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Resilience in healthcare and clinical handover

S A Jeffcott, J E Ibrahim, P A Cameron

ABSTRACT

Background: Understanding and applying human factors in healthcare provides significant opportunities for improving patient safety. A key human factors concept is "resilience," which investigates how individuals, teams and organisations monitor, adapt to and act on failures in high-risk situations. Although it is a new concept to healthcare, it is well accepted in other high-risk industries. Resilience moves the focus away from "What went wrong?" to "Why does it go right?", that is, it moves from simplistic reactions to error making toward valuing a proactive focus on error recovery. Resilience is a better match for healthcare settings than the principles for high reliability because it more effectively addresses the unique complexities of healthcare.

Objective: This article introduces the concept of resilience and how it applies to healthcare using clinical handover as an exemplar. Clinical handover and the risks it presents to patient safety are used to illustrate the key principles of resilience to healthcare professionals. The overall aim of this paper is to motivate research which focuses on understanding how frontline staff "fix" mistakes. Researching resilience in healthcare needs to focus on developing measurement, improvement and prediction tools.

Conclusion: Resilience can benefit patient safety efforts because it represents a change in emphasis from a traditional, reactive focus on errors to seeing humans as a defence against failure. Translating this concept into practice requires identifying and testing mechanisms for measuring and building resilience within complex healthcare processes.

DEFINING "RESILIENCE"

A new application of an old term

Resilience is an everyday word, often synonymous with "robust," "buoyant," "elastic" and "flexible." It can describe a person's ability to recover readily from illness, depression or some other adversity in life. When used to refer to structures, it is the power for a material to return to its original form after being put under physical stress.

However, from a human factors perspective, resilience refers to the ability, within complex and high-risk organisations, to understand how failure is avoided and how success is obtained. It describes how people learn and adapt to create safety in settings that are fraught with gaps, hazards, trade-offs, and multiple goals.

Resilience has three interconnected levels: (1) the individual or cognitive/knowledge-based—for example, speaking up about safety fears; (2) micro-organisational or team/intergroup dynamics—for example, clear supervision, leadership and feedback; and (3) macro-organisational or whole organisation—for example corporate commitment to safety. This means that resilience can be described as a property of individuals as well as teams within their workplace.

Resilience offers a system-based approach, allowing an organisation to understand both what sustains and what erodes its ability to adapt to changing pressures, that is how to learn to stay "safe," rather than focusing on error as an end in itself. It is innovative in that it looks proactively rather than reactively and does not assume that erratic people degrade an otherwise safe system. Instead resilience aligns with what is described as a "new view of human error" which sees humans in a system as a primary source of resilience in creating safety. The "old view" focuses more on the elimination of risk rather than, more realistically,
A common source of misunderstanding

The concept of resilience is often compared with broader work on the theory of High Reliability Organisations, or HROs. Although there is some overlap, these are two distinct ideas. HRO theory describes core principles of organisations that have few accidents despite operating in highly dynamic, technologically rich and hazardous industries (e.g., aircraft carriers). Researchers argue that the theory and practice of HROs provides lessons for the medical domain. This is readily understood because HROs take a systems approach to error, threaten mindfulness, and other mechanisms must be in place to prevent harm.

These features overlap with the concept of resilience. However, modelling on the practices of HROs will not achieve resilience in healthcare because there are significant differences in the nature and complexity of healthcare work. Healthcare’s variability, diversity, limited resources, specialisation and ad hoc teams mean that HRO characteristics, such as redundancy and extensive training, are simply not achievable. Reliability in HROs is often accomplished by standardisation and simplification. In contrast, resilience values behaviours/resources which contribute to a system’s ability to respond flexibly to new and unexpected demands. Full explanations of each of the five characteristics of HROs can be found in Weick and Sutcliffe.

Integrating safety concepts into resilience

Two other human-factors concepts which impact on whether an organisation can operate in a resilient way are (1) “safety culture” and (2) “mindfulness.” Safety culture is integral within the safety science research field. It describes how individuals, teams and organisational structures value and prioritise “safe” work. Safety culture is underpinned by the beliefs, attitudes, and assumptions that are shared across an organisation and become expressed in the daily practices. Arguably, safety culture is the bedrock to building resilience.

