

# What keeps patient safe? A Resilience Engineering perspective

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## ABSTRACT

In this paper I explore the potential contribution a Resilience Engineering perspective could offer towards a better understanding and improvement of patient safety. I argue 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. Health care organisations and health policy makers should consider identifying ways that enable organisations to learn about performance variability and trade-offs from everyday clinical work.

## 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]. In the UK, the scandal surrounding appalling standards of care at Mid Staffordshire NHS Foundation Trust created much media attention. The ensuing Public Inquiry found that between 2005 and 2009 as many as 1,200 patients died needlessly [8]. 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 [9].

In order to improve patient safety health care organisations have been turning to safety-critical industries, such as aviation, in order to harness learning about safety management practices [10, 11]. Approaches that have

been carried across from industry include the reporting and analysis of incidents, standardisation of processes, and the introduction of aviation-style checklists [12, 13]. However, the adoption of solutions from ultra-safe industries (e.g. aviation) has met with variable success [14, 15], and questions have been raised about the applicability and suitability of traditional safety management approaches in health care settings [16, 17].

Considering the difficulties of applying traditional safety management approaches in health care, a group of clinicians and academics from the Resilience Engineering community have been developing over the past five years an alternative approach of looking at patient safety – Resilient Health Care [18-20]. In this paper I explore the potential contribution a Resilience Engineering perspective could offer towards a better understanding and improvement of patient safety. I argue 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 positive contribution of performance variability, and the role of trade-offs are frequently overlooked in traditional safety management approaches. A Resilience Engineering perspective might provide novel insights into why progress with patient safety has been slow, and what kind of recommendations might be appropriate in the future.

The paper is structured as follows: in the next section I briefly review some of the problems with the traditional approach to safety management using the example of clinical handover. I then provide a critique of safety management as currently practiced in health care based on a Resilience Engineering perspective. I conclude the paper with recommendations for practice and for research.

## **2 THE TROUBLE WITH CLINICAL HANDOVER**

Clinical handover refers to the activity of transferring professional responsibility and accountability for the care of a patient from one health care professional to another. Clinical handover can occur at scheduled times in the form of shift handover, where responsibility for an entire group of patients is transferred. Clinical handover also occurs for individual patients, for example when patients are transferred from the ambulance to the emergency department [21]. These latter types of handover are particularly vulnerable

as they involve practitioners with different professional backgrounds, and from different organisations (or departments) [22, 23].

A large body of research demonstrates that inadequate clinical handover practices are putting patients at risk [24-26]. Handover failures can lead to delays in treatments [27], medication errors [28], unnecessary duplication of assessments [29], and poor patient experience [2].

Studies of handover often approach this activity from a traditional safety management perspective. The problem with handover is framed rather narrowly as the failure of the transfer of information from a sender to a receiver [30]. Accordingly, it is frequently suggested, and attempted in practice, to reduce failures in clinical handover in a normative way through the introduction of procedures and standardised, structured communication protocols based on mnemonics such as the popular SBAR (Situation, Background, Assessment, Recommendation) [31]. Reviews of the literature on clinical handover conclude, however, that there is no reliable body of evidence to suggest that these attempts have been successful [24, 32]. This echoes cautions that the narrow perspective on information transfer may be potentially impoverishing and limiting [33].

### **3 RESILIENT HEALTH CARE**

Standardisation, communication protocols and checklists can be regarded as instances of formal assumptions about how work should be carried out – work-as-imagined (WAI) [34]. However, recent literature in the area of Resilient Health Care provides many examples that the way everyday clinical work is actually unfolding – work-as-done (WAD) – is necessarily different from what those who design and manage health care systems assume [18-20]. Modern health care systems are characterised by changing demands and finite resources giving rise to competing organisational priorities, such as the management of patient flows and time-related performance targets [22]. Health care systems might be regarded more appropriately as Systems of Systems [35] or Complex Adaptive Systems [36]. The complexity of this context creates tensions [37] that clinicians have to resolve and to translate

into safe practices through dynamic trade-offs on a daily basis [38, 39]. Such necessary performance adjustments contribute to organisational resilience [40]. More generally, resilient health care systems have been described as systems capable of anticipating and adapting to surprises and changes, and of monitoring their response and learning from their performance [40].

