurses' station or in the corridor, depending on where the EAU nurse is when the A&E nurse finds her. The verbal handover is typically given to the nurse that will be looking after the patient but, if that nurse is not available when the A&E nurse arrives, the verbal handover might be given to another nurse on the ward, who then passes this information on. This reflects the need of A&E staff to hand over patients quickly and keep the flow of patients through A&E going, in order to meet the Government target of a maximum four hour wait for patients in A&E.

The verbal handovers are typically brief, lasting a couple of minutes, and are often rushed. As in the general medical ward, they are fairly consistent in their content and structure, with the following information being handed over: name, age, presenting complaint, any relevant past medical history, and the plan for care, including any medications that had been prescribed. Often also mentioned is who the patient had so far been seen by, i.e. whether they have seen the EAU/medical team (or whichever other specialty they have been referred to, e.g. surgery) or only the A&E medical team. Any investigations that have been done, most frequently blood tests and x-rays, are mentioned, although the results are typically not available at this stage. If a diagnosis, or a preliminary diagnosis, has been made, this is handed over, although

often a diagnosis has not been made by the time the patient is transferred. Information about observations is sometimes given, although this is generally just a comment that the 'obs' are 'stable', 'fine' or 'okay', as is the following fieldnote extract:

4:02 p.m. A patient is wheeled in on a bed from A&E by two porters, with the A&E nurse walking alongside. The patient is moved into one of the side rooms. Once the patient is settled, the A&E nurse comes out and asks who she needs to hand over to. She hands over to one the EAU nurses. A summary of what was said: name, age, pregnant, nauseous, vomiting, diarrhoea (the EAU staff would already have been told about the diarrhoea when A&E gave them the name of the patient because that is why she was given a side room), bloods have been done. As she is going through this information, she is pointing at the relevant parts of the A&E form. She turns to the page where the obs are written but doesn't say anything about them, instead saying, 'So that's it basically.' The EAU nurse looks down at the obs (actually bending her head down, as if trying to read them). At that point, the A&E nurse says, 'Obs are okay.' The EAU nurse questions why they are admitting her: 'Does she need to be in hospital?' The A&E nurse says that the patient is too weak to do anything. […] The EAU nurse didn't make notes during this handover. It took place at the nurses' station.

As in the fieldnote extract above, the A&E nurse typically reads from the A&E form, holding it so that the EAU nurse can also look at it and sometimes pointing to the relevant pieces of information as she mentions them. In contrast to the general medical ward, the EAU nurses generally do not make notes. Following the verbal handover, the EAU nurse then writes on the whiteboard the time at which the patient

arrived in the ward and uses information from the A&E form to complete the front page of the EAU nursing form.

5.3 Setting 3: Paediatric surgical ward

When a patient is ready to be transferred from theatre back to the paediatric surgical ward, the recovery suite telephones the ward and a nurse goes to collect the patient as soon after this as is possible, normally leaving in a matter of minutes. In this setting, it is assumed that the transfer will be accepted.

A verbal handover is given from one of the theatre nurses to the nurse from the paediatric surgical ward that is looking after the patient. In contrast to the general medical ward and the EAU, the verbal handover takes place in front of the patient, next to the patient's bed in the recovery suite. Also in contrast to the other settings so far considered, the patient will have been on the ward before going to surgery and so the nurse may already have met and looked after the patient. At least one parent is typically present and they may on occasion contribute information or be given information by the theatre nurse.

The verbal handovers are face to face and, as in the other settings, typically very brief, taking three or so minutes. While the order in which information is given varies, the following is normally covered: the reason for the operation and any relevant past medical history, what was done in the operation and any subsequent nursing care such as the application of a dressing, the patient's subsequent observations, any post-operative care that is required, when the patient can be discharged, and details of

medications. Discussion of the post-operative care that is required may be brief, as shown in the following fieldnote extract:

