



# A HUMAN FACTORS RESOURCE

for Health Professionals and Health Services Staff

# Acknowledgments

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## Forward

Healthcare work needs to be performed safely and efficiently in a way that allows healthcare workers to recognise key risks in their environment, feel safe to report these risks, and deal with them. The best way to achieve this aspirational goal is through the application of Human Factors in the design of work systems and environments (physical and organisational); ideally at the early stage of healthcare design, but otherwise throughout operation with the right advice achieving positive results. And where do you find out about good design and the right advice? This resource.

What a wonderful collaboration between a wide range of human factors specialists, ergonomists and other healthcare professionals to produce this resource. Healthcare is a complex and often unpredictable work environment using highly evolved technology, leading edge medicine and pharmaceuticals to treat people who are often in pain, anxious and very vulnerable. This care usually takes place in an even more complex socio-political environment with competing demands for resources and often less than exemplary circumstances. If healthcare work design is not carefully thought through, the potential for things to go wrong increases and the consequences can be severe; even catastrophic. At the very least, the work is not efficient and prone to errors.

Compiling a resource like this on how to address and enable good healthcare work design, both systems and environments (physical and cultural) is a highly complex task in itself; unscrambling a lot of ambiguity. Only those well versed in the three domains of ergonomics, having an understanding of how to manage complexity and collaborating with adept healthcare professionals could have completed this task. The process of creating this guideline reflects how important it is for those administering or designing hospitals, or healthcare services to consider human factors and involve the right professionals in the process.

This resource will not only be helpful for those explaining human factors issues in healthcare or designing good healthcare systems and environments, but also for those human factors and ergonomics professionals working in healthcare, students and healthcare administrators; just to name a few.

Key aspects of the resource include:

- Reducing the risk of errors in the care and treatment of patients (including consideration of cognitive processes, decision-making, situational awareness, interruptions and quality communications);
- Reducing the risk of injury from patient handling;
- Best practice use of healthcare information technology with good Human-Computer Interaction;
- Leadership and team behaviour;
- Developing and sustaining a culture for safety; and
- Good Work Health and Safety Systems.

The resource also provides contemporary references assisting an evidence-based approach and considering best practice.

I really admire the volunteer work, dedication and humanity that has gone into creating this resource. It is very easy to read, breaking things down to an accessible level for everyone. I highly recommend the guideline to anyone working in healthcare all the way through to government departments to politicians. This is the “how to” document that everyone will want access to and I can see it being regularly referenced and well-known. I commend all those involved in its production and I recommend it to you.

### **Stephen Hehir**

President, Human Factors and Ergonomics Society of Australia

## Forward

Healthcare professionals have always functioned in high risk environments, as have many other workers. But we have had a strange reaction to our responsibilities. “We are different” encapsulates the prevailing sentiments of so many colleagues in the “Caring Professions”. The human Genome suggests otherwise and now, in the twenty-first century it is time to reflect on all the componentry of Healthcare. Strangely, the Humanity of Healthcare seems to have been over-looked, while our attention has been diverted by technology itself. Until now!

This “Resource” is much more than just another pamphlet to glance through and put in the library in the office. It is truly a manual, “a small book for handy use”, “a concise treatise”, “a book of instructions for operating a machine, learning a subject etc”<sup>1</sup>. But it has a dual focus. First the delivery of Healthcare in the context of illness and disease and second the frailty of the human condition that besets all of our colleagues, especially me. It clearly defines the latter while not ignoring the former. Both are biological systems, and are both subject to measurement, evaluation, definition and refinement.

The editors have gathered together an impressive list of collaborators within their special interest group who introduce the reader to the concepts of Human factors and Ergonomics and then walk us through the issues of errors, violations, and workarounds. From there the journey reveals the physical impacts of work place design, the unique problems of actually handling our patients and the hazards to psychosocial health for both patient and carer. Workplace health and safety regulators have addressed these factors for many years now but at long last this manual brings them to the attention of clinicians and managers alike.

Our workplace manual then focusses on six problem areas in Healthcare, from communication to leadership. Each need particular skills, each need particular training and each need particular evaluation, “on the job”. It is worth

noting that even our learned colleges now recognise that many of these skills are core competencies, equally important as operative or technical ability.

Finally, our manual brings us back to the real issues that may be unique to Healthcare, how do we interact with technology and build safer systems that embed not just safety but also Quality. It is well said that clinician’s primary concern is “to do no harm” while patients are more concerned with the experience quality care. This manual brings both perspectives to the forefront of the reader’s thinking. The challenge to the reader is to use the principles of human factors and ergonomics as we treat the patient in our immediate view.

The challenge to the editors is to “build an App” or find other ergonomic solutions to make these principles and practices available “just in time”.

The challenge to our leaders; clinical, managers, political and financial, to make this knowledge a core competency for those of us who are called to care for patients while treating their disease, whether in the acute care sector, aged care, mental health facilities, the community or even in the home.

### **Cliff Hughes**

Professor of Patient Safety and Clinical Quality,  
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1. Oxford Shorter English Dictionary



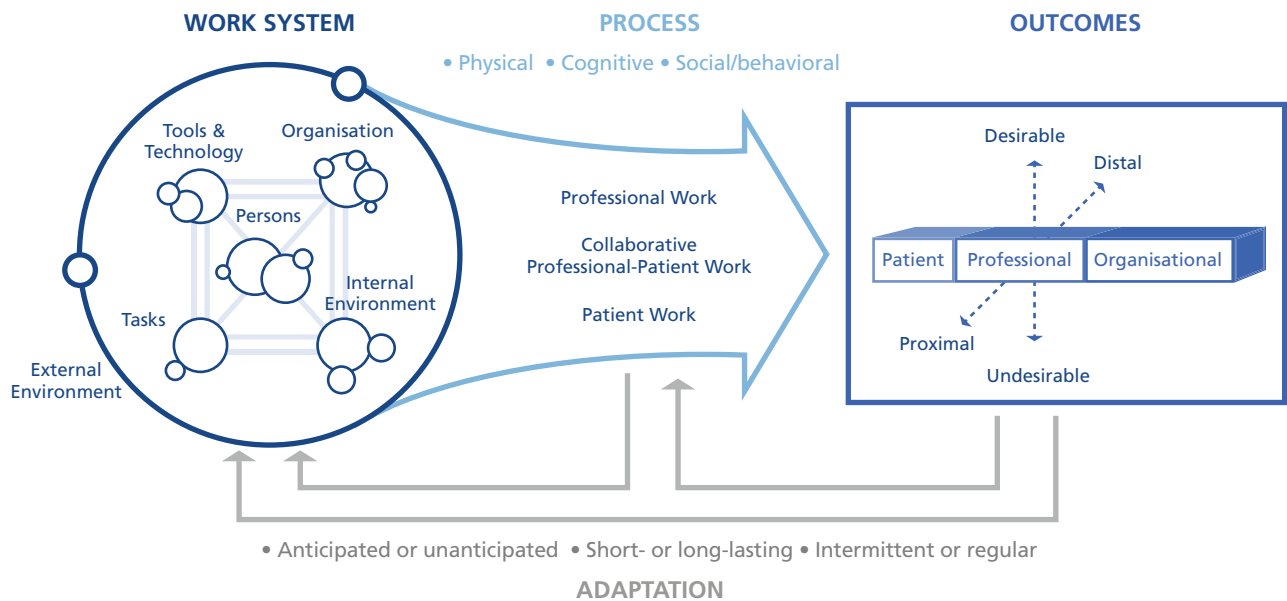


## Introduction to Human Factors and Ergonomics

Veelyn Tan, Alison Gembarovski and A/Professor Melissa Baysari

Human Factors (or Ergonomics) is a scientific discipline focused on understanding the interaction between people and their environments. The term 'environment' here refers to all aspects of the technical and social context or system in which a person operates, including (but not limited to) the tasks that are done, the equipment and technology used, the location or setting, the organisation of the work, work management processes, and the workplace culture. Refer to Systems Engineering Initiative for Patient Safety (SEIPS) model in Figure 1.1.

Human Factors draws knowledge from a wide range of other disciplines such as physiology, psychology, and engineering to optimise human performance, productivity and satisfaction, protecting workers and those impacted by work (e.g. patients or clients). Good work design is fundamental to Human Factors as it ensures there is a good 'fit' between a worker and their environment. If the 'fit' is poor, performance may be slowed, errors may occur, and incidents and accidents could result.



**Figure 1.1** Systems Engineering Initiative for Patient Safety (SEIPS) 2.0 model 1

## What is good work design?

Good work is healthy and safe work where the hazards and risks are eliminated or minimised.

Effective design of work considers:

- The people: physical, emotional and mental capacities and needs.
- The organisation of work: tasks, how the work is organised, task complexity, duration and frequency, training and supervision
- The physical working environment: the vehicles, buildings, structures that are workplaces.
- The tools, equipment, materials and substances used
- The work system: the interaction between multiple systems and workers in the workplace

## Why is good work design important?

Good work design can enhance the health and wellbeing of the healthcare workforce. Having a healthy workforce means workers experience a sense of meaning, wellbeing, confidence and improved learning at work.

