From the Certainty of Information Transfer to the Ambiguity of Intuition

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ABSTRACT
Handovers between shifts are known causes of preventable adverse events in hospitals. In order to gain an insight into the information transfer that occurs between shifts of senior staff in an emergency department, we observed handovers, interviewed practitioners and distributed questionnaires. We found that merely considering the transfer of "hard data", such as patients' heart rate, blood pressure, etc. can be insufficient: the transfer of "soft data" such as the ambiguity of intuition is also a central aspect in this type of work environment and vital for successful cross-coverage. We describe design concepts that address capture, visualization and transfer of intuition for the handover process. Addressing the issue of intuition support can be a challenge but also a rewarding opportunity for human-computer interaction research in supporting health care handovers.

Author Keywords
Intuition, handover, knowledge transfer, medical, tacit knowledge, continuity of care, ambiguity.

ACM Classification Keywords
H5.m. Information interfaces and presentation (e.g., HCI): Miscellaneous.

INTRODUCTION
The time where a single doctor takes care of a patient during the entire treatment in a hospital is long gone; specialization and restricted working hours for health care staff require several teams to juggle responsibilities. However, continuity of care is critical, especially in medical environments such as hospitals. Often tasks take longer than a single person can handle continuously, and others take over, usually after a predetermined period, and continue the work in substitution for the person leaving. This transition usually includes a transfer of responsibility, taking away the responsibility of the leaving person and passing it on to the incoming person (Perry, 2004).

Handover, which is used interchangeably for signover (Perry, 2004), handoff or signout (Van Eaton et al., 2004), is "a mechanism for transferring information, primary responsibility, and authority from one or a set of caregivers to oncoming staff." (Perry, 2004) Generally speaking, handovers between shifts aim at preserving the flow of activities – ideally, so that the oncoming person can act and interact as if they had been present and engaged in all the previous activities (Patterson, 2001).

Comprehensive information transfer between outgoing and incoming teams or individuals is essential for successful continuity of patient care; however, it is limited by intense time pressure, restricted availability and frequent interruptions, all characteristic for health care work (Coiera, 2000). It is therefore not surprising that handovers "create the potential for error" (Cheah et al., 2005), due to critical information not being passed on adequately between the shifts. This can result in a lack of a "shared picture" (Perry, 2004), which has been "shown to lengthen hospital stays, increase the amount of laboratory tests, and increase self-reported preventable adverse events" (Van Eaton et al., 2004). (AHRQ website, 2006) illustrates how failed handovers contributed to a patient's death. However, handovers can be both, a source of failure and a source of recovery (Patterson et al., 2004), (Wears et al., 2003). An improved handover that eliminates the dangers and improves the opportunities therefore has the potential to improve patient care significantly.

Despite the risks associated with handovers (Petersen et al., 1994), the nature of modern hospital work requires the existence of shift work, which will increase because legislation moves away from long hours to compulsory shifts. Patients are also having more simultaneous illnesses (due to increasing average age), requiring the care of multi-disciplinary teams (Alpay et al., 2004), creating an even greater demand for effective transitions.

We describe how we explored the issue of effective information transfer during handovers. We focus on senior health staff in a metropolitan hospital with 335 beds, in particular on the emergency department with its time-critical, high-stress environment. The handovers we observed occurred 3 times a day: morning (7am), afternoon (3pm) and night (11pm), and were semi-structured, with most of them carried out in a separate room with in- and outgoing teams present, discussing patient by patient with the aid of a patient list.

RELATED WORK
Perry reports that "…surprisingly, signovers among physicians have hardly been studied, most research in

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health care involves nursing shift changes" (Perry, 2004). (Van Eaton et al., 2004) and (Wears et al., 2003) are examples of studies investigating handovers between physicians. Many more deal with nurses' handovers, e.g. (Wallum, 1995) (Sherlock, 1995) (Lally, 1999). We therefore focus on the handover of registrars and consultants, who hold most of the senior positions in a hospital.

A study opposing handovers, which resulted in the abandonment of the handover process in exchange of an extensive use of patient records is described in (Wallum, 1995), but focuses on the handover between nurses. Other studies argue for the necessity of handovers: "I would not be able to work without it" (Sherlock, 1995). IT augmentation exists, (Van Eaton et al., 2004) describes an electronic system for downloading patient information prior to handover, and reports on rapid popularity of the system. (Dynamic Solutions, dynamic.net.au, personal communication) has developed a computerized system for more effective handovers, and (Cheah et al., 2005) reports on such use towards safer medical care. (Petersen, 1998) describes that computerized sign-outs can possibly reduce the number of preventable adverse events during cross-coverage. However, these systems are mainly concerned with "hard facts" about the patient, which can be limiting, as our findings show (Mueller et. al., 2006).