At 11 a.m., I go down to theatre with one of the ward nurses, to collect a patient. When we get down to the recovery bay, the patient's father is with her, holding her hand and the theatre nurse is by the bed. The bay is quiet. The patient seems dozy. The theatre nurse asks the ward nurse, 'Did you know her [the patient] before [the operation]?' The ward nurse says that she had seen her briefly before she went to theatre. The theatre nurse gives the patient's name, age, 'no medical problem', 'lump in her ankle and she can't move the joint', 'observations normal'. The ward nurse asks if the lump was a cyst. Both the father and the theatre nurse answer this question, saying no, the bone was joined. The nurse explains that they cut away some of the bone. Looking at the anaesthetic record, the theatre nurse tells the ward nurse what pain relief was given and when. She says that the surgeons don't want her to have any more morphine. The ward nurse asks, 'Is she written up for anything else?' At this point, the theatre nurse picked up the drug chart and read out the names and amounts of drugs that had been prescribed. The theatre nurse said that the 'surgeon spoke to the parents' and the patient can go home tomorrow. 'Nothing special instructions, just normal protocol [said while looking at the post-op instructions]. And that's it really.' The ward nurse didn't make any notes in the handover. The medical record was handed over and then the nurse went to get a porter to take the patient back to the ward. The handover itself took about 3 minutes.

As shown in the extract above, communication is largely one-way with limited asking of questions. The ward nurses typically do not make notes. The following documents

are handed over at the end of the verbal handover: the full medical notes, including a post op plan; the pink anaesthetic form, which gives the anaesthetic record from during the operation in the form of a minute-by-minute chart plotted along with other readings including blood oxygen saturation level, temperature, respiratory readings and other blood gas plots; the fluid chart; and the yellow drug chart. Sometimes the theatre nurses refer to these when handing over, while on other occasions they appear to talk from memory.

Once the verbal handover is complete, any intravenous drugs being given are moved onto the bed, any monitoring equipment is detached from the patient and the medical record is handed over. The ward nurse then escorts the patient back to the paediatric surgical ward, where the ward nurse takes over care of the patient.

5.4 Setting 4: Paediatric acute retrieval service

When a team from the paediatric acute retrieval service (temporarily) takes over care of a child in order to transfer them to a PICU, they receive information about the patient in two stages. If a DGH has a paediatric patient that they consider needs to be transferred to a PICU, typically the specialist registrar (SpR) looking after the patient will telephone the retrieval service. Calls are answered by the administrator who first takes basic details about the patient and details of the person who is calling, before transferring the call to a junior doctor and nurse. In certain situations, such as neurosurgical cases or when the junior doctor has recently joined the service, the on duty consultant also joins the call.

Following the call, the junior doctor and nurse will discuss the case with the on duty consultant and decide whether or not to retrieve the child. This decision is based on whether the child needs intensive care (as opposed to, for example, care in a High Dependency Unit) and whether the child is stable enough to survive the journey to a PICU, as well as less explicit factors such as how well staff at the DGH appear to be managing. In some cases, if there is not an urgent need to move the child to a PICU, the paediatric acute retrieval service will advise on care and remain in touch with the DGH to see how the child progresses, possibly later making a decision to retrieve the child. On making a decision to retrieve the child, a retrieval team will travel to the DGH. However, the decision is still not certain; on arriving at the DGH, the retrieval team may decide that the child is not stable enough to be moved. Before finally leaving the DGH, to take the child to the PICU, the retrieval team must get agreement from the on duty consultant that the transfer can go ahead, again based on an assessment of the child's condition.

The retrieval team is made up of a junior doctor, a nurse, an ambulance technician and, on occasion, a consultant. On arrival at the DGH a further verbal handover takes place, often at the patient's bedside or just outside the patient's room. This involves all of the clinical members of the retrieval team that are present (the junior doctor, the nurse and the consultant if they are attending) and the SpR who has main responsibility for the child, ordinarily a paediatric or neonatal SpR. There may also be other SpRs present, such as a surgical SpR or anaesthesia SpR. The nurse who has been looking after the child may also be present for some or all of the verbal handover, although they normally have limited involvement in the verbal handover.

Members of the child's family may also be present, although they are sometimes asked to leave while the verbal handover takes place.

The initial referral varies in duration, lasting anywhere from 5 minutes to 25 minutes. The face to face verbal handovers at the DGH that we observed varied from a less than one minute brief update and handing over of blood gas results to fuller handovers of approximately ten minutes. It is also difficult to estimate the duration of some of the verbal handovers that were observed because there is not always a clear ending of the verbal handover, with staff continuing to ask questions of and receive information from staff at the DGH while engaged in treating the child.