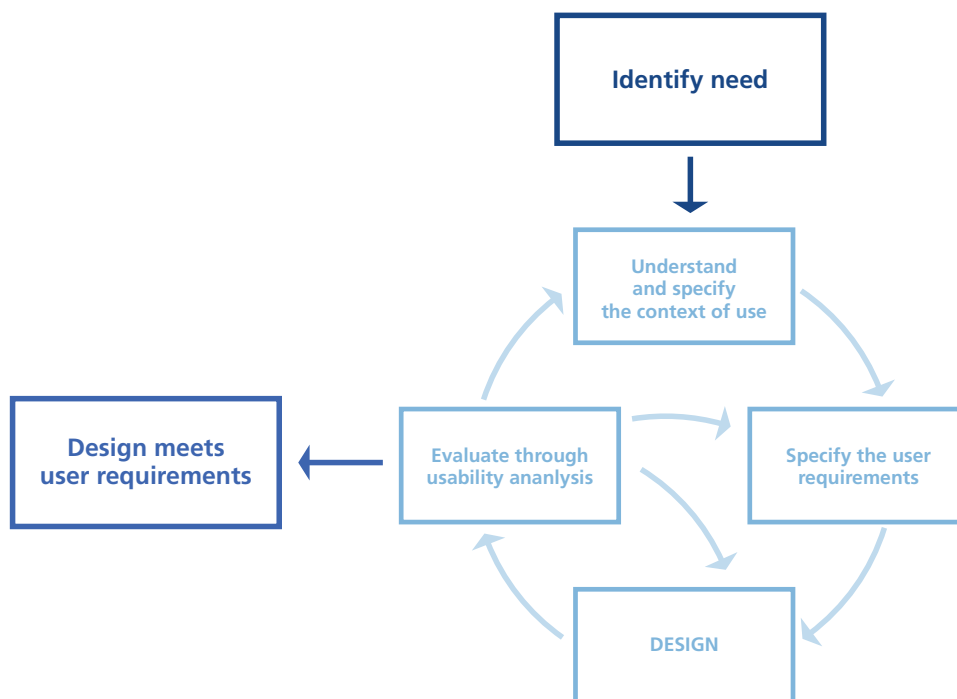
Good work design can also lead to productivity improvements, safer patient care and business sustainability by:

- Improving opportunities for workers to be creative and provide innovative solutions to reduce errors and provide a better patient experience
- Allowing organisations to be efficient and effective and to streamline work processes by reducing wastage, training and supervision costs
- Making better use of workers' skills by promoting skills development
- Making better use of workers' skills resulting in a more engaged and motivated workforce.

## How do we achieve good work design?

The most effective design process begins at the earliest opportunity during the conceptual and planning phases. At this early stage there is the greatest chance of finding ways to design-out hazards, incorporate effective risk control measures and design-in efficiencies.

Leaders of the organisation should provide support and endorsement of good work design, including employing a risk management approach to work design. This involves identifying the hazards, assessing the risks, controlling the risks and maintaining and reviewing the control measures associated with 'work'. Designs should be continually reviewed and readjusted to ensure they are still effective.



**Figure 1.2** Human (user) centred design cycle adapted from ISO 9241-210<sup>2</sup>

**Human-centred design** (sometimes referred to as user-centred design, or participatory ergonomics) is central to Human Factors. This involves understanding how work is done, co-designing with users, and testing and evaluating the design to ensure it meets the user needs. Refer to Fig 1.2 above. When included in the design process, workers are likely to take ownership of the changes, provide unique views and insights into issues, identify and articulate the work demands and stressors, and be proactive in creating solutions that ensure good work design and improve team cohesion.

## Summary of Human Factors

Human Factors focuses on optimising the fit between people and their environments. It considers the work performed, tasks and activities, the physical environment and workers' capacities, limitations and needs. Good work design promotes a healthy, happy and safe workforce and workplace. This in turn improves productivity, enables workers to care for their patients and provides a positive patient experience.

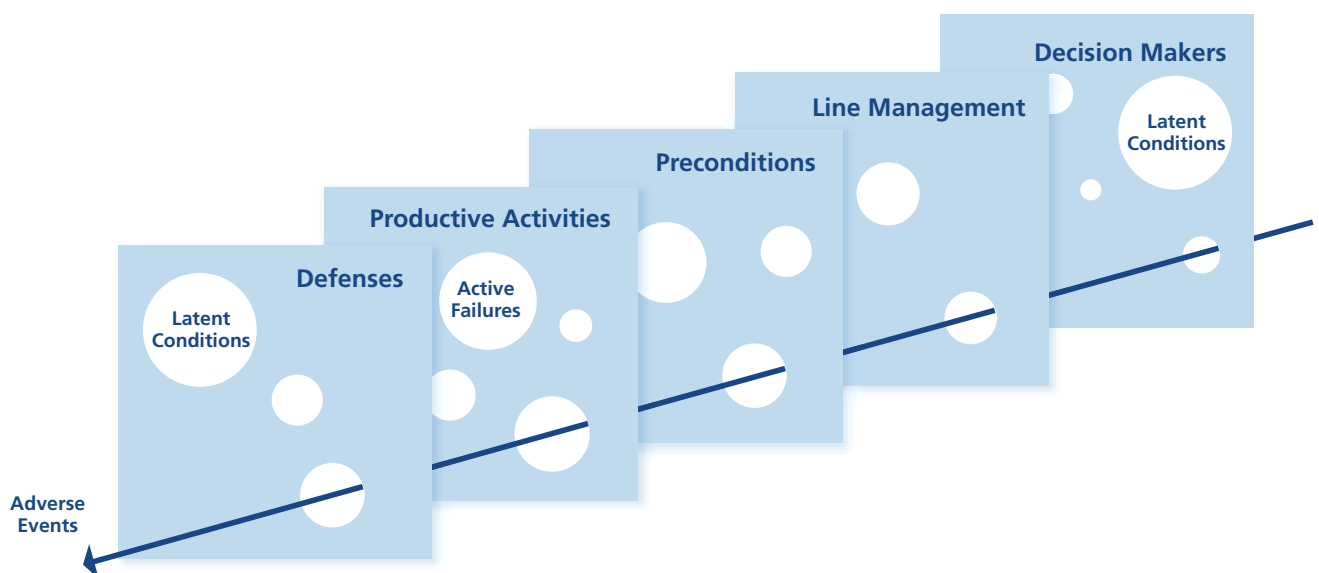


## Improving the fit between people and their environment

Although errors and other performance failures are made by people (e.g. a nurse administered the wrong dose of a medication to a patient), this 'person-centred' way of thinking about problems is not very helpful for organisations wishing to improve the fit between people and their environments and so avoid similar failures in the future. A systems approach, on the other hand, recognises that people are just one element in a complex system and that all the elements in the system play a role in the occurrence of performance failures. Was the ward under-

staffed that day? Was the dose difficult to read on the paper medication chart? Was the nurse interrupted while they were preparing the dose?

Reason's well-known model of organisational accidents ('Swiss Cheese' Model<sup>3</sup>) proposes that accidents and incidents occur when active performance failures align with latent conditions or failures in the system to break through system defences. The basic model is shown in Figure 1.3.



**Figure 1.3** Swiss cheese model<sup>3</sup>

In this model, active failures are the performance failures made by 'front-line' operational staff such as doctors, nurses, allied health staff, cleaners, etc. Latent failures, on the other hand, occur from the history of decision-making and actions in the organisation, typically by managers and others who are removed from the hazards of the work (e.g. designers and engineers, policy and procedure writers, human resources personnel, supervisors, regulators). Latent failures include things like poorly designed equipment, time pressure, inadequate

training, gaps in supervision, and workplace culture. These latent failures 'live' in the work system but do not result in immediate adverse effects. They may lie undetected in the system for a very long time (or forever) provided other safety defences do not fail. Latent failures only result in incidents when they occur alongside other failures that together expose people to hazards.

This way of thinking encourages 'find and fix', whereby latent conditions are identified and 'fixes' such as regulation, standardisation, or training are applied.

This can be very effective in a linear system, where errors are predictable and happen exactly the same way every time. Much of healthcare, however, is not a linear system, but instead is complex and adaptive. While humans – with their inherent propensity to make errors – would be seen as a liability in a linear system, in a complex adaptive system it is the continual adjustments people make to their day-to-day work to meet emerging conditions that contribute to success. This new perspective, termed Resilient Healthcare (or Safety-II), focuses on ensuring as many things as possible go right and on enabling clinicians to succeed under varying conditions.<sup>4</sup> Resilient Healthcare is fast gaining traction among researchers, policymakers, managers and health professionals as a way to safely work in complex adaptive environments. Resilient Healthcare recognises that the capacity of front-line clinical staff to flex and adjust their performance in the light of system complexity is a core characteristic of safe, high quality care.

Whether dealing with complexity or linearity, human factors practitioners and researchers adopt a systems approach (i.e. considering all latent and active failures in a system) when attempting to improve the fit between people and their environments, ensuring all elements of the work system are considered and optimised.

## How to use this resource

The goal of this leaflet is to demonstrate the importance of Human Factors in ensuring healthcare work is performed safely and efficiently and to enable healthcare workers to recognise key risks in their environment. This resource includes brief descriptions of topics relevant to healthcare, focusing on the various aspects of work. As shown in Table 1.1, the topics relate to physical, cognitive and organisational aspects of work.

**Table 1.1 Three key dimensions of human factors<sup>5</sup>**

<b>Physical</b>	Focused on the anatomical, anthropometric, physiological and biomechanical characteristics of people and how these affect interactions between humans and other elements of the work system
<b>Cognitive</b>	Focused on mental processes like perception, memory, and reasoning and how these affect interactions between humans and other elements of the work system
<b>Organisational</b>	Focused on sociotechnical systems, including organisational structures, policies and processes

The Chapters are designed to provide an overview of the topic to a broad audience. If you require more information on a topic area, please refer to the references and the section on further reading at the end of each chapter. Alternatively, consider contacting the Human Factors and Ergonomics Society of Australia (HFESA) Healthcare Ergonomics Special Interest Group (<https://www.ergonomics.org.au/signs/healthcare-ergonomics-sig-healthsig>).