Empirical studies of clinical handover provide a diverse range of examples of performance adjustments in practice [38, 39]. For example, when ambulances are queuing at the emergency department, ambulance crews might hand over their patient to another crew waiting in line in order to save time. The second crew will then be less familiar with the patient when they eventually hand over the patient to the emergency department staff. Ambulance crews in this instance are trading the risk of not meeting clinical need in the community due to queuing with the risk of having a poor quality handover from a crew who are not familiar with the patient. The empirical work demonstrated that clinicians resolve such tensions dynamically, and sometimes in violation of formal procedures, based on the specifics of the situation and on their sense of “being worried” about the patient in their care [38, 39]. Often, the ability to make such performance adjustments and trade-offs in order to deal with competing demands and changing conditions are fundamental to keeping patients safe. This ability is a key characteristic of Resilient Health Care systems.

#### **4 CONCLUSION**

What keeps patients safe? We know from the literature that patients are not as safe as one might hope. Traditional safety engineering applied to health care settings focuses on those situations, where harm occurred [41]. The aim is to generate learning about failures in order to prevent those failures from happening in the future. This is a reasonable aim, and sometimes progress with patient safety can be made as a result. Looking at patient safety from a different angle, one might say that, most of the time, patients actually receive good quality care. The reason for that is because clinicians, clinical teams and health care organisations are able to make adjustments and dynamic trade-offs.

Health care organisations and health policy makers should consider identifying ways that enable organisations to learn about performance

variability and trade-offs from everyday clinical work [42, 43]. While standardisation and checklists have their place in certain situations, so do performance variability and trade-offs. When something goes wrong, performance variability of individuals and deviation from WAI should not be identified as the root cause. Alternative learning mechanisms should be explored and supported. For example, less formal learning structures, such as lunchtime working groups or inter-departmental peer discussion groups often form around specific problems with the aim of bringing about useful change and improvement [14]. These activities are not normally considered part of an organisation's learning infrastructure, and no organisational support is provided. Organisations should consider harnessing the positive contribution of such informal, local learning by actively encouraging staff participation and by providing resource where possible, for example through the explicit introduction of improvement time into staff working hours.

Recognising the positive contribution performance variability can make, and encouraging staff to raise concerns and to propose improvements requires a certain type of organisational culture based on trust between individuals, and between individuals and the organisation. Organisations need to work hard in order to overcome a culture of blame and fear, and to progress towards a culture that is open and just, and aimed at continuous improvement, for example through the use of executive and interdisciplinary walk arounds, team building and communication initiatives [44, 45]. Organisations need to ensure that staff are being listened to, and that their concerns and suggestions are taken seriously.

Research in Resilient Health Care has focused on identifying and describing resilience mechanisms in order to raise awareness, and to build explanatory frameworks. Research needs to start moving beyond description, in order to facilitate the adoption of Resilience Engineering in clinical practice.

## REFERENCES

[1] Department of Health. An organisation with a memory. London: The Stationery Office; 2000.