DATA COLLECTION

Observation

We observed nine handovers of senior staff in the Emergency Department passively in the back of the room while taking notes about its nature, where all participants were briefed about the reason for our presence.

Although we are aware that our presence might have influenced the procedure, the handovers often involve new participants (new staff, clinical visitors, etc.), so encountering a stranger during the handover meeting is quite common.

Interviews and Focus Groups

We discussed the Emergency Department (ED) handover process with the senior ED nurse and one of the ED consultants, interviewed 3 health care professionals and conducted focus groups. We selected different participants than from the questionnaire pool so as to not influence the responses.

Follow-around

We followed a registrar during her night-shift to record the impact of the handover on her routine and to investigate the nature of interruptions that occurred during her shift. This was in direct response to some of the interviews in which participants stressed the high-level of interruptions they receive. In addition, we followed the ED disposition nurse for a few hours during the day, to get a feel for her work.

Questionnaires

In order to substantiate our initial findings from the observations and interviews, we developed a questionnaire that we handed out to registrars and consultants after their handovers. We acquired 16 forms from 7 different handovers in the emergency department.

Demographics

The participants were experienced in their professional position (median 33 months), were familiar with the local handover practice, and all of them (except the interns) brought in experience from other hospitals.

Rating Scale

The volunteers answered the questions on a common Likert scale (Bortz et al., 2002) from "Strongly Agree", "Agree", "Neither Agree nor Disagree", "Disagree" to "Strongly Disagree"; however, due to the limited number of responses, we combined the two outermost responses to work with a 3-point scale. Questions were of a format like "I am satisfied with this handover" or "I felt confident going onto my shift after receiving this hand-over". The first 12 questions referred to the handover given, the next 17 questions referred to the handover received. Six questions were of open-ended format, and basic demographic information was also asked for. The questions were presented in a random order to minimize a sequence effect. Some were also negatively formulated, so as to avoid repetitive response patterns (Rotter, 1967).

RESULTS

Observations

The handovers we observed revealed interesting insights into the process of information transfer. We could sense an attempt to structure and formalize them, mostly initiated by the responsible supervisor, but they were dominated by the ad-hoc time-pressing environment of the hospital. During each handover observed, participants arrived late due to other commitments, or had to leave early to attend patients; interruptions through pagers and mobile phones were frequent.

We observed handovers in which the hierarchy of the participants' professional positions determined the order of the handover process: first the outgoing consultant briefed the incoming consultant, and then the outgoing registrar briefed the incoming registrar.

Due to the time-pressing environment, it is usually the most senior person's task to keep up the pace and remind others to move through the patient list quickly. Sometimes, updates occur during the handover process, for example new patients get admitted while the handover takes place.

On several occasions, we observed how incoming staff needed to ask several times "Who is he/she?" when a patient's name was mentioned, because they could not match a name with a person. In order to help out, others refreshed their memories by referring to specific characteristics such as "The confused woman" or "The girl with the big family". It became apparent that patients were often initially discussed around their quantitative data (e.g. age/amount of medication/days of stay), but subsequently assessed emotionally ("Ah, him! Yeah, I do not feel good about this guy").

Not all senior staff deal with all patients, therefore it is likely that a discussion around patients can occur which only affects a subset of staff. This leads to times where busy health care professionals are idle, waiting for their next relevant case to be discussed. This could be an opportunity for time-saving by providing only relevant information through a better structure.

Interviews

We discussed our observations and brought them forward during open interviews we conducted with five senior emergency department staff. The participants pointed out several issues we did not anticipate initially as being essential for the information transfer: in particular, "subtle hints" play an important role during the handover. These hints, which we encountered during the observations and regarded as emotional anecdotes, do not make it into the patient's record, but contain essential information for the incoming doctor to effectively manage the next shift. These hints could be "This patient does not know what's going on with her" or "His family always asks strange questions" or "He says he never had that before, but I don't believe him."

It was also explicitly mentioned by two interviewees that the information exchange depends on the trust the registrar puts into his/her colleagues. "If I know this person and trust him/her, I don't need to ask many questions, but if she/he is new or I don't trust him/her, I double check everything."