## References

1. Holden RJ, Carayon P, Gurses AP, Hoonakker P, Hundt AS, Ozok AA et al. SEIPS 2.0: a human factors framework for studying and improving the work of healthcare professionals and patients. *Ergonomics*. 2013; 56(11): 1669-1686.
2. Ergonomics of human-system interaction – Part 210: Human-centred design for interactive systems. ISO 9241-210. International Organization for Standardization. 2010.
3. Fukuoka, K. Visualization of a hole and accident preventive measures based on the Swiss cheese model developed by risk management and process approach. *WMU Journal of Maritime Affairs* 2016; 15(1): 127-142..
4. Hollnagel, E., et al. (2015). From Safety-I to Safety-II: A White Paper. Published simultaneously by the University of Southern Denmark, University of Florida, USA, and Macquarie University, Australia, University of Southern Denmark.
5. International Ergonomics Association. Definitions and domains of ergonomics. 2019. <https://www.iea.cc/whats/index.html>

## Further reading

- Human Factors and Ergonomics Society of Australia. <https://www.ergonomics.org.au/>
- Parker S, Griffin M. Principles and evidence for good work through effective design. 2014. <https://www.safeworkaustralia.gov.au/sites/swa/files/good-work-design-and-psychosocial-risks-application.pdf>.
- Towards a Safety Culture. The relationship between Workplace Culture and Medical Indemnity Claims in the Victorian Health Sector. VMIA Occupational paper. May 2012.
- Guide for managing the risk of fatigue at work. Safe Work Australia. 2013. <https://www.safeworkaustralia.gov.au/system/files/documents/1702/managing-the-risk-of-fatigue.pdf>
- Trinkoff AM, Geiger-Brown JM, Caruso CC, et al. Personal Safety for Nurses. In: Hughes RG, editor. Patient Safety and Quality: An Evidence-Based Handbook for Nurses. Rockville (MD): Agency for Healthcare Research and Quality (US); 2008 Apr. Chapter 39. Available from: <https://www.ncbi.nlm.nih.gov/books/NBK2661/>



## Errors, violations and workarounds

Dr Deborah Debono, Dr Valerie O’Keeffe and Dr Ronald Day

### What is the difference between an error, a violation and a workaround?

Most definitions of errors and violations differentiate the two based on whether the action was a conscious decision. For example, the Human Factors Analysis and Classification System (HFACS) defines errors as unintentional behaviours that fail to achieve the intended outcome. By comparison, a violation is an action that deliberately disregards rules and regulations.<sup>1</sup>

A common misconception is that violations are malicious or negligent, however, this is not always the case. Indeed, many violations are workaround behaviours which may differ from organisationally prescribed or intended procedures. However, the motivation underlying

the workaround is to circumvent or temporarily ‘fix’ an evident or perceived workflow hindrance in order to meet a goal or to achieve it more easily.<sup>2</sup> Indeed, workarounds are used by healthcare workers every day to circumvent real or perceived barriers to achieve the goal of delivering care. That is, workers use workarounds that violate prescribed procedures to get the job done.

## Why do errors, violations and workarounds matter in healthcare?

Errors and violations happen in most workplaces and range from minor breaches or irritating incidents to serious issues that result in injury or death. In 2000, the landmark “To err is human” report, estimated that at least 3.7% of patients were subject to an avoidable adverse event during their care, with at least 44,000 people dying in American hospitals each year as a result of preventable medical errors.<sup>2</sup> In the same report, violations were estimated to contribute to up to 27% of avoidable adverse events, though it should be noted that the net impact of violations is difficult to calculate because many violations constitute rational workarounds that may actually prevent harm by delivering care in a timely fashion.

## What do we know about errors, violations and workarounds?

### Error

There are many theoretical models of human error, however almost all contemporary models today acknowledge the role of organisational latent factors in producing human error and violations ‘at the sharp end’. An important concept in human error analysis is that these latent factors can create pressure to produce errors and violations and protect against errors and violations being realised as catastrophes. Therefore, when an incident does occur, the actions of the individual and teams should be considered within the broader context in which they occurred (see section ‘[Improving the fit between people and their environment](#)’ p.06).

### Violations and Workarounds

Workarounds flourish where there is tension between work-as-imagined (how those at the managerial or ‘blunt’ end conceive the work), and work-as-done (how the practitioners at the direct care interface perform the work at the ‘sharp’ end).

Workarounds are paradoxical as they both increase and decrease risk at the same time.<sup>3</sup> See for example the case study in Box 1 and 2.

### Box 2.1 Case study 1

RN Ken is an experienced nurse in a 32 bed intensive care unit. His patient, Mrs Jones, has been improving and has enjoyed a brief period sitting out of bed. Mrs Jones tells Ken that she is now experiencing some pain, is feeling really uncomfortable and would like to go back to bed as soon as possible. Ken also notices that Mrs Jones is fatiguing and is concerned for her immediate comfort and well-being if he doesn't get her back to bed. Ken knows that the hospital has a "no lift" policy (a hoist should be used when transferring patients between a chair and their bed). However, to use a hoist, Ken will need to get it from the equipment room. This will take time and he is aware that in fifteen minutes, when his colleagues go on their break, he will need to watch two patients. At the moment there are enough staff to help him get Mrs Jones back to bed. He reasons to himself: "getting the hoist will cost time during which Mrs Jones may deteriorate clinically; the hoist is cumbersome and awkward; Mrs Jones is not that heavy; and he has lifted many patients far heavier than Mrs Jones during his nursing career – particularly prior to the "no lift" policy". Ken decides that the most efficient way to get Mrs Jones back to bed and reduce the risk of her deteriorating is to ask a couple of colleagues to help him to lift her back to bed manually before they go on their break. Peta and Pippa are available to help now and agree that it would be better for Mrs Jones if she could be returned to bed sooner rather than later. Pippa makes arrangements for another nurse to watch her patient while she helps Ken lift Mrs Jones back to bed. Peta is unable to find a nurse who is free to watch her patient and tells herself: "I really want to help Ken because he is always so helpful to me and I need to swap a shift with him next week; Mrs Jones is looking uncomfortable; it will not take long to lift Mrs Jones back to bed as she is not heavy; and besides the patient I am looking after has been stable all shift, so it should be fine to leave my patient unattended just for a moment". Together the three nurses lift Mrs Jones from the armchair and return her to bed. Pippa and Peta go on their breaks and Ken continues to attend to Mrs Jones who looks and feels better since returning to bed.

1. Workarounds create risk of harm to patients, staff (physical, psychological and professional) and organisations. Working around the policy requirement to use a hoist by lifting Mrs Jones back to bed manually, for example, creates a risk of physical harm to staff (e.g. back, shoulder injury). It also creates a risk of physical harm to Mrs Jones as it increases the likelihood that she may fall during the lift. Should she be physically harmed as a result of the workaround, there is a risk of psychological harm to Mrs Jones and the nurses who used the workaround, as well as professional and reputational harm to the nurses involved. Harm to Mrs Jones as a result of using the described workaround introduces a risk of organisational harm (financial and reputational).
  2. Workarounds also prevent harm. Returning Mrs Jones to bed promptly by lifting her manually (against policy) may result in quicker relief of pain and avoid deterioration in her condition. In another scenario, nurses describe preparing and checking medication in the medication room and checking the 5Rs against information transcribed to a piece of paper. Nurses adopted this workaround, rather than taking a mobile computer into a room where a patient is isolated, to avoid cross-infection.<sup>4</sup>
- The delivery of healthcare relies heavily on the use of workarounds to overcome basic design problems such as IT systems that quickly log healthcare workers out when they are interrupted by other clinical tasks or creating "shadow systems" when an electronic system does not provide appropriate fields that clinicians need to informally record particular types of information.<sup>5</sup>
- Workarounds can create hazards where tasks depend on team collaboration for successful completion. This is particularly likely to emerge when each team member has developed and employs their own unique workarounds, creating a chaotic and poorly understood set of practices across the team. Frequently, the use of one workaround (primary workaround) requires the use of another workaround (secondary). These secondary workarounds often occur in other parts of the system so are not evident to the person using the primary workaround.



The risk may lie not in the primary but in the secondary workarounds (i.e. the primary workaround might be safe, but the secondary workarounds may increase risk). Since the primary and the secondary workarounds are temporally disconnected, the consequences (both positive and negative) of the primary workaround may go undetected. In the ICU scenario, Ken's primary workaround is in manually moving Mrs Jones back to bed, reducing her discomfort and deterioration, but it also led to the secondary workaround in Peta leaving her patient unattended.

Workarounds are fundamental to work-as-done and are a practical reality of everyday life. Healthcare workers must recognise their potential to highlight opportunities for improvement by either adapting or formalising the workaround or addressing the barrier that led to the workaround. Practical steps healthcare workers can take are to make the workarounds transparent by communicating, problem solving and reporting barriers to formal procedures and policies. Managers can support these processes by building an open culture by listening, providing support and acting to review work processes in partnership with staff.

### Box 2.2 Case study 1, continued

Ken's goal was to promote Mrs Jones' comfort and prevent her from fatiguing by getting her back to bed as soon as possible. According to the "no lift" policy in the hospital, staff should use a hoist if it is necessary to lift patients. The location of the hoist and the time taken to retrieve it from the equipment room present barriers to Ken achieving his goal, while also following policy. Perceptions of the barriers that lead to the same workaround may be different between individuals. We can also see from her self-talk that Peta perceives that insisting she and her colleagues use the hoist according to the "no lift" policy presents a barrier to her goals to be a team player and to support patient comfort and safety. In the described scenario Ken and his colleagues work around the identified barriers by lifting Mrs Jones manually from the chair to bed rather than using a hoist. In the ICU scenario, it is challenging for Ken to comply with the "no lift" policy while at the same time giving Mrs Jones immediate care. The challenges Ken has to confront are:

- There is the work-as-imagined – the assumption is that ICU has patients are mainly in bed and do not need to get out of bed, so the lifters are stored elsewhere.
- The reality of work-as-done – patients do sit out of bed, are actually more frail and have more equipment attached and so require greater care during handling. Compounding this is that often at the bedside there are not enough power-points to accommodate a lifter socket, rendering the use of the hoist onerous.
- Communication, consultation and participation – in the busy ICU the nurses have little time to spend communicating and problem solving and can become task-focused. Making workarounds transparent is important for managing risk throughout adopting effective systems of work. Workarounds often remain covert because there is a focus on being seen to be 'doing things right' – being compliant and following procedures, although often there is tacit agreement that the procedures are not always practical or realistic. What is needed is to be doing more of the 'right things' - speaking up, problem solving together and highlighting what is not working, along with the opportunities to make adaptations and improvements more formal and accepted.
- Work Health and Safety legislation places a duty of care on managers who control work to provide safe systems of work, and to manage hazards and risk. Workers performing work also have a duty to comply with reasonable instructions and not to put themselves or others at risk. Workarounds are often seen as a form of non-compliance although they may be beneficial in keeping work flowing. Highlighting the causes of workarounds as system inadequacies both identifies risks and opportunities for improvement.

