WARWICK
THE UNIVERSITY OF WARWICK

The Role of Dynamic Trade-Offs in Creating Safety – A Qualitative Study of Handover Across Care Boundaries in Emergency Care

Mark Sujan*

Warwick Medical School, University of Warwick

Coventry CV4 7AL

m-a.sujan@warwick.ac.uk

+44 24765 72941

(* Corresponding author)

Peter Spurgeon

Warwick Medical School, University of Warwick

Coventry CV4 7AL

p.c.spurgeon@warwick.ac.uk

Matthew Cooke

Warwick Medical School, University of Warwick

Coventry, CV4 7AL, UK

m.w.cooke@warwick.ac.uk

Word count: 6,393

Abstract: The paper aims to demonstrate how the study of everyday clinical work can contribute novel insights into a common and stubborn patient safety problem – the vulnerabilities of handover across care boundaries in emergency care. Based on a dialectical interpretation of the empirical evidence gathered in five National Health Service organisations, the paper argues that performance variability is an essential component in the delivery of safe care, as practitioners translate tensions they encounter in their everyday work into safe practices through dynamic trade-offs based on their experience and the requirements of the specific situation. The findings may shed new light on the vulnerabilities of the handover process, and they might help explain why improvements to handover have remained largely elusive and what type of future recommendations may be appropriate for improving patient safety.

1. INTRODUCTION

It is widely recognised that patients across all healthcare systems may suffer preventable harm [1, 2]. Research from various countries and different medical settings provides evidence suggesting that 4% - 12% of patients experience an adverse event during the course of their treatment, and that half of these may have been preventable [3-6]. This causes needless harm and suffering to patients, and it can be traumatic for the practitioners involved [7]. There are significant financial implications in terms of litigation and additional treatment costs; for example it is estimated that the costs associated with adverse drug events in the National Health Service (NHS) are £0.5-1.9B annually [8].

Communication failures have been identified as a key threat to patient safety [2]. A Joint Commission report suggests that breakdown in communication was the leading root cause for sentinel events reported during 1995 – 2006 [9]. A large body of research demonstrates that inadequate handover practices from one caregiver to another are putting patients at risk [10-12]. Handover failures can lead to delays in treatments [13], medication errors [14], unnecessary duplication of assessments [15], and poor patient experience [2]. The risks arising from inadequate communication and handover in emergency care may be particularly significant due to high patient acuity and overcrowded emergency departments (ED) [16]. The Institute of Medicine identified poor handover as a leading cause of medical error in the ED [17]. Factors that may affect the quality of handover include unclear structure of the handover conversation [11], frequent distractions [18], inadequate documentation [19] and overreliance on documentation [20], and a lack of training in handover and non-technical skills [21].

A frequent recommendation for the improvement of handover is the adoption of standardised communication protocols [22-25]. However, a systematic review of the literature on handover in hospitals (up to 2008) concluded that there was no reliable body of evidence to suggest that standardisation of handover provided sustainable improvements in patient outcomes [10]. This may be due to an overly narrow perspective that regards handover as discrete acts of information transfer [26]. The introduction of standardised communication protocols is intended to prevent failures of information transfer, which are perceived to be caused by inadequate communication skills. The focus on failures is a key characteristic of traditional approaches to safety management. However, it has been argued that this might lead to solutions that are not based on an in-depth understanding of everyday clinical work and the problems practitioners face [27, 28].

Leading writers in the domain of Resilience Engineering refer to this kind of thinking as Safety-I [29]. Safety management from a Safety-I perspective aims to reduce harm and adverse events as far as possible by either eliminating the causes of harm or by controlling the risk associated with these. In order to prevent an undesirable event from repeating itself, the learning that is generated from retrospective analysis of incidents and adverse events frequently leads to the implementation of additional safeguards or defences in order to reduce or eliminate vulnerabilities in the system [30]. Such defences often include technological solutions or attempts at eliminating human error by constraining behaviour and reducing variability through standardisation [31], as in the case of patient handover.

Safeguards, defences and standardisation are examples of well-intentioned interventions that represent instances of formal assumptions about how work should be carried out – work-as-imagined (WAI) [32]. Their primary purpose is to break a particular causal chain in order to prevent a specific failure trajectory from repeating itself. However, the way everyday clinical work is actually unfolding – work-as-done (WAD) – is different, and modern healthcare systems might best be understood as complex adaptive systems [33]. The complexity of healthcare opens up gaps in the continuity of care, which practitioners have to anticipate, detect and bridge using their judgement and expertise [34]. Such necessary performance adjustments are thought to contribute to organisational resilience [35].

Resilience has been defined as the ability of a system to adjust its functioning prior to, during, or following changes and disturbances, so that it can sustain required operations under both expected and unexpected conditions [36, 37]. The emerging field of Resilience Engineering [38] is based on an alternative view of safety – referred to as Safety-II - that regards the performance adjustments that people undertake on a daily basis as the origin of both success and failure [29]. Most of the time, these performance adjustments enable successful transformation of WAI into practice; sometimes the performance adjustments are inadequate or insufficient and lead to failure. From a Safety-I perspective, however, performance variability is often regarded as detrimental deviations or violations [32]. Safety-II, on the other hand, aims to understand and learn from how systems succeed, i.e. from situations when there is safety, rather than exclusively from failures, i.e. situations where there is no safety [39]. It could be argued, therefore, that there is a need for a change in focus from the study of the extraordinary (i.e. failures) to the ordinary, everyday clinical work.