Furthermore, one of the most pressing questions the health care professionals often have is "Is the patient ok?" which requires a very personal, intuitive response to a very vague-sounding question, they reported. This personal opinion was described to be essential, but often underrated in the understanding of the handover process.

The interviewees mentioned the word "intuition": They wanted to know, as the incoming doctor, what the outgoing team's "feeling" was about the patients, or a personal assessment of the patients by the last shift's team, something they cannot get out of the patients' records. One registrar called it the "gut feeling", and he expressed how difficult he finds it to convey this to the next shift. The "gut instinct" can surface through expressions such as "this patient is a difficult man", "I don't like it if patient X always asks for drug Y" or "patient Z does not make me feel good". These statements, which we also heard during the observations, contain rather ambiguous information, but were described by the interviewees as being an essential part of the handover process and necessary for an effective preparation of the next shift.

We began to realize that transferring the "hard" patient data from one shift to another is only one component of a successful handover, another component is providing an exchange platform for this "soft", ambiguous data, the other team's "feeling" of a patient's state. Handovers have previously been described as being "more conversations than transactions" (Perry, 2004), and (Coiera, 2000) makes a distinct differentiation between communication and computational systems. These observations are in accordance to our findings and support the recommendation to not formalize or control the handover process (Perry, 2004), because of the risk of losing the ambiguous component.

Follow-around

Interviewees suggested that a better handover could lead to improved team coordination, which would result in fewer interruptions, hence improving care. The dynamic and fluid nature of health care includes frequent interruptions such as a colleague asking a question, mobile phone calls, pager requests etc. These interruptions were described as disturbing and it was suggested that they could be reduced by an improved handover.

We therefore decided to follow a registrar around during her shift in order to gain an insight into the results of a handover, i.e., how influential a handover is on a shift, to understand the causes and effects of interruptions. We chose a registrar who was not a participant in the interviews to avoid a bias. After the registrar had received a handover, she was accompanied by a note-taking researcher during her shift. The researcher followed the registrar around to all locations, and asked the registrar to comment on the performed tasks where appropriate, and how it related to the handover received.

However, our follow-around experiment showed that the interruptions are highly diverse and most often do not relate to information given (or omitted) during the handover process. Health care professionals have different experience levels and areas of expertise, and often need to interrupt their peers to seek timely information not available otherwise. Hence an improvement in handover information transfer does not necessarily result in fewer interruptions. We therefore decided not to investigate further in this direction; more information on communication and interruptions in an emergency department can be found in (Coiera et al., 2002).

Questionnaires

All of the 16 questionnaires collected contained usable answers to the questions on the handover that had just occurred. However, 4 respondents were not present at the handover at the beginning of the shift, so they did not respond to these questions, one respondent did not answer four general questions on handover, and another only replied to the first six questions on the handover at the beginning of their shift. A further five respondents did not answer the question "I felt confident going onto my shift after receiving this handover". We have listed the number of responses we received for each question when discussing the questions below.

We know that the small number of returned questionnaires is unlikely to provide significant results; however, for our target group of health specialists in a certain senior position, finding enough volunteers proved to be very difficult due to their limited time availability. Still, we are confident to state that the answers from the questionnaire can be seen as indicator and supplement to the findings from the interviews, supporting our results.

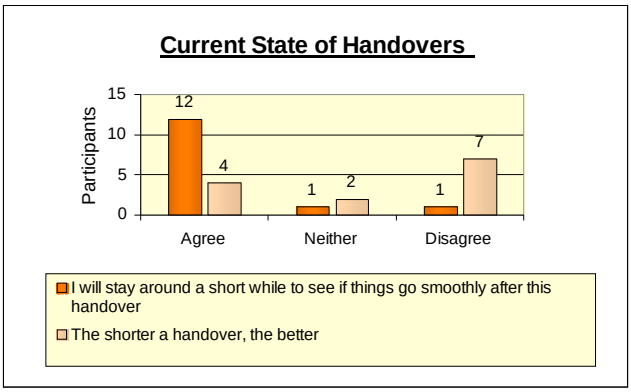

Figure 1. Current State of Handovers.