**Table 2.1** Signs and Symptoms of errors, violations and workarounds

Effective management of errors, violations and workarounds	Ineffective management of errors, violations and workarounds
Errors are caught before harm occurs and (1) for errors that occur frequently or in the same way, defences are put in place to prevent recurrence, or (2) for errors that are less frequent or context-dependent, effort is made to understand why the process does not normally result in error and that learning is used to improve future work	Common, basic errors result in catastrophic outcomes
Management monitors workarounds to identify opportunities for improvement	Management turns a blind eye to violations (or even encourages them)
Policies, procedures, processes and performance indicators are based on an accurate understanding of work-as-done	Policies, procedures, processes and performance indicators are based on incorrect assumptions regarding delivery of care (work-as-imagined)

## References

1. Shappell SA, Wiegmann DA. Applying reason: The human factors analysis and classification system (HFACS). *Human Factors and Aerospace Safety*. 2001; 1: 59-86.
2. Debono DS, Greenfield D, Travaglia JF, et al. Nurses' workarounds in acute healthcare settings: a scoping review. *BMC health services research*. 2013; 13(1): 175.
3. O'Keefe VJ, Tuckey MR, Naweed A. Whose safety? Flexible risk assessment boundaries balance nurse safety with patient care. *Safety Science*. 2015; 76: 111-120.
4. Debono D, Taylor N, Lipworth W, et al. Applying the theoretical domains framework to identify barriers and targeted interventions to enhance nurses' use of electronic medication management systems in two Australian hospitals. *Implementation Science*. 2017; 12(1): 42.
5. Koppel R, Smith SW, Blythe J, Kothari V. Workarounds to computer access in healthcare organizations: you want my password or a dead patient? Paper presented at: ITCH2015.



## Physical environment and workplace design

Aileen Conroy

### What is physical environment workplace design?

Workplace design refers to the process of designing and organising a workplace to optimise worker performance and safety. Common considerations in design of the physical environment are:

- Workspace layout
- Noise
- Air quality
- Lighting
- Vibrations

### Why does the physical environment matter in healthcare?

Good workplace design can minimise health worker injuries; maximise health worker performance and optimise patient healing or quality of life.

Design of the built environment is one of the most effective ways of controlling the risk of health worker injury. Well-designed health facilities minimise exposure to hazards which can result in body stressing, occupational violence and other injuries to workers. According to the Australia Workers' Compensation Statistics 2015-2016 report, the healthcare sector accounts for 15% of serious injuries to workers. The Healthcare and Social Assistance

sector has the greatest proportion of serious claims of any industry.<sup>1</sup> Most of these injuries are to nurses, orderlies, carers and allied health staff handling patients and clients. These injuries result in substantial direct and indirect costs to the health sector, the national budget, injured individuals and their families.

A well-designed workspace enhances health worker performance by making it easier and quicker to complete required tasks accurately, reducing errors, workarounds and wasted time. This positively affects patient outcomes as illustrated in the case study below (Falls in the en suite). Evidence shows good workplace design also enhances staff satisfaction and retention, thus reducing recruitment and training costs.

#### Box 3.1 Case study 2: Falls in the en suite

A ward reported that there was an unusually large number of falls in a particular en suite bathroom. On investigation, it was determined that a combination of en suite design elements greatly increased the risk of a fall. First, nurses reported that the slope on the floor did not drain water from the shower to the floor drain and they had to sop up the excess water after every shower with towels to stop it flowing into the patient bedroom. Second, with the door shut at night, the lighting was very poor and the sleepy elderly patients not wearing their spectacles needed brighter lighting to see clearly when they went to the bathroom. Finally, the sliding door to enter the en suite was heavy and required a lot of force to open and close.

The lighting was easy to improve, and the door slid better after maintenance. However, correcting the slope of the floor was expensive and difficult and therefore it was never fixed.

#### Box 3.2 Case study 3: ICU visitors

Life hangs in the balance for patients in the Intensive Care Unit and accordingly, families find the unit a very intimidating place to visit their loved ones. In designing a replacement for the existing one large room with 6 beds and three tiny single rooms, a major design brief was to create a welcoming environment for traumatized and grieving families. A 'mock-up' of a proposed patient room was constructed in a large meeting room and workers were encouraged to try out various beds, furniture and equipment in the space and make comments and suggestions. Between each pod of 4 rooms a comfortable break out space for visitors beside a window was furnished with comfortable chairs in soothing natural colours around a coffee table. A private counselling room was situated beside the waiting room.

There is some evidence to suggest that supportive design can enhance patient healing and quality of life. Supportive design includes odour free air quality, arrangement of seating, and access to direct sunlight and windows. There is also evidence that single rooms and effective ventilation reduce hospital acquired infections. For example, single family rooms in Neonatal Intensive Care Units were associated with less noise and improved infection control and patient privacy. However negatives included less patient visibility and increased workload for nurses.<sup>2</sup> Inclusion of music, art and gardens are claimed to have a buffering effect on stress and are widely included into design of Hospices and Dementia Units

## What do we know about workplace design?

During design or refurbishment, it is important to ensure the position of basics such as lifts, walls, doors and windows are optimal, as these are expensive to change. Simple mock-ups can be used to help workers to visualise and try out the proposed layout and provide constructive feedback. From the early stages of all projects, consult workers (as required under Work, Health and Safety law<sup>3</sup>) and involve subject matter experts or staff who are aware of health industry patient and staff incident trends and the most effective design solutions. This should be specified in robust Workplace Safety Policy and procedures.

### Workspace Layout

Australasian Health Facility Guidelines<sup>3</sup> make recommendations about the location of various units and how to co-locate them as well as layouts for all types of rooms. These guidelines can be bolstered by studies of clinical work including reviewing workflows and processes; mapping the movements of workers in the unit under consideration; and / or conducting focus groups or huddles with workers. Final designs should aim to eliminate design aspects which have resulted in worker or patient injuries in the past (or could foreseeably cause harm in the future). Involving workers in the design of their job compliments and enhances productivity.

### Noise

Any exposure to very loud sound or prolonged exposure to moderately loud sound may damage hearing. The frequency of the sound is also critical, with high pitched sound potentially more damaging. Safe levels are specified in Australian Standards<sup>4</sup>. Duty holders under Work Health and Safety legislation<sup>3</sup> must ensure the risk of hearing loss due to occupational noise is controlled. Note that wearing personal protective equipment, such as earplugs, is the least effective control and therefore addressing environmental mitigations should be prioritised.<sup>5</sup>

Environmental noise falls under different legislation. It can interfere with intelligibility potentially compromising accuracy, confidentiality, productivity and ability of patients to sleep. Acoustic controls include double glazing, ceiling treatments and soft furnishings.

### Air Quality

Some aspects of air quality including absence of chemicals and contaminants such as asbestos, Legionella and particulates (suspended particles) are fundamental to safety, especially in critical care environments. A well designed and maintained HVAC (heating ventilation and cooling) system ensures filtered, temperature and humidity-controlled air is provided to all areas of the facility. Comprehensive monitoring assesses air quality against published exposure limits<sup>4,5</sup>.

Products with low emissions of chemical pollutants should be chosen for paint, furnishing and cleaning. Before construction and renovation, a mitigation plan must be agreed for dust, chemical, asbestos and aspergillus fungus to protect workers and patients, especially those with respiratory illness or those who are immunocompromised. Some environments such as laboratories and pharmacies may require specific gas exhaust cabinets and infection control requires pressurized isolation rooms for patients with some diseases.

### Lighting

Variables for appropriate lighting include: the level of illumination, balance, and glare. The visual demands of each space determine the recommended lux (luminance) which is measured by a light metre and levels are specified in Australian Standards<sup>4</sup>. Common examples in health are 150 lux for all rooms where manual handling occurs; 300 lux for entirely computer-based tasks; 500 lux for reading fine print and 10,000 lux for some surgical tasks. In acute and critical care environments the colour or warmth of the lighting must have accurate colour rendering properties whereas in places like dementia facilities or hospices warmer, more indirect light creates a calmer atmosphere. Some hospital beds have lights underneath to assist patient toileting at night and reduce the likelihood of falls. Corridors require night /emergency lighting and staff station lighting must allow staff to work without disturbing patient sleep. Windows admitting natural light are preferred to assist circadian rhythms and provide visual relief. Appropriate window treatments must

provide privacy, control glare, be adjustable and be able to be cleaned. Environmental sustainability is promoted by LED bulbs and movement detector switches in toilets, cupboards and office areas.

temperature and effectiveness of dampening measures. Vibration from railways and heavy vehicles in the vicinity of health facilities can be a cause of annoyance. Isolation is the most effective control.

### Vibration

Vehicles, machines and tools are the likely sources of vibration. Symptoms vary depending of the frequency of the vibration, period of exposure, environmental

#### Box 3.3 Case study 4: Computers in the cupboard

Embracing new technology, a Maternity Unit mandated record keeping using newly purchased software. However, in the 30-year-old birth suite there was only space for one computer on the staff station, so a makeshift computer was set up in a cupboard in the corridor to improve access for up to 10 staff. This created potential access and body strain issues. Extensive consultation and redesign of the surrounding area resulted in streamlining of storage to provide additional workstations accommodating up to 4 staff in a nook behind the existing workstation at minimal cost.