The aim of this paper is to demonstrate how the study of everyday clinical work can contribute novel insights into a common and stubborn patient safety problem – the vulnerabilities of handover across care boundaries in emergency care. Based on a dialectical interpretation of the empirical evidence gathered in five NHS organisations, the paper argues that performance variability is an essential component in the delivery of safe care, as practitioners translate tensions they encounter in their everyday work into safe practices through dynamic trade-offs based on their experience and the requirements of the specific situation. Such insight might help explain why improvements to handover have remained largely elusive, and what type of future recommendations might be appropriate for improving patient safety.

The next section provides a brief description of the context of handover in emergency care. This is followed by a description of the methods for data collection and data analysis. We then present the results of the qualitative data analysis, and we discuss these in the wider context of the growing body of resilience engineering literature. We conclude the paper with implications for research and for practice.

2. HANDOVER IN EMERGENCY CARE

The British Medical Association defines handover as "*the transfer of professional responsibility and accountability for some or all aspects of care for a patient, or group of patients, to another person or*

professional group on a temporary or permanent basis" [40]. The definition includes explicitly the transfer of responsibility for patient care, in addition to the transfer of information from one caregiver to another.

The emergency care pathway includes pre-hospital, ED and hospital activities for patients with acute needs. In this paper only patients taken to the ED by ambulance, and patients referred from the ED to acute medicine are considered. Handover in emergency care comes in different shapes and forms. There is the handover at the end of a shift, which takes place between peers that share the same professional background. On the other hand, the types of handover considered in this paper take place along the patient pathway. Such handover typically involves individuals from different backgrounds who often belong to different departments or organisations.

For critically ill patients requiring immediate treatment, handover occurs from the paramedic to a senior ED doctor in the resuscitation area. Other patients arriving by ambulance will be handed over from the paramedic to the nurse coordinator at the nurses' station or at a dedicated handover point in the main ED area. When the patient is referred on from the ED there is a handover by phone from the ED doctor to either a doctor or a nurse in acute medicine or a specialty. There is also a handover from the ED nurse to the nurse on acute medicine when the patient is transferred physically onto the ward.

The style of communication and the information that is communicated during the handover are dependent on the purpose of the handover and on where in the patient's journey it occurs. For example, handover from paramedic to ED nurse is predominantly unidirectional and typically includes consideration of aspects such as patient demographics, patient condition, aspects of clinical and social history, treatments given pre-hospital, observation of vital signs, and any symptoms exhibited. When a patient is referred to acute medicine the communication style is more interactive, and the focus of the conversation is on the need and justification for admission [41]. The handover from the ED nurse to the nurse on acute medicine will focus on issues relevant to nursing aspects, such as any specific care arrangements that may be required. As an example, figures 1 and 2 provide a graphical representation of the emergency care pathway and the handovers that take place along the pathway for "Majors" patients involving the ambulance service, the ED and the acute medical ward in the hospital. The pathway for resuscitation patients is slightly different, and pathways may vary for different organisations. Full pathway descriptions are provided elsewhere [42].

**** Insert figure 1 ****

**** Insert figure 2 ****

3. METHODS

3.1 Setting

The Emergency Care Handover (ECHO) project was funded by the National Institute for Health Research (NIHR) Health Services & Delivery Research (HS&DR) programme. Study sites included three English

NHS hospitals and two NHS ambulance services that provide emergency care services in the catchment area of one participating hospital, respectively. The third ambulance service chose not to participate in the study, and no data involving their staff were collected.

Table 1 provides an overview of general characteristics of the three hospitals. Hospital A is part of a large NHS Foundation Trust and provides services to a deprived city community with ethnic diversity. Hospital B is part of an NHS Trust consisting of four hospitals. The population served is slightly younger than the national average, and it has above average health and life expectancy. Hospital C is a District General Hospital providing services to an ethnically diverse and rural population.

Table 1: Basic characteristics of participating hospitals

	Population	Beds	Annual ED attendances	ED bays
Hospital A	440,000	750	110,000	30
Hospital B	650,000	850	90,000	36
Hospital C	300,000	400	49,000	22

The study was undertaken from April 2011 – December 2012. The study had NHS research ethics approval from South Birmingham Research Ethics Committee (reference 11/WM/0087) as well as institutional approval at all participating organisations. All participants received a participant information leaflet and were briefed prior to participation, and provided written consent.

3.2 Data Collection and Data Analysis

A researcher was recruited at each site. The researchers conducted process walks and informal observations to familiarise themselves with the pathway. For each pathway, a half-day process mapping session was held with a purposive convenience sample of staff in order to produce a graphical representation of the process. Process walks, observations and process mapping are common improvement science methods, which are recommended by bodies such as the Institute for Healthcare Improvement in the US [43], and the NHS Institute for Innovation and Improvement in the UK [44].

A total of 270 patient handovers (paramedic to senior ED clinician; paramedic to ED coordinator; senior ED clinician to acute medicine clinician) were audio recorded by the researchers during daytime (8:00 – 18:00) for a period from November 2011 – July 2012. The audio recordings were subsequently transcribed and all identifiers removed. Transcripts of handover conversations were segmented into utterances and analysed using Discourse Analysis [45]. The results of this Discourse Analysis are described in detail elsewhere [41].