There is no obvious structure in the information handed over in the initial referral. The retrieval service have a policy of allowing the person calling to say what they feel they need to say and then asking questions to build up a fuller picture, although this is not always what happens. The content of the referrals focuses on 'hard data' about the patient state and details of treatment/care given, as shown in the following fieldnote extract:

3:55 p.m. A referral comes in. Both the junior doctor and nurse take the call in the admin office (the junior doctor facing the wall, while the nurse is at one of the administrators' desks, so that the junior doctor has his back to the nurse), while I stay in the junior doctors' room. The person calling says that the child has chickenpox which the mum had treated at home with nurofen. That morning, he had woken with a temperature of 39 and had swelling on the right side of his face. Mum took him to the GP. His blood pressure was 88/40. They've given him a bolus. She goes through the

drugs that they have given him. He's had a CT scan but they don't have the results yet. His blood pressure is now 68/27. She wants to know if they should carry on with the bolus. She says that the boy is wide awake, talking. The junior doctor asks what his heart rate is, and she says its 125. The junior doctor says that is high for a 9 year old. He asks if the boy has passed urine; yes. He asks if they have given him albomin; no - they want to know if it would be safe to do so and should they give it to him there or should he be moved? The junior doctor says that the boy needs fluids. She then goes through the blood results. The junior doctor asks if she has a lactate level? A blood sugar level? 'These are after the fluid?' 'No, before.' He asks for the urea and creatin. He asks if they have done a 'chest x-ray, scans?' 'No.' 'Neurology wise, he is quite active?' […] The call lasts about 10 minutes.

In the initial referral, there is an asymmetry in the information representations that the person giving the handover and those receiving the handover have access to. The SpR at the DGH has access to the patient record, print outs of blood gases etc. and images such as x-rays, as well as the patient themselves. In contrast, the retrieval team only has access to the verbal information given in the handover. On occasion, the DGH may upload images for staff at the retrieval service to access but they will not be available in the initial referral. During the call, the junior doctor begins to fill in the medical part of the referral form with the information that they are given. The nurses may make notes on scrap paper.

The face to face verbal handover at the DGH is typically led by the local SpR and in such instances the name and age are given, followed by the 'admission story' and information about patient state and treatment given. This information is largely

ordered chronologically, rather than by type of content. The following fieldnote extract describes the beginning of one face to face verbal handover:

4:40 p.m. We arrive at the hospital and find the maternity ward. The nurse goes up to the parents, who are stood by the cot, and introduces herself and the junior doctor. The parents are asked to leave while the verbal handover takes place - they go to sit in the visitors' room. The handover takes place by the bed. The DGH SpR says, 'Mum is [mother's full name] […] This is a unbooked pregnancy. Mum's age is (pause) around thirty, thirty three years, she's Caucasian. Um, dad is [father's full name]. Essentially, this is mum's third pregnancy. The first pregnancy two were pretty much normal. This is the second baby from the same relationship. […] So kind of delivered yesterday at home, um, in morning at around eight twenty um where no medical team was involved. […] So the midwife was called for postnatal check today, she went there and found the baby blue. Um, so she couldn't feel any femoral pulses so she kind of er blue lighted him over.'

As in the referral, hard data about the patient state and information about care and treatment given, particularly medications and fluids, is provided. The most frequent information given about the patient state refers to the results of investigations such as x-rays, ultrasound scans and CT scans, blood gases, the result of blood tests and blood pressure. The following extract is from the face to face verbal handover introduced above:

DGH SpR: 'Um, both femoral as well as brachial pulses were very weak to palpate. […] Um, there's no murmur as such, he's breathing in air um um spontaneously

without any respiratory distress. Was making appropriate noises […]. His abdomen was soft […]. His […] post ductule saturation was seventy seven per cent, preductule between seventy five and seventy seven per cent although we picked up saturations only after fifteen to twenty minutes after admission. […] Um, we tried to kind of um give head box oxygen and see whether he improves but even at around sixty to seventy per cent head box oxygen, the saturation just remained the same. […] Um, he's got two boluses of ten mils per kilo of normal saline given, one on the advice of the [retrieval service] team. […] So erm, the blood pressure, yeah, the blood pressure's have generally been stable. They have been forty eight, forty nine mean, um initial blood pressure of seventy one.'