**Table 2.1** Signs and Symptoms of good and bad workplace design

Examples of good workplace design	Examples of poor workplace design
Wide level corridors and paths which allow the widest beds to pass one another	Slopes, rough surfaces and poorly designed gutter crossings between buildings greatly increase forces required to push beds, wheeled equipment and wheelchairs, potentially injuring staff
Unobstructed turning circles for the longest, widest equipment beside lifts and doorways	Sharp turns into rooms and corridors are obstructed by fixtures and furniture
Well lit, predictable stairs which meet building standards	Variation in the height and depth of steps
Width of lifts and doorways fit the longest, widest beds with a bed mover, pressure mattress motor and orderly	Extra wide or long beds are unable to move between floors, buildings and rooms, potentially compromising patient care
Shared worker areas and patient journey whiteboards facilitate interdisciplinary communication and promote teamwork to expedite patient discharge	Division of professions into separate spaces reduces opportunities for teamwork



**Table 2.1** Signs and Symptoms of good and bad workplace design continued

Examples of good workplace design	Examples of poor workplace design
Unambiguous, well-positioned, legible labelling and way finding uses internationally recognised symbols and is consistently integrated into all communication, including websites and mobile phone applications. Transport options and escape routes are clearly communicated minimising customer stress	Inadequate, confusing way finding cannot be followed by consumers with sensory, cognitive, mobility or language and literacy impairments
A proportion of large rooms and bathrooms have fittings and furniture with a high safe working load for heavy patients	No adequate space, beds, rooms, bathrooms, chairs, or ceiling tracking for large patients, potentially resulting in patient and staff injuries
Attachment points are avoided in mental health unit fixtures, fittings and furniture	The potential risk of self-harm in Mental Health Units is not controlled
Pressurized isolation rooms are available, and surfaces are easy to clean to assist infection control	Isolation rooms are not separated in the Heating, Ventilation and Air Conditioning system. Absorbent surfaces such as carpet and difficult to reach crevices cannot be adequately cleaned
Easy to clean floor coverings with minimal cushioning to minimize pushing force on wheeled equipment	Thick underlay in patient areas increases manual handling injury risk to workers. In administration areas it increases force required to move an office chair
Illumination levels are appropriate for the visual demands of each space according to Australian Standards. LED fittings with accurate colour rendering properties are installed in acute and critical care areas	Visual fatigue, eye strain and /or glare are reported by staff Visual monitoring of patient colour is inaccurate
Acoustic controls are included in design, especially in spaces where high reliability auditory tasks are performed and near patient bedrooms	Mistakes occur and stress is reported due to background noise interfering with critical tasks. Poor patient satisfaction reporting interrupted sleep due to noise
Well organised storage spaces maximize storage at average trunk height. Mechanised equipment is used to move loads	Inadequate, unlabelled, disorganised storage spaces necessitate awkward access and reach
The Heating, Ventilation and Air Conditioning ventilation system is appropriate, well maintained and regularly monitored	Respiratory symptoms from poor air quality are reported by workers and patients

## References

1. Safe Work Australia. Australian workers' compensation statistics. 2015-16; 16.
2. Doede M, Trinkoff AM, Gurses AP. Neonatal intensive care unit layout and nurses' work. *HERD: Health Environments Research & Design Journal* 2018; 11(1): 101-118.
3. Work Health and Safety Act 2011. <https://www.legislation.gov.au/Details/C2018C00293>
4. Standards Australia. <https://www.standards.org.au/search?q=noise&mode=allwords&filter=standards&sort=relevance>
5. Safe Work Australia. Managing noise and preventing hearing loss at work; code of practice. September 2015. <https://www.safeworkaustralia.gov.au/doc/model-code-practice-managing-noise-and-preventing-hearing-loss-work>

## Further reading

- Australasian Health Facility Guidelines (AHFG). <https://www.healthfacilityguidelines.com.au/>
- Worksafe Victoria. A guide to designing workplaces for safer handling of people for health, age care, rehabilitation and disability facilities. 2007. <https://content.api.worksafe.vic.gov.au/sites/default/files/2018-06/ISBN-Designing-workplaces-for-safer-handling-of-people-guide-2007-09.pdf>



## Patient handling

Leanne Loch

### What is patient handling or manual handling of people?

People handling refers to any workplace activity where a person is physically moved, supported or restrained at a workplace. Specifically, people handling refers to workplace activities requiring the use of force exerted by a worker to hold, support, transfer (lift, lower, carry, push, pull, slide), or restrain a person at a workplace.<sup>1</sup> Patient handling can occur in a variety of contexts including

hospitals, day therapy centres, medical clinics, community care, aged care, special schools, child care and in some recreational settings. The focus of this resource is on the application of ergonomic principles to patient handling in healthcare.

## Why does patient handling matter in healthcare?

People handling is a known hazardous manual task. Hazardous manual tasks include activities that involve repeated or sustained force, repeated or sustained awkward postures and repetitive movements, such as might be associated with assisting a dependent patient to get out of bed, assisting a person to shower when in restricted space, moving an anaesthetised patient on the operating table or helping a person to lift their leg into a car.

Hazardous manual tasks can cause acute or cumulative musculoskeletal disorders (MSDs) such as back pain, neck pain and tendonitis of the hands, wrists, elbows and shoulders. Historically, the incidence of musculoskeletal disorders among nurses has been higher than the population average. In 2016, health workers experienced a rate of serious MSDs (serious defined as 1 week or more off work) of 15.8 for every million hours worked, compared to labourers who experienced a rate of 11.3, and construction and mining workers 8.3.<sup>2</sup> So working in healthcare is almost twice as hazardous as mining work in terms of risk of developing MSDs.

## What do we know about patient handling?

Traditional methods of moving patients have included the shoulder lift, 'top and tail', cradle lift, underarm hook, pivot transfers, bear hug transfers and draw sheet lifts. These techniques have been strongly linked with increased risk of injury and are considered unacceptable in contemporary healthcare.

Evidence-based practice supports the use of a systematic approach to prevent or minimise injuries related to patient handling tasks. The traditional approach of providing training in patient handling techniques alone has shown little, or no long-term impact on work practices or injury rates. Rather, multifaceted patient handling programs that incorporate a number of strategies and key elements, and are based on risk management processes, are more likely to be successful in reducing the risks and injuries related to patient handling activities.<sup>3</sup>

Best practice advocates a systematic approach to patient handling risk management including the following key elements<sup>4</sup>:

### 1. Commitment and policy

- Management commitment to the program and resource needs is critical to the success of a safer patient handling program.
- Policies and procedures that nominate responsibilities.

### 2. Planning

- Review current work practices, incident reports and relevant safety data.
- Determine program objectives, targets and performance measures.
- Determine resource requirements.

### 3. Assessing and controlling risk

- Develop and conduct individual patient handling risk assessment and communicate patient handling needs e.g. displayed beside bed, in end of bed chart, in a care plan, handover notes or other.
- Facility or unit risk assessment e.g. use a checklist or other systematic tool that identifies hazards and contributing factors such as work area design issues, equipment availability, patient acuity issues or workload issues.
- Implementation of risk controls through provision of patient handling equipment and training. For instance, nurses in theatre will need different patient handling competencies to a home care worker in aged care.
- Implementation of risk controls through design e.g. redesign the work area to improve workflow or space for better postures, development of a standard for procurement of patient beds/trolleys/ wheelchairs in terms of usability, safe work load etc.

#### 4. Monitoring and measurement

- Measure progress e.g. number of people trained, number of new pieces of equipment, rate of use of patient handling equipment, audit compliance with preferred patient handling practices, rate of incidents or injuries.
- Communicate results of the program e.g. staff newsletter, team meetings.
- Investigate any patient handling incidents.

#### 5. Evaluation and continuous improvement

- Evaluate measured progress against program targets.
- Conduct annual program review and plan for changed or growing resource needs.
- Consider additional resource needs.

Evidence-based practice for safe patient handling advocates the use of local champions to foster knowledge transfer and forge a direct link between staff and program goals. Studies have found that these champions are essential to the implementation process and can ensure and stimulate commitment to the program.

Further information is available below regarding the systematic approach to patient handling as well as the particular hazards and risk controls required in the care of bariatric patients.

## References

1. Workplace Health and Safety Queensland (2001) Manual tasks involving the handling of people. Office of Industrial Relations.
2. Safe Work Australia (2016) Statistics on Work-Related Musculoskeletal Disorders.
3. Nelson A, Matz M, Chen F, Siddhartan K, Lloyd J, Fragala A (2006) Development and evaluation of a multifaceted ergonomics program to prevent injuries associated with patient handling tasks. *International Journal of Nursing Studies* 43(6): 717-733
4. Queensland Health (2001) Think Smart Patient Handling Better Practice Guidelines 2nd Edition

## Further reading

- Workplace Health and Safety Queensland. Manual tasks involving the handling of people; code of practice 2001. [https://www.worksafe.qld.gov.au/\\_\\_data/assets/pdf\\_file/0007/58174/manual-tasks-people-handling-cop-2001.pdf](https://www.worksafe.qld.gov.au/__data/assets/pdf_file/0007/58174/manual-tasks-people-handling-cop-2001.pdf)
- Workcover New South Wales. Manual handling for nurses. 2005. <https://www.reliefnurses.com.au/images/ManHand2005A.pdf>
- Australian Association for the Manual Handling of People. <http://www.aamhp.org.au/home>
- Queensland Health. Health, safety and wellbeing risk management. 2018. [https://www.health.qld.gov.au/\\_\\_data/assets/pdf\\_file/0032/397319/qh-imp-401-3.pdf](https://www.health.qld.gov.au/__data/assets/pdf_file/0032/397319/qh-imp-401-3.pdf)
- Safe Work Australia. The Bariatric Journey in Australia: Hospital Case Study. 2009. <https://www.safeworkaustralia.gov.au/doc/bariatric-journey-australia-hospital-case-study>



## Psychosocial hazards

Dr Carlo Caponecchia

### What are psychosocial hazards?

“Hazards” are typically considered to be sources or situations that could cause harm. Psychosocial hazards are usually defined as “aspects of job content, work organization and management, and environmental, organizational conditions that have the potential for psychological and physical harm”.<sup>1,2</sup> These features of work and organisational structure are sometimes known as “stressors”, “antecedents” and “risk factors”<sup>3</sup>, but they are also called “psychological hazards” or “psychosocial hazards” in Workplace Health and Safety (WHS).<sup>4</sup> Though it has long been acknowledged that health includes psychological health, this was made

explicit in 2011 in the harmonised model WHS legislation and continues to be emphasised in guidance and best practice resources.