Two of the authors (MS and PS) conducted semi-structured interviews with a purposive convenience sample of 39 staff from the five participating organisations during May – November 2012. Interviews lasted between 20 – 50 minutes. Interviews were audio recorded and transcribed. Any identifiers were removed to preserve anonymity. Initially, 15 interviews were conducted with front line staff (5 staff per pathway) to establish their involvement with handover and to explore their perceptions of current handover practices. Participants also had the opportunity to suggest improvements to any problems with handover they identified. Following the analysis of this initial set of interviews, further interviews were conducted with 24 staff. The sample was broadened to include individuals with senior management responsibilities. Interview transcripts were analysed using Thematic Analysis [46]. Transcripts were first read and then coded using Open Coding [47]. Main categories were identified through clustering of codes during meetings of the research team. Categories were constantly compared with the data and revised until new data added no further conceptual insights. The coding was supported by the NVivo 10 software package. A validation workshop was held at the College of Emergency Medicine (London). At this workshop, preliminary findings were presented to and validated with a broader range of twenty emergency care stakeholders from a number of different ambulance services and hospitals in England (external to the participating study sites).

4. RESULTS

The analysis identified a number of themes [42, 48]. In this paper we focus on one of the themes that suggests that practitioners experience tensions inherent in the activity of handover. Depending on their professional backgrounds and the specific circumstances, different practitioners translate these tensions into safe practices through different dynamic trade-offs. Table 2 provides a summary of these tensions. Examples are described in more detail below.

Table 2: Tensions inherent in the activity of handover

Goals	Different actors have different motivations and information needs.
	Staff from different departments and organisations have to work together and trust one another.
	Trust among colleagues is put under pressure by time performance targets.
Documentation	Organisational push to document everything.
	Practitioners cannot rely on documentation alone.
	Lack of time and capacity leads to inadequate use of documentation.
Verbal communication	Enables better care.
	Highly dependent on individuals and their goals.

	May not take place due to lack of time and capacity.
Transfer of responsibility	Explicit transfer of responsibility ensures seamless transitions of care.
	Difficult conversations may result in refusal to accept responsibility for patient care.
	Lack of capacity may lead to situations with unclear allocation of responsibility and patients being stuck or lost in the system.

4.1 Goals

Different actors have different motivations and these can create tensions in the handover process. For example, there is a tension in the goals or motivations for handover of the ambulance crews and the ED nurse coordinator. The ambulance crews want to tell the full story, i.e., they want to provide information on everything that they feel is clinically relevant. The ED nurse coordinator, on the other hand, approaches handover predominantly from a management perspective. For them it is important to determine quickly the acuity of the patient, where they can go in the department, and the implications for the department in terms of workload and availability of resources. Such a management perspective is concerned more with aspects of capacity and patient flow, rather than with clinical details and psychosocial background. Given this tension in goals, it is not altogether surprising that on occasion disturbances in the handover process can be observed. Paramedics, with a more clinical perspective, may feel that the nurse coordinator is not listening properly, and the nurse coordinators, with a management perspective, may perceive that paramedics should get to the point more quickly as the detail is documented in the paperwork. Similarly, there is a tension in the overall goals of the paramedic. They need to ensure the safety of the individual patient under their care. However, they also need to ensure the safety of the patients in the community. In order to deal with these tensions – different goals and motivations between communication partners, and competing goals for the individual - they adapt their behaviour by making dynamic trade-offs based on their experience and depending on the specific circumstances of the patient in their care. As one paramedic put it, *"when I am worried I will make sure that I'll talk to the nurse"*.

This is reflected in the practice of the "secret second handover" [49]. To speed up the handover process, one organisation introduced a single handover protocol. In practice, paramedics often carried out a second, informal ("secret") handover to the nurse who would be looking after the patient. This second handover is discouraged at an organisational level, as it is perceived as a redundant activity. A paramedic reflects on this using the notion of personal accountability, and describes how they deal with the tensions by using their time in the ED intelligently depending on the needs of the situation.

"I just…I think it takes out the human factor, just this piece of paper. I don't like it. I just…I like to tell the person who's looking after my patient, because it's my patient, because I've handed over, [tell] them what's

been going on and give them the whole story and give them the opportunity to ask me questions […] we've got 15 minutes from when we arrive to when we should hand over […] and then 15 minutes from when we've handed over to when we've finished our paperwork and we've come clear […] so we've only got a 30-minute window here […] so I look at it as, OK as long as I press that button I will wait around and talk to the nurse, as long as I've cleared in 30 minutes how I spend my time here [is up to the paramedic]." (Paramedic)

The secret second handover illustrates the gap that exists between work-as-imagined and work-as-done. What appears wasteful and redundant from one perspective (WAI) is a key mechanism for ensuring the safety of patients from another perspective (WAD). The paramedics use their subjective assessment of the characteristics and the requirements of the specific situation in order to main high-quality and safe delivery of care. From the outside (or from the WAI perspective) such choices appear as variation in practice, but from a WAD perspective they reflect the ability to adapt to the requirements of specific situations.

4.2 Documentation

Documentation of information if often perceived to contribute to the delivery of high-quality care. Organisations push to document as much as possible ("*if it's not documented, it didn't happen*"), both for legal and for quality assurance purposes. Managers perceive that the number of verbal handovers can be reduced if everything is documented comprehensively. This would save time and allow, for example, the ambulance crews to get back onto the road more quickly. However, clinicians feel that they cannot simply rely on documentation. Documentation can be missing, temporarily unavailable, inaccurate and incomplete. Documentation may not highlight important bits of information, and subtleties or concerns may not be documented. Most importantly, documentation does not provide the opportunity to discuss and clarify areas of particular concern or interest. This is important to staff who take on responsibility for patient care. For professional and personal accountability, gathering accurate information in a dialogue is perceived as highly valuable.