- [2] Kohn LT, Corrigan JM, Donaldson MS. To Err Is Human: Building a Safer Health System. Washington: The National Academies Press; 2000.
- [3] Brennan TA, Leape LL, Laird NM, Hebert L, Localio AR, Lawthers AG, et al. Incidence of Adverse Events and Negligence in Hospitalized Patients. New England Journal of Medicine. 1991;324:370-6.
- [4] de Vries EN, Ramrattan MA, Smorenburg SM, Gouma DJ, Boermeester MA. The incidence and nature of in-hospital adverse events: a systematic review. Quality & safety in health care. 2008;17:216-23.
- [5] Thomas EJ, Studdert DM, Burstin HR, Orav EJ, Zeena T, Williams EJ, et al. Incidence and types of adverse events and negligent care in Utah and Colorado. Medical care. 2000;38:261-71.
- [6] Vincent C, Neale G, Woloshynowych M. Adverse events in British hospitals: preliminary retrospective record review. BMJ (Clinical research ed). 2001;322:517-9.
- [7] Wu AW. Medical error: the second victim. BMJ (Clinical research ed). 2000;320:726-7.
- [8] Francis R. Report of the Mid Staffordshire NHS Foundation Trust Public Inquiry. 2013.
- [9] Ovretveit J. Does improving quality save money? . London: Health Foundation; 2009.
- [10] Helmreich RL. On error management: lessons from aviation. BMJ (Clinical research ed). 2000;320:781-5.
- [11] Kapur N, Parand A, Soukup T, Reader T, Sevdalis N. Aviation and healthcare: a comparative review with implications for patient safety. JRSM open. 2016;7:2054270415616548.
- [12] Barach P, Small SD. Reporting and preventing medical mishaps: lessons from non-medical near miss reporting systems. BMJ (Clinical research ed). 2000;320:759-63.
- [13] Haynes AB, Weiser TG, Berry WR, Lipsitz SR, Breizat A-HS, Dellinger EP, et al. A Surgical Safety Checklist to Reduce Morbidity and Mortality in a Global Population. New England Journal of Medicine. 2009;360:491-9.
- [14] Sujan M. An organisation without a memory: A qualitative study of hospital staff perceptions on reporting and organisational learning for patient safety. Reliability Engineering & System Safety. 2015;144:45-52.
- [15] Clay-Williams R, Colligan L. Back to basics: checklists in aviation and healthcare. BMJ quality & safety. 2015;24:428-31.
- [16] Sujan MA, Habli I, Kelly TP, Pozzi S, Johnson CW. Should healthcare providers do safety cases? Lessons from a cross-industry review of safety case practices. Safety Science. 2016;84:181-9.
- [17] Wears RL, Cook RI, Perry SJ. Automation, interaction, complexity, and failure: A case study. Reliability Engineering & System Safety. 2006;91:1494-501.
- [18] Braithwaite J, Wears R, Hollnagel E. Resilient Health Care III: Reconciling Work-as-Imagined with Work-as-Done. Farnham: Ashgate; 2016.
- [19] Hollnagel E, Braithwaite J, Wears RL. Resilient Health Care. Farnham: Ashgate; 2013.
- [20] Wears R, Hollnagel E, Braithwaite J. The Resilience of Everyday Clinical Work. Farnham: Ashgate; 2015.
- [21] Sujan M, Spurgeon P, Inada-kim M, Rudd M, Fitton L, Horniblow S, 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.](#)

[22] [Sujan MA, Chessum P, Rudd M, Fitton L, Inada-Kim M, Cooke MW, et al. Managing competing organizational priorities in clinical handover across organizational boundaries. Journal of Health Services Research & Policy. 2015;20:17-25.](#)

[23] [Sujan MA, Chessum P, Rudd M, Fitton L, Inada-Kim M, Spurgeon P, et al. Emergency Care Handover \(ECHO study\) across care boundaries: the need for joint decision making and consideration of psychosocial history. Emergency Medicine Journal. 2015;32:112-8.](#)

[24] [Cohen MD, Hilligoss PB. The published literature on handoffs in hospitals: deficiencies identified in an extensive review. Quality and Safety in Health Care. 2010;19:493-7.](#)

[25] [Johnson JK, Arora VM. Improving clinical handovers: creating local solutions for a global problem. Quality and Safety in Health Care. 2009;18:244-5.](#)

[26] [Raduma-Tomas MA, Flin R, Yule S, Williams D. Doctors' handovers in hospitals: a literature review. BMJ quality & safety. 2011;20:128-33.](#)

[27] [Solet DJ, Norvell JM, Rutan GH, Frankel RM. Lost in translation: challenges and opportunities in physician-to-physician communication during patient handoffs. Academic medicine : journal of the Association of American Medical Colleges. 2005;80:1094-9.](#)