New guidance material on psychological health at work, which outlines an organisation’s duties to protect workers from psychological harm has recently been released.<sup>5</sup> Further, the new International Standard on Safety Management Systems highlights that factors such as workload, work hours, victimisation, harassment and bullying should be identified as hazards within an organisation’s Safety Management System.<sup>6</sup>



## Why do psychosocial hazards matter in healthcare?

Psychosocial hazards can be encountered in any workplace, regardless of industry, task, equipment or location. However, healthcare workplaces are known for exposure to psychosocial hazards, particularly through long working hours, high task demands, hierarchical organisational structures, exposure to violence, and work that is often emotionally demanding.<sup>7-9</sup> Accordingly, psychosocial hazards are particularly relevant to healthcare. Further recognition of this was provided in the 2008 Garling report into NSW health<sup>10</sup>, along with public inquiries into health and emergency services organisations concerned with fatigue and workplace bullying.<sup>11</sup>

## What do we know about psychosocial hazards?

Examples of psychosocial hazards include:<sup>12-14</sup>

- The levels of control and autonomy people may have over their work;
- Issues of workload, pace and schedule (including underload);
- Job context, including task variety and opportunity to use skills;
- Nature and quality of supervision and support;
- Nature of interpersonal relationships;
- Role ambiguity (the extent to which an individual's role/tasks are unclear);
- Role conflict (the extent to which an individual is being asked to do tasks which are seemingly contradictory or in conflict with one another, for example, being required to provide excellent patient care but to not spend too long with any individual patient);
- Career progression; and
- Home-work pressure.

A range of other issues are also sometimes included as hazards, such as workplace violence, bullying and harassment, though these are sometimes subject to specific criteria due to relevant workplace legislation in various jurisdictions.

The outcomes of psychosocial hazards are variable and can include stress, fatigue, effects on task performance,

and other negative health effects. Psychosocial hazards can also impact on other hazards or hazardous tasks. For example, it is now well accepted that psychosocial issues influence hazardous manual tasks and whether they lead to musculoskeletal injury. For example, pressure to perform multiple tasks in a limited timeframe, or social/cultural pressure to lift a load without assistance or equipment can affect injury outcomes.<sup>15, 16</sup> Stressors such as those outlined above are also known to affect human performance and human error.<sup>17</sup>

## Controlling psychosocial hazards

Controls for psychosocial hazards are frequently viewed through an individual lens, where control strategies are focused on providing support for individuals (such as Employee Assistance Programs [EAPS], and stress management or resilience training) or promoting mental health or wider health more generally (e.g. through exercise or wellness programs and activities). These strategies may be beneficial, but they are secondary and tertiary, rather than preventative. Controls should always be prioritised by effectiveness.<sup>18</sup>

The key control strategies for psychosocial issues are in work and organisational design.<sup>5,14,19</sup> Examples of work and organisational design strategies include:

- Using consultation to change tasks or workflow, increasing perceptions of control and autonomy
- Re-designing position descriptions, roles and/or reporting lines (with consultation)
- Analysing and re-distributing/re-scheduling work tasks and workflow
- Senior management professional development in safety management and related issues
- Strategies to improve the nature, quality and degree of supervision, monitoring and mentoring
- Collaboratively designing and implementing procedures for managing conflict

Further examples are available from the People at Work project.<sup>20</sup>

Developing an improved workplace culture in relation to safety (for more information, see the section entitled '[Safety Culture](#)' p.62), as well as appropriate resourcing to support this and other controls should not be overlooked, as they affect psychosocial variables.

## References

1. Cox T. Stress research and stress management: Putting theory to work. Vol 61: Hse Books Sudbury, 1993.
2. ILO W. Psychosocial factors at work: recognition and control. Occupational Safety and Health Series. 1986; 56.
3. van den Brande W, Baillien E, De Witte H, Vander Elst T, Godderis L. The role of work stressors, coping strategies and coping resources in the process of workplace bullying: A systematic review and development of a comprehensive model. *Aggression and Violent Behavior*. 2016; 29: 61-71.
4. Moayed FA, Daraiseh N, Shell R, Salem S. Workplace bullying: a systematic review of risk factors and outcomes. *Theoretical Issues in Ergonomics Science*. 2006; 7(3): 311-327.
5. Work-related psychological health and safety: A systematic approach to meeting your duties. Safe Work Australia, 2018. [https://www.safeworkaustralia.gov.au/system/files/documents/1806/work-related\\_psychological\\_health\\_and\\_safety\\_guide.pdf](https://www.safeworkaustralia.gov.au/system/files/documents/1806/work-related_psychological_health_and_safety_guide.pdf)
6. AS/NZS ISO45001 Occupational health and safety management systems – requirements with guidance for use. Standards Australia, 2018.
7. Magnavita N. Workplace Violence and Occupational Stress in Healthcare Workers: A Chicken-and-Egg Situation - Results of a 6-Year Follow-up Study. *Journal of nursing scholarship*. 2014;46(5):366-376.
8. Cole DC, Robson LS, Lemieux-Charles L, McGuire W, Sicotte C, Champagne F. Quality of working life indicators in Canadian healthcare organizations: a tool for healthy, healthcare workplaces? *Occupational medicine*. 2005; 55(1): 54-59.
9. Healthcare and social assistance. Safe Work Australia, 2018. [https://www.safeworkaustralia.gov.au/industry\\_business/health-care-and-social-assistance](https://www.safeworkaustralia.gov.au/industry_business/health-care-and-social-assistance) (accessed 24 October 2018).
10. Garling, P. Final report of the Special Commission of Inquiry into acute care services in NSW Public Hospitals. Vol 1: Chapter 12 Workplace bullying and culture, 2008. <https://www.dpc.nsw.gov.au/publications/special-commissions-of-inquiry/special-commission-of-inquiry-into-acute-care-services-in-new-south-wales-public-hospitals/> (accessed 23 October 2018).
11. The management and operations of the NSW Ambulance Service. GPSC2 Legislative Council. Parliament of NSW, 2008. <https://www.parliament.nsw.gov.au/committees/inquiries/Pages/inquiry-details.aspx?pk=2027> (accessed 23 October 2018).
12. Leka S. Psychosocial risk management: calamity or opportunity? *Occupational Medicine*. 2016; 66(2): 89-91.
13. Cooper CL. Identifying stressors at work: Recent research developments. *Journal of Psychosomatic Research*. 1983; 27(5): 369-376.
14. Good work design. Safe Work Australia, 2018. <https://www.safeworkaustralia.gov.au/good-work-design#ten-principles-of-good-work-design> (accessed 20 October 2018).
15. Oakman J, Macdonald W, Bartram T, Keegel T, Kinsman N. Workplace risk management practices to prevent musculoskeletal and mental health disorders: What are the gaps? *Safety science*. 2018; 101: 220-230.
16. Lang J, Ochsmann E, Kraus T, Lang JW. Psychosocial work stressors as antecedents of musculoskeletal problems: a systematic review and meta-analysis of stability-adjusted longitudinal studies. *Social science & medicine*. 2012; 75(7): 1163-1174.
17. Clarke S, Cooper C. Managing the risk of workplace stress: Health and safety hazards. Routledge, 2004.
18. Identify, assess and control hazards: Hierarchy of controls. Safe Work Australia, 2017. <https://www.safeworkaustralia.gov.au/risk> (accessed 2 April 2018).
19. Parker S. Does the evidence and theory support the Good Work Design principles? An educational resource. Safe Work Australia, 2015.
20. People at Work. WorkCover Queensland, 2019. <https://www.worksafe.qld.gov.au/injury-prevention-safety/mentally-healthy-workplaces/guidance-and-tools/people-at-work>



## Human-computer interaction

Dr Wu Yi Zheng and A/Professor Melissa Baysari

### What is human-computer interaction?

Human-computer interaction (HCI) is the study of the interaction between people and information technology. It is a broad field which often encompasses approaches such as user-centred design, user experience (UX), and usability testing.

### Why does human-computer interaction matter in healthcare?

HCI is critical in healthcare because of the rapid increase in the adoption of information technology in all areas of health.<sup>1,2</sup> Common examples of health information technology (HIT) include electronic medical records (EMR), electronic health records (EHR), computerised provider order entry (CPOE) systems, mobile health applications, pharmacy dispensing systems, decision support systems, and patient administration systems. In fact, it would be very difficult to identify a process in healthcare that did not involve some form of information technology.

## What do we know about human-computer interaction in healthcare?

Information technology is often viewed as a solution to improving quality, safety and efficiency of patient care. With the transition from paper records to electronic systems, there is an expectation that medical information will be legible, easy to access, and more complete. In an ideal world, an interaction between a user (e.g. doctor) and the information technology (e.g. electronic medical record), should be smooth, quick, easy, and error free. Unfortunately, this is rarely the case. Users often complain about systems being clunky, unintuitive, and time-consuming.

There is now good evidence to show that information technology can improve care and reduce costs if implemented and used optimally.<sup>3</sup> For example, implementation of CPOE systems has been associated with significant reductions in prescribing errors.<sup>4,5</sup>

Implementation of clinical information systems in hospitals is estimated to result in savings of \$371 billion over the next 15 years.<sup>6</sup> However, research has also shown that poor system design can lead to negative outcomes. For example, the inclusion of false-positive alerts in CPOE systems (e.g. alerts triggered to warn a doctor that a medication is unsafe to use in pregnancy for a male patient) has led to user annoyance and frustration, and to 'alert fatigue', where alerts are ignored or bypassed by users regardless of the alert content.<sup>7,8</sup>

To design information technology well, one should at a minimum consider the fit between the operator and the system, as shown in Figure 6.1 and ensure a good understanding of the user and the user's work.