Mindfulness traditionally describes the mental state of an individual who has a heightened alertness to their environment. Weick and colleagues were the first to extend the concept from the individual to the organisational level. Mindful organisations better prepare themselves to notice the unexpected and halt its development. It describes a heightened vigilance to risk which is kept fresh in people’s minds, at all levels of the organisation, at all times. Being mindful and constantly monitoring safety are important aspects of resilience. However, acute production pressures and resource limitations threaten mindfulness, and other mechanisms must be in place to build resilience.

Elements of resilience: foresight, coping, recovery

Resilience is therefore about transforming lessons from past failures into future success by learning how it is that humans bridge gaps and recover from errors (and often in situations before patient harm occurs). Hollnagel and colleagues describe three key elements as part of resilience. These include:

- **foresight** or the ability to predict something bad happening;
- **coping** or the ability to prevent something bad becoming worse; and
- **recovery** or the ability to recover from something bad once it has happened.

A resilient organisation is one whose workers are supported in these key elements, so that safety is promoted by anticipating failure, by learning how to adapt to circumstances where failure is indicated and by restoring safe conditions after events. A valid example of applying the concepts of resilience in healthcare must demonstrate application across a range of clinical settings, from institutional to home-based care, and for diseases which range from acute, life-threatening illnesses to chronic conditions impacting on quality of life. We selected handover as an exemplar because it is an integral healthcare process involving all professional disciplines, disease states and clinical settings. It also represents a disruption to the continuity of care and so is particularly prone to errors.

Specifically, poor clinical handover can create discontinuities in care leading to patient harm and is recognised as an international patient safety priority. Measurement of safety and quality in handover requires consideration of three key elements: (1) information transfer; (2) responsibility and/or accountability, within; (3) the context of multidisciplinary teams. Successfully applying resilience in this context should transform handover from a source of vulnerability to one that provides proactive mechanisms for preventing and recovering from errors and process failures. This strengthens the argument that resilience is applicable to healthcare, since if we are able to demonstrate how the principles of resilience are addressed or applied to a specific work practice, which occurs every day, then we can generalise these principles across other healthcare processes.

Table 1 explains these concepts, using handover as a practical demonstration.

**RESILIENCE FOR CLINICAL HANDOVER**

**Principles of resilience**

Seven key principles have been created and defined within the new resilience paradigm in order to help articulate what the concept means in a macro-organisational sense. This is important because it lays out a set of defined practices that an organisation could learn to adjust, in either a positive or negative direction, in order to increase or decrease its resilience. Again, we apply this to the example of handover, in table 2.

**Stages of resilience: reactive, interactive and proactive**

There are three stages of resilience which describe different standards of functioning. These include:

1. **Reactive** (or brittle) which represents the most basic stage and is characterised by a mere response to failure that means an individual, team or organisation is easily overwhelmed by even minor disruptions and deviations from standard practice. It can stem from the belief that the absence of failure indicates that hazards are not present and/or that countermeasures are adequate to handle unexpected occurrences.

2. **Interactive** (or partial resilience), which represents a middle stage where there is attention to failure but not anticipation of it.

3. **Proactive** (or full resilience), which represents the mature stage where deviations are worthy of additional attention, but there is a constant commitment to proactively seek out evidence testing assumptions about risk and the overall “health” of the system.

Arguably the principles of resilience (see table 2) could be applied to positively advance an organisation up through these different stages. Table 3 expands our discussion of the three key
stages of resilience, as set against the three key elements of clinical handover.

RESEARCHING RESILIENCE IN HEALTHCARE

Researching concepts in resilience

Within this section, we will concentrate on the development of tools for resilience which we argue has immediate application. However, further work focusing on tailoring the concept of resilience within healthcare is required and is likely to be an evolving process.

Researching tools in resilience

It follows from examining both the principles of resilience (see table 2) and the stages of resilience (see table 3) that it might be possible to identify foresight, coping and recovery strategies for handover and to outline a series of practical strategies that will aid the development of these skills and knowledge sets within specific healthcare scenarios.

Up to now, within our case study examples, we have taken a very generic look at the handover problem, but it would be appropriate for a hospital, for instance, to identify its core categories of handover and apply resilience approaches which are tailored to each.