[28] [Petersen LA, Brennan TA, O'Neil AC, Cook EF, Lee TH. Does housestaff discontinuity of care increase the risk for preventable adverse events? Annals of internal medicine. 1994;121:866-72.](#)

[29] [Bomba DT, Prakash R. A description of handover processes in an Australian public hospital. Australian health review : a publication of the Australian Hospital Association. 2005;29:68-79.](#)

[30] [Cheung DS, Kelly JJ, Beach C, Berkeley RP, Bitterman RA, Broida RI, et al. Improving handoffs in the emergency department. Annals of emergency medicine. 2010;55:171-80.](#)

[31] [Haig KM, Sutton S, Whittington J. SBAR: a shared mental model for improving communication between clinicians. Joint Commission journal on quality and patient safety / Joint Commission Resources. 2006;32:167-75.](#)

[32] [Talbot R, Bleetman A. Retention of information by emergency department staff at ambulance handover: do standardised approaches work? Emergency medicine journal : EMJ. 2007;24:539-42.](#)

[33] [Patterson ES, Wears RL. Patient handoffs: standardized and reliable measurement tools remain elusive. Joint Commission journal on quality and patient safety / Joint Commission Resources. 2010;36:52-61.](#)

[34] [Hollnagel E. Why is Work-as-Imagined different from Work-as-Done? In: Wears R, Hollnagel E, Braithwaite J, editors. The Resilience of Everyday Clinical Work. Farnham: Ashgate; 2015.](#)

[35] [Harvey C, Stanton NA. Safety in System-of-Systems: Ten key](#)

challenges. *Safety science*. 2014;70:358-66.

[36] Braithwaite J, Clay-Williams R, Nugus P, Plumb J. Healthcare as a complex adaptive system. In: Hollnagel E, Braithwaite J, Wears R, editors. *Resilient Health Care*. Farnham: Ashgate; 2013. p. 57-73.

[37] Sujan MA, Rizzo A, Pasquini A. Contradictions and critical issues during system evolution. *ACM symposium on Applied Computing: ACM*; 2002. p. 711-5.

[38] Sujan M, Spurgeon P, Cooke M. The role of dynamic trade-offs in creating safety—A qualitative study of handover across care boundaries in emergency care. *Reliability Engineering & System Safety*. 2015;141:54-62.

[39] Sujan M, Spurgeon P, Cooke M. Translating tensions into safe practices through dynamic trade-offs: The secret second handover. In: Wears R, Hollnagel E, Braithwaite J, editors. *The Resilience of Everyday Clinical Work*. Farnham: Ashgate; 2015. p. 11-22.

[40] Fairbanks RJ, Wears RL, Woods DD, Hollnagel E, Plsek P, Cook RI. Resilience and resilience engineering in health care. *Joint Commission journal on quality and patient safety / Joint Commission Resources*. 2014;40:376-83.

[41] Sujan M, Pozzi S, Valbonesi C. Reporting and Learning: From Extraordinary to Ordinary. In: Braithwaite J, Wears R, Hollnagel E, editors. *Resilient Health Care III: Reconciling Work-as-Imagined with Work-as-Done*. Farnham: Ashgate; 2016.

[42] Sujan M, Furniss D. Organisational reporting and learning systems: Innovating inside and outside of the box. *Clinical Risk*. 2015;21:7-12.

[43] Sujan MA. A novel tool for organisational learning and its impact on safety culture in a hospital dispensary. *Reliability Engineering & System Safety*. 2012;101:21-34.

[44] Weaver SJ, Lubomksi LH, Wilson RF, Pfoh ER, Martinez KA, Dy SM. Promoting a culture of safety as a patient safety strategy: a systematic review. *Annals of internal medicine*. 2013;158:369-74.

[45] Singer SJ, Vogus TJ. Reducing hospital errors: interventions that build safety culture. *Annual Review of Public Health*. 2013;34:376-96.