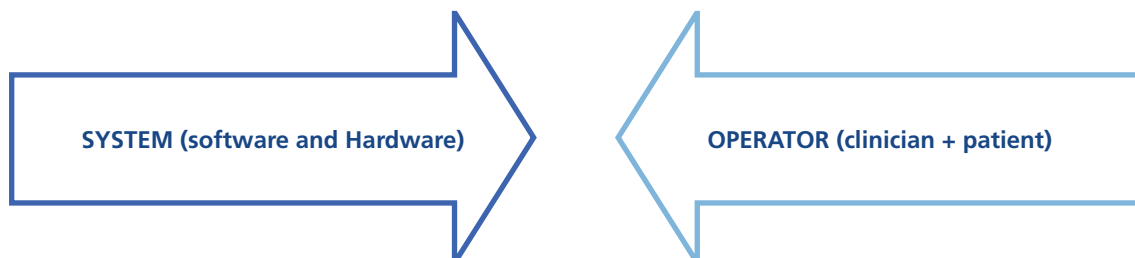


Figure 6.1 Usability factors of human-computer interaction – Adapted from Franklin & Sridaran, 2012

Nielsen's ten usability heuristics<sup>9</sup> provide us with a good starting point to think about well-designed and poorly designed aspects of information technology. Some examples of heuristics or guidance principles appear in Table 6.1.

**Table 6.1** Examples of usability heuristics<sup>9</sup>

Heuristic	Description
Visibility of system status	<p>The system should always keep users informed about what is going on, through appropriate feedback within reasonable time.</p> <p>For example, a system that is loading information could display a turning wheel icon so the user knows the screen has not frozen.</p>
Consistency and standards	<p>Users should not have to wonder whether different words, situations, or actions mean the same thing. Follow platform conventions.</p> <p>For example, using the word 'warning' in a pop-up alert should convey the message that danger is present.</p>
Aesthetic and minimalist design	<p>Dialogues should not contain information which is irrelevant or rarely needed. Every extra unit of information in a dialogue competes with the relevant units of information and diminishes their relative visibility.</p>

However, as both technology and associated work practices have evolved over time, and we begin to appreciate the highly variable context of use of information technology, some additions to these heuristics may be required. For example, recent work has identified 'integration into real-time workflow' as a new heuristic to supplement Nielsen's heuristics, taking into account that information must be rapidly accessible and understood in real-time if technology is to reach its full potential.<sup>10</sup>

Healthcare work is complex, dynamic, and often unpredictable. Healthcare workers can also work across multiple settings and organisations, each with different technologies in place, requiring users to adapt, acclimatise and be proficient in using multiple systems. Designing information technology to support and not hinder this

complex work is challenging. Information technology has also traditionally been designed to meet the needs of individual users, when we know that a lot of work in healthcare is performed by teams. In order to design information technology that supports work and aligns well with workflow, an in-depth understanding of how work is done is needed. This can be achieved by observing users perform everyday tasks, noting when and how information is accessed, and by speaking to users about what works well and what doesn't, and where information technology could potentially assist. Involving users in the design and/or selection and implementation of information technology has been shown to result in greater uptake and acceptance of technology. You're also likely to end up with a product that better meets the needs and preferences of end-users.

The way people interact with information technology is influenced not only by the system and the operator but by a number of external factors. In viewing healthcare as a sociotechnical system, we acknowledge the human, social, organisational, as well as the technical components of the system.<sup>11</sup> Eight interdependent and inter-related dimensions of a sociotechnical model for studying health information technology are presented in Table 6.2.

**Table 6.2** Dimensions of a Sociotechnical model to study health technology<sup>12</sup>

Sociotechnical model dimension	Brief description
Hardware and software	The computing infrastructure required to run the applications
Clinical content	Data, information, and knowledge that is stored in the system
Human-computer interface	Aspects of the system that users can see, touch or hear
People	Humans involved in all aspects of the design, development, implementation and use of the technology
Workflow and communication	People often need to work cohesively to accomplish patient care. Collaboration requires significant two-way communication, and workflow accounts for the steps needed to ensure that each patient receives timely care
Organisational policies and procedures	The organisation's internal structure, policies and procedures affect every other dimension in this model. For example, software needs to accurately represent and enforce organisational policies and procedures.
External rules, regulations, and pressures	External forces can facilitate or place constraints on the design, development, implementation, use and evaluation of technology in the clinical setting.
System measurement and monitoring	The effects of health information technology must be measured and monitored on a regular basis.



**Table 6.3** Signs and symptoms of good and bad HCI

Things to look out for to suggest good human-computer interaction	Things to look out for to suggest bad human-computer interaction
Good uptake of the system (system used by most people)	Poor uptake of the system (most people avoid using the system)
Satisfied users	Unsatisfied users (i.e. lots of complaints about the system)
Quick and easy navigation through system	Lots of clicks and screens required to perform tasks
Streamlined workflow	Workarounds (i.e. users not using the system the way it was designed to be used)
Improved efficiency – tasks are performed more quickly with the system in place	Lots of helpdesk enquiries
Improved safety – Operators make fewer errors with the system in place	User errors

## References

1. Franklin SS and Sridaran R. Making human-computer interaction usable: Thinking from healthcare perspective. *International Journal of Computer Applications*. 2012; 58(1): 34-40.
2. Stowers K and Mouloua M. Human-computer interaction trends in healthcare: An update. *International Symposium on Human Factors and Ergonomics in Healthcare*; 2018: Human Factors and Ergonomics Society. 2018; 88-91.
3. Agency for Healthcare Policy and Research. Using Computers to Advance Healthcare. 1996. <http://archive.ahrq.gov/research/computer.htm> (accessed 12 October 2018).
4. Khanna R, Yen T. Computerized physician order entry: promise, perils, and experience. *Neurohospitalist*. 2014; 4(1): 26-33.
5. Westbrook JI, Reckmann M, Li L, et al. Effects of two commercial electronic prescribing systems on prescribing error rates in hospital in-patients: a before and after study. *PLoS Med*. 2012; 9(1): e1001164.
6. Hillestad R, Bigelow J, Bower A, et al. Can electronic medical record systems transform healthcare? Potential health benefits, savings, and costs. *Health Affairs*. 2005; 24(5): 1103-17.
7. Hines LE, Murphy JE, Grizzle AJ, Malone DC. Critical issues associated with drug-drug interactions: highlights of a multistakeholder conference. *American Journal of Health Systems Pharmacy*. 2011; 68(10): 941-6.
8. van der Sijs H, Aarts J, Vulto A, Berg M. Overriding of drug safety alerts in computerized physician order entry. *Journal of the American Medical Informatics Association*. 2006; 13(2): 138-47. Epub 2005 Dec 15.
9. Nielsen J, Molich R. Heuristic evaluation of user interfaces. *Proceedings of the SIGCHI conference on Human factors in computing systems*. ACM. 1990. p. 248-56.
10. Miller K, Capan M, Weldon D, et al. The design of decisions: Matching clinical decision support recommendations to Nielsen's design heuristics. *International Journal of Medical Informatics*. 2018; 117:19-25.
11. Baxter G, Sommerville I. Socio-technical systems: From design methods to systems engineering. *Interacting with Computers*. 2011; 23: 4-17.
12. Sittig DF, Singh H. A new sociotechnical model for studying health information technology in complex adaptive healthcare systems. *Quality and Safety in Healthcare*. 2010; 19(Suppl 3): 68-74.



## Decision-making and cognitive processes

Professor Mark Wiggins

### What is decision-making?

Decision-making is a combination of cognitive processes employed to select a course of action among several alternative possibilities. These cognitive processes have been identified through decades of cognitive psychology research and explain how the design of a system can hinder or enhance the decision-making performance of individuals and teams. Applying this research to system design is fundamental to the work of Human Factors practitioners and researchers.

Several of the chapters in this resource focus on specific cognitive processes and models, like situation awareness, which explain where decision-making processes can fail. However, the cognitive psychological research relevant to

decision-making is broadly applicable to many ergonomics topics. For example, it is now generally accepted that optimising the performance of teams requires creating a shared understanding of a problem space to guide group decision-making (this sentence will hopefully make more sense by the end of this chapter). Similarly, ergonomists specialising in Human-Computer Interaction, draw heavily on cognitive psychology to anticipate how information can best be presented to help make better decisions. Consequently, this section reviews the cognitive mechanisms behind decision-making, as well as when and how those mechanisms can fail or succeed.

## Why does decision-making matter in healthcare?

Healthcare workers make decisions every day. These decisions can be routine (e.g. deciding in what order to review patients) or non-routine (e.g. deciding how to respond when a patient unexpectedly deteriorates 'on the table'). They can be simple (e.g. whether to feed a patient who is nil by mouth – hopefully not!) or complex (e.g. recognising a patient with multiple comorbidities).

Errors amongst health professionals are often an outcome of ineffective cognition brought about through inaccurate mental representations, excessive demands, and/or a tendency towards rapid responses (relying too heavily on intuition). The full impact of cognitive failures on patient outcomes would be difficult to fully estimate, but for a common decision-making activity in healthcare, diagnosis, research has shown that diagnostic errors contribute to approximately 10% of patient deaths (Institute of Medicine, Improving Diagnosis in Healthcare report).

## What do we know about cognition and decision-making?

Perhaps not surprising to people working in healthcare, one of the main (if not the main) purposes of cognition is to preserve (our) life. If you understand this to be the case, you can begin to understand how human cognition works. First, we need a means by which we can identify and distinguish threats from opportunities. This is referred to as attention and it is the means by which we prioritise information that we process.

Information may be prioritised based on the nature of the information itself. Loud noises, for example, such as a bedside alarm, will 'attract' your attention because loud noises imply a 'threat'. This sort of information processing is referred to as 'bottom-up' processing. However, we can also seek out information in our environment based on our preconceived ideas of what to expect (and what features in the environment may be present). For example, notification of a patient with breathing problems might prompt a physician to attend to the patient's airway to check for any obstructions to breathing. This sort of information processing is referred to as 'top-down' processing.