In these verbal handovers, not only is much more information handed over than typically observed in other settings, a result of the complexity of the patient's condition, but specific features of the communication are observed that are absent in other settings. In describing the care and treatment provided, the SpRs explain their reasoning, as shown in the following two fieldnote extracts:

'So it was a little bit tricky, we weren't sure whether he was an osteomyelitis on a background of something chronic. [unclear] because we've seen something quite similar which ended up being an SLE. So he had a sort of auto immune and that sort of screen done and screen but we started on antibiotics.'

'It doesn't look like it's a collapsed consolidation […] because he hasn't lost a lot of lung (unclear) and there may be something going on the left side, and it may be the lingula, because it's typically not well defined.'

What these extracts highlight is the ambiguity of the situation, thus requiring the SpR to make their reasoning explicit.

The SpRs also describe the opinions expressed by colleagues, making visible the collaborative nature of the work. As those giving and receiving the handover are not familiar with the organisations in which each other work, and the people working within those organisations, it is necessary to explicate who was involved and what their role was in relation to the patient, another contrast with the other settings.

A noticeable feature of the verbal handovers from the local hospital is the use of acknowledgement tokens by the retrieval team - ‘okay’, ‘u-huh’, ‘alright’, ‘excellent’, ‘sure’. These show that the team have heard and understand, but the use of positive terms such as ‘excellent’ also works towards building a positive relationship with the local team.

The retrieval team take the referral form with them to the DGH. In most cases no notes are made by the retrieval team during the face to face verbal handover at the DGH. Once they arrive at the DGH, the retrieval team also have access to the patient and information provided, for example, via monitoring equipment. Print outs of blood tests get handed over as they become available. X-rays and CT scans may be viewed. Photocopies of all patient notes and drug charts are made by staff at the DGH and images are copied on to CD. The retrieval team take these with them when they leave. However, these typically are not looked at by the retrieval team while at the DGH.

6. Discussion

The accounts of handover presented above demonstrate that the term 'patient transfer' describes a range of practices that vary in their form and content and therefore how misleading analysis of only one setting could be. While all the handovers are concerned with the transfer of responsibility for, and information about, a patient and involve both written and verbal communication, we see variation in the types of information transferred, the amount of information, how that information is organised (a standard structure versus the chronological presentation of information), who participates and where the participants are located, access to and use of artefacts, and the nature of the communication such as the extent to which questions are asked. How the handover takes place appears to be influenced by a range of factors, such as the workload, staffing levels, the roles and responsibilities of those participating in the handover, the patient history and state, the artefacts that are available at the time of the verbal handover report, and the goals of those participating in the handover.

One could argue that, rather than undertaking multi-site workplace studies, what is needed is to look for commonalities across studies undertaken separately (Schmidt et al. 2007). However, it is not only that multi-site workplace studies can enable us to identify commonalities, but seeing the differences across settings focuses our attention on aspects of work practice that we otherwise may not notice. For example, it was in comparing handovers across settings that our attention was drawn to the differing goals across the settings of those participating in the handovers. In the EAU, the A&E nurses are concerned with keeping the flow of patients moving, while the EAU nurses appear as gatekeepers, often questioning the need for the patient to be admitted to hospital. Where those collaborating have not done so before or do not collaborate

frequently, particular goals can become important which are not visible in other contexts, so that in handovers from the DGH to the paediatric acute retrieval service, members of the retrieval team use the handover to build a relationship with the staff at the DGH.

Below we consider a particular aspect of the settings, that of the level of heterogeneity between those giving and receiving the handover, and the implications that this for the handover process. We then make suggestions for the conduct of multi-site workplace studies and how they can feed into design.

6.1 Heterogeneity and patient transfer

Heterogeneity and what it means for processes of collaboration is a topic that has previously been explored in CSCW studies of health care. For example, in their study of a surgical intensive care unit, Reddy et al. (2001) describe the different views of patient data required by different clinical roles in order to reflect their different priorities and to support their different tasks, while Fitzpatrick (2004) describes how the flexibility of the working medical record supports a range of clinicians, with a variety of forms providing different clinician-centric views of work.