A participant from the ED describes this tension, where they also indicate the importance of experience in determining the amount and ultimately the quality of documentation. In this view, documenting everything is a naïve and sub-optimal approach. Experience provides people with the skills to determine and articulate what is important and thereby resolve this tension.

"You've got an organisational system, which ideally should allow all these ports of transfer of information. So they should allow the actual chat between paramedic and the nurse or the paramedic and the doctor and should also allow the written conveying of that information. The formal part, the recorded part must be there for legal purposes. […] In both my management and my clinical role, I would insist that both are always done. To be able to effectively do that is experiential. So the person with little experience is going to be required or going to have a necessity to record an awful lot of normal information. Because he or she, or the computer. Because computers are doing a lot of this sort of thing now which is a most dire system. You know, it really is. But it's a computer. It's a computer saying no! And it's a very simplistic thing. Then you

get an untrained person, they're going to have a simplistic approach. And the simplistic medical or nursing practitioner, you take every single bit of information and you record it. The consultant's approach, the senior person right at the end, is going to record the important positives and the important negatives. He or she can justify his clinical actions, justify the treatment and will hopefully represent exactly what the patient said."(ED Consultant)

Workload has an influence on the way documentation is used. Writing comprehensive notes takes time, and people may write less when they feel that they are under time pressure. This may lead to omissions. Equally, the person taking on responsibility for patient care may not read the notes or only consult them superficially due to the perceived pressure of seeing the patient quickly. A second participant from the ED describes this trade-off, and also emphasises again the importance of experience over a simplistic standardised approach that may be inappropriate depending on the circumstances.

"You can read stuff very quickly. I think you can probably read information quicker than you can hear it if someone's speaking to you. So the quickest way would be to read what somebody's written. But that then takes longer for the person who actually has to write it down because it takes longer to write than to say. So it's really looking to all different time pressures because everybody is under a time pressure. You can't have a standard formula for all the information because for a 21 year old, otherwise fit and healthy person, you probably don't want to know the social information you might need to know for someone who is house-bound with elderly relatives at home. So you can't standardise and say this is what must be given. In many ways, it's experience knowing what's important and which is the information that you really do need to get."(ED nurse coordinator)

In practice, therefore, it is normal to expect to see a significant amount of variation in the documentation, and participants perceive it as impossible and counter-productive to document everything, and to do so in a rigid manner. Participants highlight that experience is a crucial determinant of the quality of documentation. It is the experience of healthcare professionals that allows them to manage competing priorities and to select trade-offs that are appropriate for a given situation.

4.3 Verbal Communication

Participants described many advantages of verbal communication. It goes beyond documentation and provides added value by conveying subtleties and information that may not be immediately relevant to the patient's acute condition, but which may be of importance later on (*"small things that may seem unimportant, but aren't"*). It allows highlighting of important information, and it provides information first hand (*"straight from the horse's mouth"*). It also allows for questioning, feedback and education. Verbal communication fosters collaboration between colleagues, and the resulting personal familiarity with colleagues is perceived as an important facilitator in providing high quality care across departmental boundaries. However, participants also pointed out many problems they faced with verbal communication. It relies on memory and it usually conveys only what the sender perceives as the important issues. The

communication can be unstructured, rushed, and jumping from topic to topic without providing a clear picture of what is required. Verbal communication often takes place in less than adequate locations, where there are frequent interruptions, high levels of noise and activity, and little privacy.

A participant from the ED describes the tension that is inherent in verbal communication when referring a patient by contrasting this with the alternative form of electronic referrals, pointing out the potential risks of not having the possibility of a discussion.

"Then there's the actual transmission of the information of course, which obviously there's the amount of communication that you have, the method of it and the records of it, so our systems at the moment for instance, we're trying to move with some of our referrals to an electronic system where we would be able to transmit information electronically, because what happens at the moment is a lot of the conversation that's happening is just repetition of information that's already available. Now, there are two sides to it. As the manager of this area I can say, yes this will smooth the process and make it much quicker. Looking at the system I would say, yes but that also means that the person, if there isn't any element of discussion or challenge at the point of referral, potentially these inaccuracies won't be picked up, so there's kind of – that's something that can improve systems, but also a risk can be accentuated by that as well." (ED Clinical Director)

A second participant from ED describes how a trade-off could be made between relying on documentation only and having the verbal communication that allows providing added information. The trade-off, in this instance, relies on the subjective notion of "*being worried*", i.e. on the clinical judgement by and experience of the person giving the handover about what is of importance.

"If I'm seeing the patient first, I'm quite happy just to look at that initial documentation. When I want a verbal handover is when they're [paramedics] worried about a patient because if they're worried, I want to know and I want to know earlier. I don't just want to happen to find it. So I like to know that if somebody is concerned, they will alert me otherwise I think it's too much by chance that you find out that your patient is sick whereas if that's already been recognised, then you go in then with a heightened sense of urgency and then heightened awareness." (ED nurse)

The example illustrates how healthcare professionals make conscious judgements about whether or not it is safe to pursue a particular course of action. While this is influenced, but not determined, by procedures and guidelines reflecting WAI (in this case not to have a verbal handover), it relies to a significant extent on previous experience and a resulting subjective risk assessment of the particular situation at hand.