Current State of Handovers

The questionnaire revealed that most staff are satisfied with their handovers (11 out of 14 were in favour), a surprising result considering the significant risks associated with handovers (Brennan and Zinner, 2003) (Petersen et al., 1994). However, the current handovers are not optimal, as demonstrated by the answers to the question "I will stay around a short while to see if things go smoothly after this handover": The majority (86%) of participants stated that they sacrifice their spare time to make sure the transition takes place smoothly (Figure 1). The duration seemed to be acceptable for most participants: "This handover took too long" was not what 10 out of 14 respondents thought (3 indecisive). With regard to the question: "The shorter a handover, the better"; 4 were in favor, 2 indecisive and 7 disagreed (Figure 1).

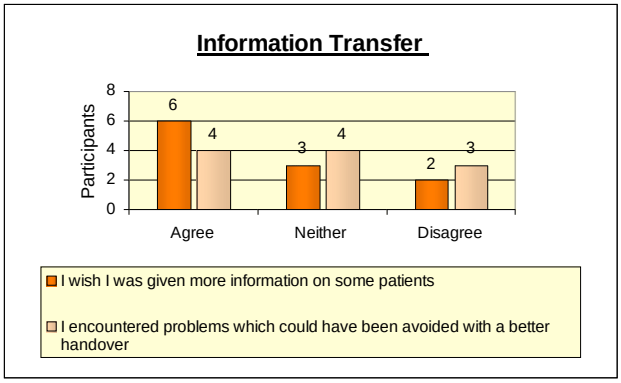

Figure 2. Information Transfer.

Information Transfer in Handovers

The practitioners wished they were given more information on some patients, and four out of the 11 who answered the question even believed that they had encountered problems in their recent shift which could have been avoided with a better handover (Figure 2). This is an alarming number. Two consultants received incorrect information, four participants were not sure whether they received incorrect information or not.

Intuition in Handovers

After we were prompted by the participants of the interviews on the role that intuition plays in their daily health care, we included questions regarding this topic in the questionnaire. Most of the questions regarding the importance of intuition were indeed rated highly, confirming the key role that "gut feeling" plays in the health care environment. Most notably, the registrars and consultants placed a high value on knowing how "worried" their previous shift was about particular patients (82% agreed; Figure 3). However, 7 out of the 10 respondents neither agreed nor disagreed with the most direct question we asked with regard to getting to know if a colleague was "worried" (Figure 3).

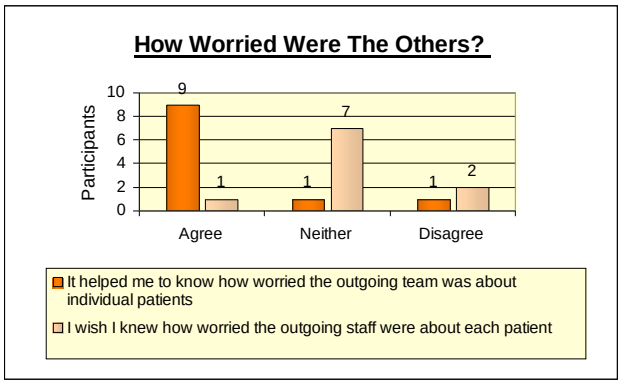

Figure 3. How Worried Were The Others?

However, the health care professionals were very actively involved in communicating their concerns (Figure 4), and believed they conveyed their personal assessment to their colleagues: "I communicated how worried I was about some patients" was answered favorably by 12 out of 14 participants, with none disagreeing. "I was conveying my personal assessment of the patients during this handover", was answered favorably by 13 out of 14 respondents.

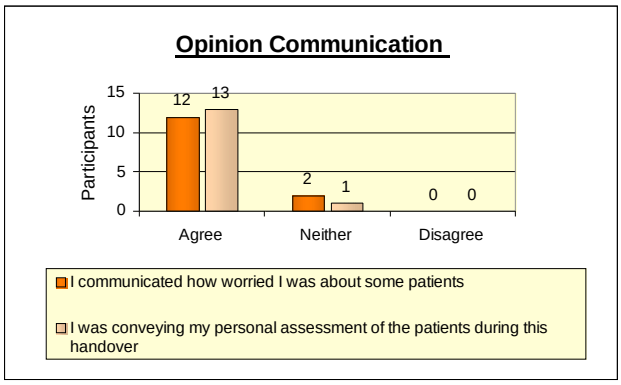

Figure 4. Opinion Communication.