Yet the methods to extract this information and the tools to apply learnings are currently not defined within the resilience engineering paradigm, let alone for specific domains like healthcare. This is because resilience is a relatively new concept, and it is yet to be seen whether or not it can support the design and maintenance of safety-critical systems.

As a starting-point, we have identified some critical components, adapted from Woods and colleagues, which might form a framework for the development of tools to investigate resilience. Three types of tools require development, including (1) measurement tools, (2) improvement tools and (3) prediction tools (see table 4).

Developing measurement and improvement tools could leverage on existing knowledge bases about the principles of resilience and stages of resilience, which are already highlighted in this paper. All three tools can:

► give some structure to the intentions of such applied resilience investigations;
► demonstrate what and where tools are necessary in order to build an organisation’s ability both to anticipate and to gauge potential future difficulties;
► assist in the development of structured plans for optimising safer work processes.

The third set of “prediction” tools involve ways to model short- and long-term effects of change and help decision-makers balance safety and production pressures—referred to as

| Table 2 Principles of resilience (adapted from Wreathall) applied to the handover |
|--------------------------------------|--------------------------------|--------------------------------|
| Principles of resilience            | Explanation                                      | Handover example                  |
| 1. Top-level commitment             | “Top management shows commitment towards addressing human performance concerns” | Management participate in executive walk-arounds and some committee meetings looking at improving handovers |
| 2. Just culture                     | “Supports reporting of issues up through the organisation, yet not tolerating culpable acts” | Handover rounds are supervised by senior clinicians who support speaking out about concerns of staff about safety |
| 3. Learning culture                 | “Organisation responds to events with repair and true reform rather than denial” | Communication breakdowns in handover are examined and shared openly and widely |
| 4. Awareness                        | “Data gathering that provides management with insights regarding the quality of human performance, the extent to which it is a problem and the current state of the defences” | Monitoring of handover is performed routinely (and specifically when changes are made, eg, when new technology is introduced) |
| 5. Preparedness                     | “Organisation actively anticipates human performance problems and prepares for them” | Foresight, coping and recovery strategies are identified and integrated (ie, staff rotas and workforce requirements are reviewed prior to new mandated reduction in duty hours for junior doctors) |
| 6. Flexibility                      | “Ability for the organisation to adapt to new or complex problems in ways that maximise ability to solve the problem without disrupting operations” | Allowing certain frontline clinical groups admitting privileges when senior staff are absent in order not to delay patient treatment in emergencies |
| 7. Opacity                          | “Organisation aware of economic, workload, and safety pressures (see: Rasmussen) and where effort needs to be invested to ensure that defences are not degraded” | Monitoring of pressures (such as budget cuts) so that strategies may be developed to ensure standards of handover practice are always maintained |
‘sacrificing decisions.’28 29 These tools can support resilience in healthcare by signalling how to make trade-offs in the face of performance pressures.

Research opportunities

Attempting to do things safely, in the course of meeting other goals, has always been part of operational practice within healthcare (as it is in all high-risk industries). As set out in Rasmussen’s model of risk management,30 complex work processes, like those involved in handover, do not choose failure but drift toward it as production pressures and other changes erode the defences that normally keep failure at bay. Woods et al describe this drift as the result of systematic, predictable organisational factors at work, not simply erratic individuals—in line with the new view of error.5 27

As discussed already, the theory around resilience provides principles for building resilience in complex socio-technical systems and reflects different levels of resilience that an organisation can find itself at and move between. Progressing through levels, for example from reactive (ie, brittle organisations) to proactive (ie, resilient organisations), requires an awareness of failure by both individuals and teams within a mindful and safe culture so that failure-sensitive strategies can be developed to forestall possibilities.

Handover as a process has many such “gaps” (or disruptions to patient care), of varying sizes, that develop because of the large amount of change that occurs at the point of patient transfer. This includes changes in key personnel and the responsible care team, change in environment and differences in type and complexity of technology and so on.

Cook and colleagues have proposed that one way to characterise this complexity in the system is to identify and formally document the frequency and nature of gaps in the continuity of care, as well as experts’ strategies for bridging gaps.8 This approach was operationalised by Rogers et al and enabled them to gain a much better insight into why problems were arising and, more importantly, how they were being alleviated or avoided.4 In order to begin to gather baseline data as part of building resilience within patient safety priority areas, five key steps should be taken. This process was first outlined by Cook et al5 and is further elaborated in Hollnagel et al.