4.4 Transfer of Responsibility

Handover entails both the communication of information and the transfer of responsibility for patient care. The explicit transfer of responsibility ensures that there are no gaps in the provision of care. When the transfer of responsibility involves verbal communication, this provides the opportunity to have a discussion,

review treatment plans, and to ensure that the transfer of responsibility is appropriate and in the patient's best interest (*"ensuring the patient goes to the right place, first time"*). However, each handover and each additional patient also represent a demand on individuals in high-workload situations, and on scarce resources in overstretched departments. During the interviews participants provided several examples where the trade-offs that are used to deal with this tensions are perceived to be inadequate and potentially threatening to patient safety.

Participants from ED described the referral of patients from ED to other departments as *"a difficult conversation"* and *"not a handover, but a bargaining tool"*, which may result in the transfer of responsibility for patient care being refused. From an ED perspective the refusal to accept patients by specialists or the *"selling of patients"* that they have to do may be caused by *"boxing"* or *"gatekeeping"* behaviour of specialist wards and their concern for their own work.

One participant from ED describes the difficulties they experience when referring patients that may not fit a particular speciality unambiguously. This can lead to discussions and refusal to accept the patient, which ultimately leads to delays and situations of crowding. The solution they offer is to take a decision based on their expertise, and then being assertive, which should be backed by a formal trust policy.

"The classic thing is medicine has become so boxed and every specialty in the hospital has made their box as small as possible and they put up as big a wall as they can around it, so we've got our upper GI [gastrointestinal] surgeons, we've got lower GI surgeons, we've got little finger, toenail surgeons almost. It's just ridiculous. We, as the attending clinicians, have to make a decision about who is most appropriate. And if we're wrong, which we will be, they then send on to the next team that they think. But it's classically patients who fall in between. So that GI bleed. Is it lower GI or upper GI? So should a surgeon take that or is it Medicine? So you can end up with patients waiting in the ED, and that's what's classically has happened across ED's, across the country. For hours and hours and hours, no one makes a decision. So we have to make a decision which way they should go. It's still a problem but we try and force the issue by doing these techniques. The patient is coming in, I say they are coming in under you, that's been agreed by the Chief Operating Officer of the Trust, and you need to come and see them now. Occasionally they fight back. Occasionally I have very difficult conversations with consultant colleagues. And they say 'Oh, this is all about 4 hours [breach target]' and I say, 'Yes, it is about 4 hours.' But that's really about quality of care of patients."(ED Consultant)

The above quotation illustrates a common problem in healthcare – working in silos and at cross-purposes. While local performance adjustments can make sense and provide resilience at the local level (such as not accepting a patient in order to conserve resources), there is also the danger that this might create problems elsewhere. This illustrates a fundamental problem, where the gap between WAI and WAD is large, and the overall system might become more brittle.

5. DISCUSSION

The empirical evidence presented in this paper provides an illustration of how many of the vulnerabilities of handover in emergency care are linked to tensions inherent in everyday clinical work that involves multiple actors with different professional, cultural and organisational backgrounds. Such tensions are almost inevitable in healthcare environments that are highly interactive, complex and dynamic. The evidence provides examples of how practitioners translate these tensions into safe practices through dynamic, context-dependent trade-offs. Recognising such tensions in everyday clinical work and the necessary performance adjustments of practitioners might provide further insights into why some of the existing interventions have failed to deliver sustainable improvement, and what type of further recommendations for improving patient safety might be appropriate.

Many studies of handover have regarded this activity as a discrete, well-defined problem of ensuring that information is transferred reliably from a sender to a more or less passive receiver [50]. This is sometimes described using analogies from sports such as "passing the baton" or similar. From this point of view, a significant cause of problems with handover is the perceived lack of communication skills of healthcare professionals. According to this logic, solutions to the problems with handover are to be found in normative interventions aimed at standardising processes and constraining variability. This reflects a Safety-I perspective. Accordingly, the most frequently encountered recommendation for improving handover communication is that of standardisation through procedures, checklists or mnemonics, and appropriate training in their use [22-25]. Even though this logically feels like it should reduce the instances of critical information being omitted, the literature suggests that sustainable improvements in patient outcomes remain elusive [10, 51].

In the research described in this paper, handover was considered as being embedded in everyday clinical and organisational practice, i.e. as an activity with different actors, different goals and motivations, and different supporting tools (external and cognitive tools). Taking this view allowed us to identify and to describe a number of inner tensions that can be found in this socio-technical activity. It might be a useful exercise to investigate these tensions dialectically [52, 53] rather than looking at handover normatively. Tensions can be regarded as a misfit or misalignment between different elements of an activity or between different developmental stages of the activity [54]. Such a misalignment, for example in the goals of different actors, becomes visible as disturbances or disruptions in the activity. These disturbances - for example missing or inaccurate information, people not listening during handover, unclear allocation of responsibility etc. - cannot be eliminated without addressing the underlying tension. However, the fundamental point of the application of dialectics in this case is that tensions are the drivers of development [55]. Tensions are not eliminated - they are encountered in different forms as the activity evolves through its developmental stages.