The health care professionals confirmed that the more they were concerned about a patient, the more time they spent with that patient (Figure 5). "Knowing the gut feeling of the outgoing staff will influence how I prioritize my ward work" was also an important component for some staff (Figure 5). However, the participants were not under the impression that "We should have exchanged more about the outgoing team's opinion of the patients": 5 were indecisive, 4 disagreeing, 1 in favor, probably because verbal transfer of information already took place.

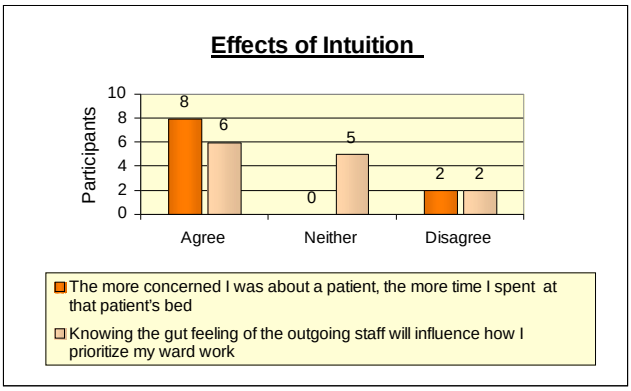

Figure 5. Effects of Intuition.

"If all the patient records would have been easily accessible, I would not have needed this handover" was strongly rejected by 71% (14% indecisive), thus strengthening the finding from the interviews that transferring "hard" facts is only one component of the overall picture (Figure 6). This was also supported by "We should have talked more about facts, less about feelings", with which 11 out of 14 participants disagreed (Figure 6). This supports the importance of communicating the "feel" for a patient's health state.

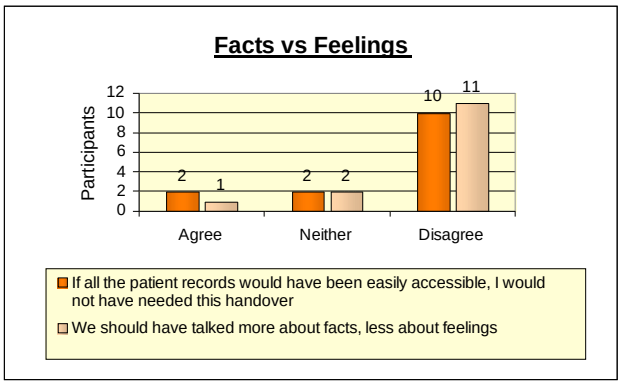

Figure 6. Facts vs. Feelings.

INTUITION

We have found indicators that intuition can play a substantial role in the handover between senior staff in an emergency department. Although it is acknowledged that handover processes are of "variable quality, lack standardization and organization" (Sherlock, 1995), formalized handovers have the potential to undervalue the role of intuition in the process, which might be the reason why some researchers are opposing a structured handover, as (Perry, 2004) summarizes: "…formalizing or controlling signovers may not be the best approach to reducing their risk". We therefore want to emphasize the importance of intuition for the handover process and elaborate on it.

Intuition in Health Care

Although intuition may be a very simple concept to understand, it is often difficult to acquire in practice. The Oxford English Dictionary describes intuition in a general sense: Direct or immediate insight (Intuition Oxford Dictionary, 2006); dictionary.com defines it as the act or faculty of knowing or sensing without the use of rational processes (Intuition Dictionary.com, 2006). Klein defines intuition as "the way we translate our experience into action" (Klein, 2003). These definitions describe what we observed and what we were told quite adequately by the health care staff.

Although acknowledging that intuition is often seen as "unscientific", Klein claims that up to 90% of critical decisions are based on intuition (Klein, 2003). He cites examples where intuition helped health care staff, and we found a job ad looking for a nurse "with intuition".

We discovered during the interviews that senior health care professionals seem to be uneasy about expressing their intuition. Although the registrars emphasized strongly the importance of the transfer of the outgoing team's intuition, they criticized that it is too often not addressed during their handovers. When asked if they could be "a good example" and start expressing their own intuition during their handover for others to follow, they expressed they would "not be good at it". They reported that doctors have a problem expressing their intuitive feeling about patients, probably based on their education, which favors factual data. If they did, this would be regarded as not being backed up by facts (which is by definition "intuitive"), and therefore could be interpreted as a weakness in their professional capacity. However, this component should be a key part of the information transfer in the handover process.

Intuition and HCI

"Intuition is an essential, powerful and practical tool. Flawed though it sometimes may be, we could not survive, much less excel without it" (Klein, 2003). However, support for intuition in HCI systems is limited, probably because it is not an easy endeavor, and its importance in today's work environments has only recently been acknowledged.