Table 3 Stages of resilience (adapted from Hollnagel et al1) applied to the three key handover elements

<table>
<thead>
<tr>
<th>Resilience stage</th>
<th>Explanation</th>
<th>Key handover elements</th>
<th>1. Information</th>
<th>2. Responsibility/accountability</th>
<th>3. System</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. “Reactive” (or brittle with no resilience)</td>
<td>This is about response and knowing what to do to respond to failures</td>
<td>For example, standardised but not tailored formats (ie, reducing flexibility)</td>
<td>For example, wide acceptance of not completing handovers after pagers interrupt handover updates</td>
<td>For example, absence or incomplete staff rotas for handover</td>
<td></td>
</tr>
<tr>
<td>2. “Interactive” (or robust with partial resilience)</td>
<td>This is about attention and knowing what to look for</td>
<td>For example, provide easy access to extra information, if needed</td>
<td>For example, provide an opportunity for receiving team to seek clarification</td>
<td>For example, designated handover times and areas</td>
<td></td>
</tr>
<tr>
<td>3. “Proactive” (or resilient with full resilience)</td>
<td>This is about anticipation and knowing what to expect before it disrupts system</td>
<td>For example, triage or clinical review (ie, cross-check decision, not just transfer)</td>
<td>For example, official sign-off and escalation policies for common understanding</td>
<td>For example, designing the system so that the incoming person in a handover has to update the outgoing person listens to ensure accuracy</td>
<td></td>
</tr>
</tbody>
</table>

Table 4 Tools for resilience (adapted from Woods et al30): measurement, improvement and prediction

<table>
<thead>
<tr>
<th>Type of resilience tool</th>
<th>Explanation</th>
<th>Knowledge base</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Measurement tools</td>
<td>Ways to analyse, measure and monitor the resilience of organisations in their operating environment</td>
<td>“Principles of resilience” (see table 2)</td>
</tr>
<tr>
<td>2. Improvement tools</td>
<td>Tools and methods to improve an organisation’s resilience vis-à-vis the environment</td>
<td>“Stages of resilience” (see table 3)</td>
</tr>
<tr>
<td>3. Prediction tools</td>
<td>Techniques to model and predict the short- and long-term effects of change and decisions on risk</td>
<td>Provide basis and support for “sacrifice decisions”* (see Morel et al31)</td>
</tr>
</tbody>
</table>

*New research is needed to understand the judgement process that underpins “sacrificing” in organisations, especially from the perspective of resilient organisations. Morel et al31 help begin this discourse.
Research challenges
The successful bridging of gaps by experts may limit the impacts of those gaps and their significance and potential to cause harm (eg, to patients, in the context of handover).

However, as Weick reminds us, safety is a “dynamic non-event.” When healthcare professionals employ foresight, coping and recovery to bridge gaps, there is often no overt failure.

Without the presence of the adverse consequences of clinician behaviour, it is possible for them to undermine the strategies which were vital in keeping them “safe.” Moreover, it may prove hard to justify research spending on how people do not fail, in turn, making or breaking potential resilience-based research opportunities.

Lack of research funding may make understanding resilience within healthcare a non-starter. Fortunately, recent work shows promise in helping to justify the case for carrying out such research. Rogers and colleagues found that 44% of errors involving medication administration and 31% of procedural errors—both in the ICU over a 28-day period—were discovered by registered nurses, thus preventing harm to patients. These types of investigations, set within specific “problem” domains and related to high-risk processes, should help to pave the way for a deeper examination of how such recovery is achieved, can be better supported and, even, trained for in both real and simulated environments.

SUMMARY
A change in emphasis from traditional counts of errors to an examination of the ability of a system to cope with errors is important in order to optimise learning about successful behaviours that staff adopt when caring for patients. Improving patient safety through resilience requires the development of a broader research agenda across a number of healthcare settings. Resilience fits the complexities of healthcare more effectively than principles of high reliability. In essence, resilience represents a shift from seeing humans as a pathological feature of a healthcare system to one where they contribute actively to “safe” work and greater patient safety.

This paper hopes to motivate others to adopt resilience-based approaches, when tackling key patient safety priorities in the future.

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