The example of the "secret" second handover [49] alluded to above serves to illustrate this point. The tensions exist in the goals of the paramedics (clinical) and the nurse coordinator (management), and in the goals of the paramedics having to care for the patient they are attending to (individual) as well as for the unknown patients in the community who may require emergency services (global). The time performance

target and the official procedure designed to support its achievement by constraining behaviour (i.e. having a single handover) did not resolve the tensions, but exacerbated these. The paramedics adapt their behaviour to these tensions in order to resolve them meaningfully on a case-by-case basis. This is done based on their experience, and they express this through the subjective assessment of "being worried". In those cases where the paramedics are concerned or feel that there are important details they need to communicate, they may find reasons to stay in the department and thereby create the opportunity for a verbal handover to the nurse.

More generally, the evidence described in this paper suggests that performance variability of practitioners is an essential contributor to the delivery of safe care. Practitioners encounter tensions in their everyday work, and it is their adaptability and experience that allows them to translate these tensions into safe practices through dynamic trade-offs depending on the characteristics of the specific situation. Practitioners utilise their own perception of risk ("being worried") based on their expertise and experience to determine how to trade-off particular tensions: for example what to document, when to seek out a verbal handover, what kind of information to hand over, and how to use their time intelligently. Procedures (e.g. document everything) and targets (e.g. ambulance turn-around time) represent static trade-offs that may not always be the most appropriate for specific situations [56], and practitioners interpret them flexibly to ensure the safety of their patients. In actual practice practitioners guard against threats to patient care by making the required dynamic trade-offs between the different tensions in order to provide flexibility and resilience to the system.

From this study of everyday clinical work we conclude that the vulnerabilities of handover in emergency care might not be predominantly an issue of inadequate communication skills – rather, the performance variability that we can observe is the result of local adaptations aimed to cope with the tensions inherent in everyday clinical work. Most of the time, these performance adjustments facilitate the delivery of safe care. Sometimes they turn out to be inadequate or unsuccessful. An example of an inadequate performance adjustment was given above when we discussed allocation of responsibility for patients in the ED. Local performance adjustments by healthcare professionals working in different departments can make sense at the departmental level, but can exacerbate the situation at the systems level and lead to brittleness rather than resilience. However, we argue that this brittleness is not the result of inadequate communication skills, but rather that we need a different framework (i.e. different from Safety-I) to explain developments in complex adaptive systems. For example, Woods and Branlat propose basic patterns in how adaptive systems, such as hospitals, fail: decompensation, working at cross-purposes, and getting stuck in outdated behaviours [57]. The practice of "selling" patients by ED staff in order to meet the breach target, and that of "boxing" by specialists illustrates how working at cross-purposes can lead to threats to patient safety.

Studies of everyday clinical work can describe how work-as-done by practitioners is necessarily different from work-as-imagined in the minds of those who design and manage it. As the gap between WAI and WAD widens, organisations are prone to becoming more brittle [58]. The challenge for safety management and for Resilience Engineering is to devise ways to keep WAI and WAD aligned [32]. Alignment in this

sense does not mean that WAI and WAD are in perfect correspondence. Rather, the intention is to create mutually positive awareness (meaning appreciation) among the different stakeholders of how they perceive work and of how it actually unfolds. The learning that is derived from a Safety-I perspective is not normally able to capture and to acknowledge the positive impact of performance adjustments on successful outcomes, but carries negative connotations of errors, deviations and violations. As a result, practitioners might be tempted to hide performance adjustments from those responsible for managing work, and in this way contribute to organisational brittleness rather than resilience [59]. Studies of everyday clinical work might make a positive contribution by providing valuable information about the judgements and performance adjustments that healthcare professionals make in order to deliver safe care. In this way, learning from the ordinary (i.e. everyday clinical work) might contribute to reducing the gap between WAI and WAD by providing rich information about WAD to those who design, manage and evaluate clinical work, and by promoting an environment within which healthcare professionals can reflect about their everyday clinical work.

6. CONCLUSIONS

In this paper we have demonstrated how the study of everyday clinical work embedded in a Resilience Engineering framework can provide novel insights into one of the most common patient safety problems – the handover of patients in emergency care. We have argued that practitioners need to make dynamic trade-offs in order to translate inevitable tensions in their everyday work into safe practices. Performance variability based on the expertise and the risk awareness of practitioners may be essential for providing safe care. Failures occur when the adaptations by practitioners are insufficient or inappropriate, but not necessarily because performance was variable in the first place. We conclude from this work that improvement efforts, in handover and more generally in patient safety, need to move beyond interventions that are aimed at eliminating perceived causes through the introduction of safeguards, barriers or standardisation. Instead, improvement efforts should consider how the system could provide flexibility and support to practitioners in making the required trade-offs. This should be based on a thorough understanding of everyday clinical work, the tensions that are present, and the resulting evolution of practice in order to bring about alignment of work-as-imagined and work-as-done.

Will healthcare become more resilient in the future? As Richard Cook notes [60], the dominance of and the persistence with the Safety-I paradigm in healthcare makes for a particular kind of resilient system – albeit one that might have to be overcome in order to make healthcare a safer place for patients. Healthcare organisations and healthcare systems are complex, adaptive, highly political and emotionally charged entities. There are many good reasons for why certain things are done in the way they are in healthcare, but these also may have downsides. Few people will contest the positive impact that evidence-based approaches have had. However, the downside is that many healthcare organisations have developed an obsession for "evidence" and measurements that fit into a particular worldview. Organisations that are used to "policing"

procedural compliance require education as well as tools and methods to support staff in making context-dependent trade-offs.