We found that collaborative tools that support health care teams should provision not only for "hard", factual data, but also accommodate "soft" ambiguous data such as intuition. This raises some tough questions, but also provides a great opportunity for the research community to make a difference in specific application domains such as health care. Furthermore, we are proposing this question to the research community: if information technology is able to raise the intuition support component, is it, in turn, able to add credibility to it?

Risk of Intuition Support

During the interview, one registrar pointed out that there is a risk in knowing the intuition of the outgoing team. Being aware of the other team's intuition might influence their work, removing the safety net of the handover, which has been previously described as a resource of recovery (Wears et al., 2003). The majority of participants are aware of this, and it seems the argument could go either way: 38% agreed that "It is more important to be unbiased than knowing the gut feeling of the outgoing team", and the same number of participants were indecisive. This also appears to depend on the individual: some registrars and consultants favor intuition

over hard facts (3 out of 13), others favor hard facts over intuition (6 out of 13). In addition, anecdotal evidence suggested that the outgoing registrar's reputation and competence (as perceived by the incoming registrar) influences this decision.

DESIGN IMPLICATIONS

In order to bring the aspect of intuition transfer to the community of information transfer developers, we describe some of the design implications this topic has. Intuition is situated in the concepts of implicit as well as tacit knowledge, but not explicit knowledge (Nickols, 2000). In order to support team work and information transfer, this knowledge ideally needs to be transferred into explicit knowledge. We therefore focus our design studies on the transfer of making intuition "explicit".

We analyzed our findings and investigated how

a) intuition or indicators of intuition could be measured in a hospital setting.

b) intuition could be visualized for the handover process.

c) intuition could be conveyed to another team.

We acknowledge that these are very complex problems and we do not attempt to address them exclusively with our design sketches. However, we see our suggestions as small steps into this territory, addressing an important issue in today's health care handovers.

Design Concepts

The following design concepts arrived out of the interviews and discussions with the participants. For the purpose of this paper, we present the most relevant examples that include an aspect of intuition.

3D Bed

One registrar expressed in the interview that he would like to have a 3D model of the patient's bed that he could examine on the way to work. Being asked why it needed to be 3D, he could not specify why, but insisted on its importance. Further enquiring revealed that the registrar wanted a 3D representation to assess the spatial distribution of the environmental context: he elaborated through thinking-aloud that the rearranged location of a patient's monitors, the tidiness of a bed, empty boxes of medication, etc. let him conclude subconsciously how many staff members were standing around the bed (so that monitors had to be rearranged) and therefore how much care the patient needed during the previous shift.

These changes in the environment are external indicators that the registrar used subconsciously to assess the situation, which in turn triggered a subconscious decision. This is an illustrative example of how powerful intuition can be in this context. This matches other findings on intuition: "…the decision makers had picked up signs of trouble, without realizing it, by noticing subtle cues" (Klein, 2003). Gladwell in his book "Blink" (Gladwell, 2005) calls it thin-slicing, and describes several examples of "moments when we 'know' something without really knowing why". The author quotes work by Klein (Klein, 2003), in particular an insight with firemen (also a profession in which people have to make rapid decisions that can directly affect lives), very similar to the scenario described by our registrar: A professional fire department commander was asked why he decided to command his team to immediately leave a burning building just seconds before it collapsed, avoiding a tragedy. He could not explain his behavior rationally, except that he felt "something was wrong" when facing the flames. In order to understand how the firefighter came to his decision, he was asked to go over the events repeatedly in an attempt to document precisely what he did and did not know. Like the registrar, by going over the incidence again, he realized that there were subtle anomalies that led him to command his team to leave the building: the fire was unusually hot, did not respond to water as expected and was not noisy. It turned out that the fire did not respond as it should because it was not centered in front of them, it had been below in the basement, below the floor the firemen were standing on. It was quiet because it was muffled by the floor, and it was unusually hot because the heat rose from below. These signals were subconsciously combined into an alarming signal for the firefighter's conscious to immediately leave the place, without wasting valuable time analyzing the rational reasons, but rather saving lives through an intuitive decision.