In comparing handovers across the settings, we began to consider the heterogeneity amongst those participating in the handover and the consequences that had for how the handover took place. While all participants in the handovers in the general medical ward, the EAU and the paediatric surgical ward are nursing staff, those giving and receiving the handover work in different clinical areas and so can be expected to have different concerns. However, this does not appear to present problems for the

participants in the handover. Within these handovers, those receiving the handover ask limited questions, suggesting that they receive the information that they require; the standard structure of the handover appears to be enough to bridge the gap between their different clinical areas. This is in contrast to previous studies of collaboration between different clinical roles and units that highlight the difficulties involved in heterogeneous collaboration and the articulation work needed to support that collaboration (Færgemann et al. 2005).

Linked to the issue of heterogeneity is the frequency with which the collaboration takes place. In the general medical ward, the EAU and the paediatric surgical ward, they collaborate frequently with those that they receive handovers from. The routine nature of their collaboration, supported by standard artefacts that all participants are familiar with, makes the standard structure of the handover possible. Due to this frequent collaboration, shorthand descriptions are often adequate, such as referring simply to the need for 'routine post-op care' in the handover to the paediatric surgical ward, rather than having to give a detailed account of what is meant by that. It is not just that the stable condition of the patient means that a description of the vital signs as 'okay' is adequate but also that both those giving and receiving the handover have a similar understanding of what is meant by 'okay'.

In this respect, the paediatric acute retrieval service is very different from the other three settings that we studied. They receive handovers from a high number of DGHs and are often collaborating with clinicians with whom they have had no previous contact. During the field study, the junior doctors and consultants in the retrieval service talked of the difficulty of judging the adequacy of the SpR's assessment of the

patient. While in other settings a limited number of questions are asked and these appear to focus on gathering further detail on information already provided, the junior doctor in the retrieval service has to work harder to get the information that s/he requires. Without having previously collaborated and without any shared standard structure or artefacts to guide the handover, it is difficult for the SpR to anticipate what information is required. It is not just that the SpRs do not always offer the necessary information but that they sometimes do not have that information available; if they are unable to anticipate the information that the retrieval service need, the necessary blood tests and patient observations may not have been done.

Our findings suggest that when designing to support collaboration in healthcare it is not enough to simply distinguish between homogenous and heterogeneous groups. Collaborators may have different roles and priorities yet frequent collaboration and standard processes enable that collaboration to occur with little difficulty. Thus we suggest that a more fine-grained analysis of the nature of the heterogeneity is required. We should be concerned with the extent to which collaborators know and understand each other's work, the frequency with which they collaborate and the structures in place to support that collaboration.

6.2 Implications for workplace studies

A call for multi-site workplace studies naturally raises questions of the number of settings required, how to select those settings and how to analyse the collected data. Our intention here is not to prescribe particular methods or to provide a comprehensive review of available methods. Rather, our intention is to briefly review those approaches that have already received attention within CSCW, considering what

they offer the CSCW researcher, as well as other approaches that appear to have particular relevance in light of the concerns of workplace studies.

The number of settings is likely to be determined by the practicalities of resources and access and thus on this we give no recommendations. However, through a study in just two organisations, de Souza and Redmiles (2007) were able to draw out several factors that can impact on the collaborative practices of software development teams, demonstrating that adding just one additional setting can result in important findings.

The choice of settings can be made before data collection begins, drawing on previous research to determine in which aspects of the context there should be variation across the settings, or as data collection progresses. Within the context of CSCW, interest is in collaborative practices and therefore settings should be selected that provide access to the 'same' collaborative practice. In determining whether the collaborative practices are 'the same', or similar, one can draw on the commonsense understandings of those in the setting (Sharrock and Randall 2004), even if subsequent data collection and analysis reveals variations within those collaborative practices, as we found with patient transfer. Obviously, such an approach requires data collection and analysis in one setting before selecting further settings.