This is a key challenge that researchers and practitioners in Resilience Engineering need to address. Healthcare organisations require concepts and tools that they can work with, that enable them to put Resilience Engineering into practice. Future research should continue to provide in-depth studies and descriptions of how practitioners make such trade-offs in practice. However, there is also a need to develop approaches that allow organisations to assess and to "measure" the degree to which they exhibit characteristics of such organisational resilience in a practical way.

ACKNOWLEDGEMENTS

REFERENCES

1.   Department of Health, *An organisation with a memory*, 2000, The Stationary Office: London.
2.   Kohn, L.T., J.M. Corrigan, and M.S. Donaldson, *To Err Is Human: Building a Safer Health System*. 2000, Washington: The National Academies Press.
3.   Brennan, T.A., et al., *Incidence of Adverse Events and Negligence in Hospitalized Patients.* New England Journal of Medicine, 1991. **324**(6): p. 370-376.
4.   de Vries, E.N., et al., *The incidence and nature of in-hospital adverse events: a systematic review.* Qual Saf Health Care, 2008. **17**(3): p. 216-23.
5.   Thomas, E.J., et al., *Incidence and types of adverse events and negligent care in Utah and Colorado.* Med Care, 2000. **38**(3): p. 261-71.
6.   Vincent, C., G. Neale, and M. Woloshynowych, *Adverse events in British hospitals: preliminary retrospective record review.* BMJ, 2001. **322**(7285): p. 517-9.
7.   Wu, A.W., *Medical error: the second victim.* BMJ, 2000. **320**(7237): p. 726-727.
8.   Ovretveit, J., *Does improving quality save money? ,* 2009, Health Foundation: London.
9.   Joint Commission Centre for Transforming Healthcare, *Improving transitions of care: Hand-off communications*, 2010, The Joint Commission: Oakbrook Terrace.
10.   Cohen, M.D. and P.B. Hilligoss, *The published literature on handoffs in hospitals: deficiencies identified in an extensive review.* Quality and Safety in Health Care, 2010. **19**(6): p. 493-7.
11.   Johnson, J.K. and V.M. Arora, *Improving clinical handovers: creating local solutions for a global problem.* Quality and Safety in Health Care, 2009. **18**(4): p. 244-5.
12.   Raduma-Tomas, M.A., et al., *Doctors' handovers in hospitals: a literature review.* BMJ Qual Saf, 2011. **20**(2): p. 128-33.
13.   Solet, D.J., et al., *Lost in translation: challenges and opportunities in physician-to-physician communication during patient handoffs.* Acad Med, 2005. **80**(12): p. 1094-9.
14.   Petersen, L.A., et al., *Does housestaff discontinuity of care increase the risk for preventable adverse events?* Ann Intern Med, 1994. **121**(11): p. 866-72.
15.   Bomba, D.T. and R. Prakash, *A description of handover processes in an Australian public hospital.* Aust Health Rev, 2005. **29**(1): p. 68-79.
16.   Apker, J., L.A. Mallak, and S.C. Gibson, *Communicating in the "gray zone": perceptions about emergency physician hospitalist handoffs and patient safety.* Acad Emerg Med, 2007. **14**(10): p. 884-94.