Looking at the Doctor to Look at the Patient

During the interviews, registrars expressed a strong desire for a visualization tool that provides them with a quick overview of "how well" a particular patient is. Contrary to our initial assumptions, this would not consist of a calculated, arithmetic "medium" value of the entire patient's physiological data such as heart rate and blood pressure, because this does not necessarily "… indicate how stable a patient is. A certain heart rate could be acceptable for some patients, for others however life-threatening", a health care professional noted. As one registrar puts it, "a light with red, yellow and green above a patient's bed would quickly enable me to prioritize". We are proposing a different approach: Getting an "overall" impression of a patient can be difficult to acquire. However, during the interviews, the participants told us that they spent more time with critical patients and their own stress level increased when they were dealing with unstable patients (although a self-assessed increase in heart-rate was not confirmed in the questionnaire). Therefore, we propose a "look at the doctor to look at the patient" concept in order to acquire an alternative assessment of a patient.

In order to obtain a sense of a patient's health status for the purpose of the handover, it might be sufficient to acquire activity data of the health care professional from the previous shift, not the patient, in order to prioritize the work for the new shift. This activity data should convey information such as "how long was the doctor with which patient", "how stressed was the doctor with which patient", etc. Activity data of multiple health care professionals could be combined to give a more accurate assessment of a patient, however, it could be difficult to assign a slot in time where increased activity data

occurred only with one particular patient due to the very mobile working style of a doctor.

Also, it is possible that there is no measurable correlation between the stress level of a doctor and the stability of a patient. As one health care professional put it: because they are all very experienced, they know how (and need) to stay calm even in difficult situations; however, their self-perception might not be accurate, and their heart-rate might indeed rise without their knowing.

We understand that our approach might only provide a very rough measure to gain a quick overview status of a patient; however it could provide an indicator for incoming staff to identify the last shift's "hotspots", supporting the intuition transfer.

Figure 7. Transferring intuition into explicit knowledge by tracking a registrar's PDA.

Breadcrumb Trail

During the interviews, one registrar noted that it would be very useful for him at the beginning of his shift to find out with which patient his "outgoing" colleague spent the most time with. When he starts his shift, he is often "thrown into" a very hectic environment. If he could trace back his colleague's path during the previous shift, similar to a breadcrumb trail, and find out how long that colleague spent with each patient, that would support his work, he said. We propose a tracking device that would record the location of the doctor during her/his shift to determine the time spent with each patient (Figure 7). This could also be a valuable addition to "digital post-it notes" systems such as GeoNotes (Espinoza et al., 2001), where health care professionals could leave spatial notes for other colleagues.

We are currently developing a solution that tracks a wireless PDA that many health care professionals already carry with them via multiple base stations. A database in the backend records timestamps of certain locations and clusters this data. The screenshot (Figure 8) might give an idea of how the animated visualization looks like that displays points of interest with a timeline scrollbar (derived from locations where the doctor spent a significant amount of time).

Figure 8. Visualization of "hotspots" from the previous shift.

Initial tests show an accuracy of about 2 meters for the tracking system, which might be enough to identify individual bed locations and corresponds to our goal of giving the incoming doctor an indicator on which areas to concentrate on in his/her upcoming shift.

We are also planning on combining the location-based approach with the acquisition of the doctor's stress level via wearable devices that measure heart rate and galvanic skin response. Using this complementary approach, we are hoping to be able to match multimodal contextual data to a patient and therefore improve the intuition support for the incoming team by providing them with indicative data from the outgoing team.

CONCLUSIONS

We investigated the information exchange during the handover process in hospitals between teams of senior staff. Initial findings and expectations were focused on the exchange of factual, "hard" data; however, we found that the information a team acquires during a handover consists also of important "soft" data that the incoming team uses to assess, coordinate and prioritize their upcoming shift for an effective continuity of care.

Through the use of interviews, focus groups and questionnaires, we conclude that tapping into this area of dealing with concepts such as intuition and gut instinct and adequately transferring it to other individuals and teams is a challenging task, but critical for effective health care. As one of the participants wrote on the questionnaire: "Medicine relies on experience and intuition as well as facts and numbers".

Having gained an understanding of handovers and the role intuition plays in the health care environment, we have started looking into designing systems that can capture, visualize and support the intuition transfer between shifts in a hospital. We are eager to develop applications that either directly or indirectly measure indicators of intuition and pass on the resulting values to other shifts, with the further aim of evaluating if we can achieve benefits with this approach.

With our experience from this project, we believe that effective information transfer tools for handovers in health care should acknowledge the presence of intuition and designers of such systems should include support for

"hard" as well as "soft" data such as intuition for an effective continuity of care.

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