Theoretical sampling, as used in Grounded Theory, is one approach that could be used for identifying further settings (Glaser and Strauss 1967). The researcher moves between data collection, analysis and further data collection, using the emerging theory to select new settings. With such an approach, the researcher is responding to the data collected, rather than being blinded by previous research on the topic. Again,

practicalities of access will again influence the decision of which settings to study but where possible, having studied one setting and analysed the data from that setting, further settings could be identified where the 'same' collaborative process exists but where there is variation in those aspects of the context that those in the setting attend to. We return to the issue of context and how it is to be dealt with below. Further guidance on the issue of sampling can be found in Miles & Huberman (1994) and Yin (2003).

An important issue is how to approach the analysis of data from multi-site workplace studies. Ethnomethodology focuses on explication of the detail of work practice (Garfinkel 1967). We consider that understanding the detail of work practice is essential for the creation of workable systems. We are suggesting that such detail is sought across multiple settings and, having explicated that detail, an attempt is then made to compare findings from across the settings. Here we are not talking of seeking to make an analytical contribution in the way that Dourish proposes, but instead seeking the commonalities and differences between settings (although elsewhere we have described how our studies led us to reconceptualise handover (Wilson et al. 2009), which may be closer to Dourish's notion of an analytical contribution).

In thinking about how to undertake such between-case analysis, we do not wish to give a predefined list of the features of the settings that should be considered. Again, it is useful to consider the ethnomethodological perspective. It has been argued that ethnomethodology's focus on the moment–by–moment interaction tends to underestimate the influence of contextual factors (Chalmers 2004). In fact, what ethnomethodology rejects is what has been referred to as the 'bucket theory of

context' (Drew and Heritage 1992), where some pre-established set of categories, such as gender or class, are viewed as determining or at least explaining members' actions. Thus, rather than treating members as 'cultural dopes' in this way, ethnomethodology chooses to restrict its concern to those elements of context that those in the setting treat as relevant (Garfinkel 1967). We argue for focusing on differences in the observable features of the work and paying particular attention to those elements of the context that those in the setting attend to. Through comparing findings from across multiple settings, the haecceity (or the 'just thisness') of a particular process within a particular setting becomes apparent, satisfying one of the objectives of ethnomethodological studies of work practice (Lynch 1993). We do not wish to recommend particular methods for such between-case analysis; while we used the constant comparative method (Glaser and Strauss 1967), other sources provide details of a range of approaches available (Miles and Huberman 1994; Yin 2003).

6.3 Implications of multi-site workplace studies for design

This paper began by reviewing some of the arguments about the relationship between workplace studies and design. Having made an argument for multi-site workplace studies, in terms of the understanding of work practice that they offer, it is appropriate to consider what the consequences of this would be for design. We consider that multi-site workplace studies provide a means through which we can give designers tools that enable them to anticipate what the needs of a particular setting might be, by highlighting features of a setting that impact the collaborative process of interest.

Taking the example of patient transfer, our findings suggest that a 'one size fits all' approach to technological support is not appropriate. For example, we can contrast the

paediatric acute retrieval service with the other settings, in terms of the level of detail of information required and how that should be structured. In the EAU and the paediatric acute retrieval service, we see less certainty in the information, for example in terms of the diagnosis, so that for these settings an important issue is how such uncertainty, and the voice of different participants, is represented and dealt with by the system. At a more abstract level, but with important implications for design, we also see how the goals to be supported by the system vary according to the setting, as described above.

A key issue when thinking about technological support for patient transfer is the level of heterogeneity and, consequently, the ease with which those receiving the handover are able to gather the information that they need to enable them to care effectively for the patient. Where collaboration is frequent, technologies may focus on supporting electronic handover of information, using structures already provided by and used within existing paper-based artefacts. Where collaboration is infrequent, and particularly where collaboration is at a distance, technology could firstly support those giving the handover in gathering the necessary information. Alternatively, it could provide those receiving the handover with direct access to the patient information, such as laboratory results and patient observations, rather than relying on those giving the handover to draw out the necessary information.

7. Summary

To conclude, this paper has presented the findings from a study of patient transfer conducted across a range of clinical settings. Through this analysis we have demonstrated the potential for multi-site workplace studies to contribute to CSCW,

enabling designers to anticipate the needs of a particular setting by highlighting features of a setting that impact the collaborative process of interest.

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