17. Institute of Medicine, *Hospital-Based Emergency Care: At the Breaking Point*. 2007, Washington: The National Academies Press.
18. Catchpole, K., et al., *Patient handovers within the hospital: translating knowledge from motor racing to healthcare*. Quality and Safety in Health Care, 2010. **19**(4): p. 318-322.
19. Pothier, D., et al., *Pilot study to show the loss of important data in nursing handover*. Br J Nurs, 2005. **14**(20): p. 1090-3.
20. O'Leary, K.J., et al., *Patterns of nurse–physician communication and agreement on the plan of care*. Quality and Safety in Health Care, 2010. **19**(3): p. 195-199.
21. Arora, V.M., et al., *A theoretical framework and competency-based approach to improving handoffs*. Quality and Safety in Health Care, 2008. **17**(1): p. 11-14.
22. Haig, K.M., S. Sutton, and J. Whittington, *SBAR: a shared mental model for improving communication between clinicians*. Jt Comm J Qual Patient Saf, 2006. **32**(3): p. 167-75.
23. Joint Commission, *Comprehensive Accreditation Manual for Hospitals*, 2012.
24. Hindmarsh, D. and L. Lees, *Improving the safety of patient transfer from AMU using a written checklist*. Acute Med, 2012. **11**(1): p. 13-7.
25. Iedema, R., et al., *Design and trial of a new ambulance-to-emergency department handover protocol: 'IMIST-AMBO'*. BMJ Qual Saf, 2012. **21**(8): p. 627-33.
26. Patterson, E.S. and R.L. Wears, *Patient handoffs: standardized and reliable measurement tools remain elusive*. Jt Comm J Qual Patient Saf, 2010. **36**(2): p. 52-61.
27. Nemeth, C.P. and R.L. Wears, *A healthcare team communication research agenda*, in *Improving healthcare team communication*, C.P. Nemeth, Editor. 2008, Ashgate: Aldershot. p. 245-250.
28. Nemeth, C., et al., *Minding the Gaps: Creating Resilience in Health Care*, in *Advances in Patient Safety: New Directions and Alternative Approaches (Vol. 3: Performance and Tools)*, K. Henriksen, et al., Editors. 2008, Agency for Healthcare Research and Quality: Rockville MD.
29. Hollnagel, E., *Safety-I and Safety-II*. 2014, Farnham: Ashgate.
30. Reason, J., *Managing the risks of Organizational Accidents*. 1997, Farnham: Ashgate.
31. Reason, J., *Human error: models and management*. BMJ, 2000. **320**(7237): p. 768-70.
32. Hollnagel, E., *Why is Work-as-Imagined different from Work-as-Done?*, in *Resilience of Everyday Clinical Work*, R. Wears, E. Hollnagel, and J. Braithwaite, Editors. 2015, Ashgate: Farnham.
33. Braithwaite, J., et al., *Healthcare as a complex adaptive system*, in *Resilient Health Care*, E. Hollnagel, J. Braithwaite, and R. Wears, Editors. 2013, Ashgate: Farnham. p. 57-73.
34. Cook, R.I., M. Render, and D.D. Woods, *Gaps in the continuity of care and progress on patient safety*. BMJ, 2000. **320**(7237): p. 791-4.
35. Fairbanks, R.J., et al., *Resilience and resilience engineering in health care*. Jt Comm J Qual Patient Saf, 2014. **40**(8): p. 376-83.
36. Hollnagel, E., J. Braithwaite, and R.L. Wears, *Reslient Health Care*. 2013, Farnham: Ashgate.
37. Hollnagel, E., *Prologue: The Scope of Resilience Engineering*, in *Resilience Engineering in Practice: A Guidebook*, E. Hollnagel, et al., Editors. 2010, Ashgate: Farnham.
38. Hollnagel, E., D.D. Woods, and N. Leveson, *Resilience Engineering: Concepts and Precepts*. 2006: Ashgate.
39. Hollnagel, E., *Is safety a subject for science?* . Safety Science, 2014. **67**: p. 21-24.
40. British Medical Association, *Safe Handover, Safe Patients. Guidance on clinical handover for clinicians and managers*, 2004, BMA: London.
41. Sujan, M.A., et al., *Emergency Care Handover (ECHO study) across care boundaries: the need for joint decision making and consideration of psychosocial history*. Emergency Medicine Journal, 2013.
42. Sujan, M., et al., *Clinical handover within the emergency care pathway and the potential risks of clinical handover failure (ECHO): primary research*. Health Serv Deliv Res, 2014. **2**(5).
43. Leonard, M., A. Frankel, and T. Simmonds, *Achieving safe and reliable healthcare: Strategies and solutions*. ACHE Management Series. 2004, Chicago: Health Administration Press.
44. NHS Institute for Innovation and Improvement, *Improvement Leaders' Guide: Process mapping, analysis and redesign*, 2005.
45. Hodges, B.D., A. Kuper, and S. Reeves, *Discourse analysis*. BMJ, 2008. **337**.
46. Guest, G., K.M. MacQueen, and E.E. Namey, *Applied thematic analysis*. 2011: Sage.
47. Saldaña, J., *The coding manual for qualitative researchers*. 2009, London: Sage.
48. Sujan, M. and P. Spurgeon, *Safety of Patient Handover in Emergency Care–Results of a Qualitative Study*. Safety, Reliability and Risk Analysis: Beyond the Horizon, 2013: p. 359.
49. Sujan, M., P. Spurgeon, and M. Cooke, *Translating tensions into safe practices through dynamic trade-offs: The secret second handover*, in *Resilience of Everday Clinical Work*, R. Wears, E. Hollnagel, and J. Braithwaite, Editors. 2015, Asghate: Farnham.
50. Cheung, D.S., et al., *Improving handoffs in the emergency department*. Ann Emerg Med, 2010. **55**(2): p. 171-80.
51. Talbot, R. and A. Bleetman, *Retention of information by emergency department staff at ambulance handover: do standardised approaches work?* Emerg Med J, 2007. **24**(8): p. 539-42.

52.   Cole, M., *Cultural Psychology: A once and future discipline*. 1998: Harvard University Press.
53.   Nardi, B.A., *Context and Consciousness*. 1996, Cambridge, MA: MIT Press.
54.   Kuutti, K., *Activity Theory as a Potential Framework for Human-Computer Interaction*, in *Context and Consciousness*, B.A. Nardi, Editor. 1996, MIT Press: Cambridge, MA.
55.   Engestrom, Y. and A. Sannino, *Studies of expansive learning: foundations, findings and future challenges.* Educational Research Review, 2010. **5**(1): p. 1-24.
56.   Sujan, M.A., et al., *Managing competing organizational priorities in clinical handover across organizational boundaries.* Journal of Health Services Research & Policy, 2015. **20**(1 suppl): p. 17-25.
57.   Woods, D. and M. Branlat, *Basic patterns how adaptive systems fail*, in *Resilience Engineering in Practice: A Guidebook*, E. Hollnagel, et al., Editors. 2011, Ashgate: Farnham. p. 127-143.
58.   Dekker, S., *Resilience Engineering: Chronicling the emergence of confused consensus*, in *Resilience Engineering: Concepts and Precepts*, E. Hollnagel, D. Woods, and N. Leveson, Editors. 2006, Ashgate: Farnham. p. 77-92.
59.   Debono, D. and J. Braithwaite, *Workarounds in nursing practice in acute care: A case of a health care arms race?* , in *Resilience of Everyday Clinical Work*, R. Wears, E. Hollnagel, and J. Braithwaite, Editors. 2015, Ashgate: Farnham.
60.   Cook, R., *Resilience, the Second Story, and progress on patient safety*, in *Resilient Health Care*, E. Hollnagel, J. Braithwaite, and R. Wears, Editors. 2013, Ashgate: Farnham. p. 19-26.