While directing attention towards specific features in the environment does offer advantages insofar as it constrains the amount of information that needs to be processed in any given moment, it can also result in information being missed. If we become distracted by highly salient information, like an alarm, or fixated on seeking out features in the environment that we expect to be present, we can fail to observe features that are literally right in front of us.

The accuracy and effectiveness of 'top-down processing' is especially dependent upon memory. Memory is thought to comprise at least two main components, long-term memory, and short-term memory. Long-term memory is generally considered to be limitless and is organised, at least in part, around mental representations. These mental representations help discern relevant from less relevant information within specific contexts. Short-term memory is where information is actively processed (i.e. attended to). Unlike long-term memory, short-term memory is capacity-limited to between 4 and 8 items. Importantly, the information that is held in short-term memory is transient so that, unless it is transferred to long-term memory, the information held in short-term memory is lost.

In situations where more information is acquired than can be accommodated in short-term memory, the information may be overlooked. Ultimately, the demands may reach a point where there is no longer capacity within short-term memory and the result is 'cognitive overload'. Cognitive overload is associated with information being missed.

In some situations, a mental representation may be triggered by a feature or features, and since the solution may seem obvious, a response may be initiated without much conscious deliberation. This sort of rapid recognition and response is colloquially referred to as 'intuition' (or System 1 reasoning in the psychology literature). While there is little doubt that rapid recognition and responses to situations is pervasive in everyday life and mostly leads to positive outcomes, when the incorrect mental representation is triggered, it can be difficult for practitioners to deviate from their initial impression. For example, radial backpain is most commonly a symptom of back pain. However, less commonly it is a symptom of cardiac distress. Accordingly, a common medical error for patients with cardiac distress is being discharged with pain relief for their back pain, having received no assessment of their cardiac health.

This intuitive, System 1, approach to decision-making is driven by mental representations and is designed presumably to allow us to engage in routine tasks while minimising the demands on attention and short-term memory. However, a more conscious and deliberate approach (called System 2 reasoning in the psychology literature) is desirable where there is a degree of uncertainty, the risks associated with an error are high, and there is time in which to undertake a comparative assessment. The System 2 approach is evident in undertaking, for example, a differential diagnosis, where alternative diagnoses are considered systematically, and are either accepted or discarded.

While a System 2 approach to decision-making will not necessarily prevent error, active and conscious engagement is intended to overcome an inherent tendency to 'jump to conclusions' based on limited information. This tendency to reach conclusions quickly and with little deliberation is pervasive, particularly in situations where there are other demands that reduce the capacity for considered deliberation, including work demands.

## Signs and symptoms of poor decision-making

A challenge for all health practitioners lies in knowing whether a mental representation is accurate and reliable. Clues to an inaccurate mental representation include:

1. The direction of attention towards irrelevant features,
2. Fixating on one or two features to the exclusion of other features
3. A susceptibility to distractions,
4. The failure to remember future actions,
5. Feeling overloaded (anxious), and/or
6. A delayed response.

Given the difficulties in establishing the accuracy of a mental representation, it is important that health practitioners engage System 2 thinking, when and where possible. For example, in the case of diagnosis, a useful 'rule of thumb' is to insist on a differential diagnostic process where time is available, there is a level of uncertainty, and/or the consequence of error is high.

## Further reading

- Kahneman, D., & Egan, P. Thinking, fast and slow. New York: Farrar, Straus and Giroux, 2011.
- Klein GA. The Power of Intuition: How to Use Your Gut Feelings to Make Better Decisions at Work. Crown Business, 2004.





## Situation awareness

Dr Natassia Goode and Professor Paul Salmon

### What is situation awareness?

Situation awareness is activated knowledge about a specific task within a system, and the use of appropriate knowledge as the situation changes.

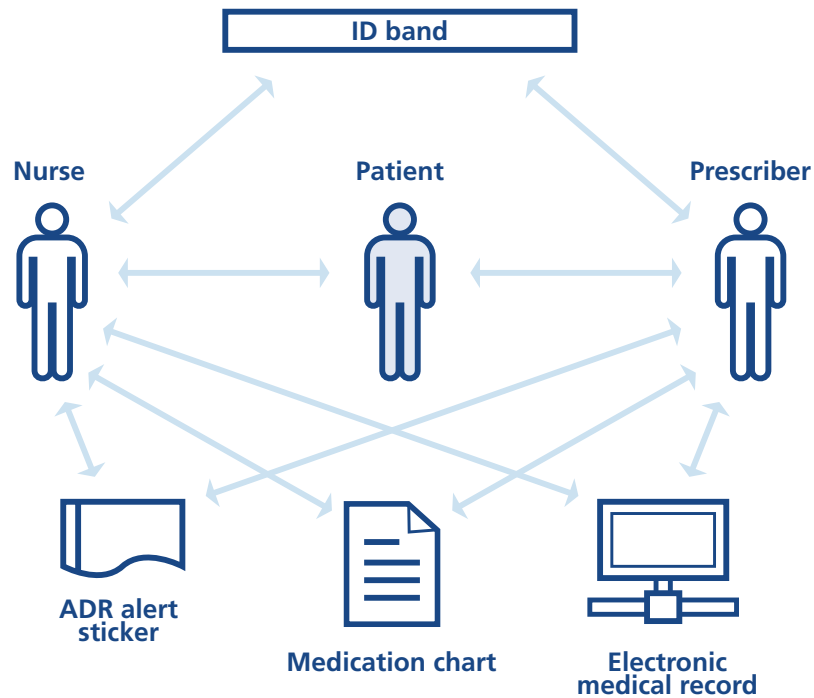
*Situation awareness is created by the system, not individual people.*

To understand situation awareness, we need to focus on the interactions between the people and objects (e.g. technologies, documentation, equipment) involved in performing a task.

### Why does situation awareness matter in healthcare?

The healthcare system is high in complexity. Treating and caring for patients usually involves multiple people working together on many interdependent tasks, and critical information is often communicated through written documentation and electronic records. Analysing the interactions between people and objects provides a starting point for identifying potential communication failures. This information can then be used to design better communication processes, documentation, technologies, and equipment to support effective team coordination.





**Figure 8.1** Systems for managing information about patient allergies

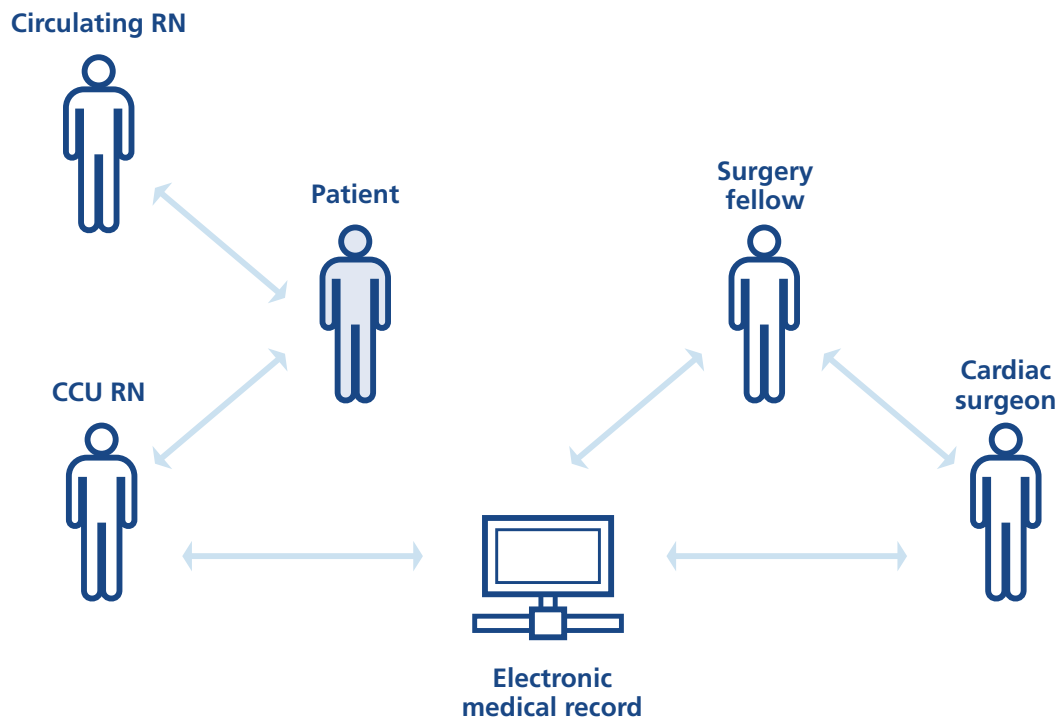
As a small example of the distributed nature of information in healthcare, Figure 8.1 shows the system used to manage information about patient allergies. Information about patient allergies is held by the patient, the electronic medical record, the Adverse Drug Reaction (ADR) alert sticker, the medication chart and the electronic medical record. Accurate, consistent and unambiguous information must be transmitted to the prescriber and nurse to ensure that the patient receives appropriate medication.

## What do we know about situation awareness?

To support individual situation awareness, systems need to be designed to ensure that the right information is given to the right person, at the right time. Not everyone needs to have the same knowledge about a situation

(indeed, this can quickly result in overload), they just need the right knowledge for their tasks. This is sometimes referred to as distributed knowledge.

Figure 8.2 provides an example of distributed knowledge, in this instance, the system for ensuring that patients receive the required preoperative medications. The nurse needs to know they must give the medications prior to entering the operating room suite. The surgeon needs to know the medications have been given prior to commencing surgery. The electronic medical record must provide appropriate instructions and feedback to each person. If the information is provided to either person too early, too late, or not at all, then they will not effectively accomplish their tasks.



**Figure 8.2 2** Distributed knowledge in system for preoperative medications

Because situation awareness is created by the system, people must not be blamed for “losing” situation awareness. Situation awareness is not something that can be held by one individual alone without interaction with the system, so cannot be lost by one individual alone.

*Focus on fixing the system, not the people*

Education and training, warning alarms, and stickers are never going to fix problems with situation awareness because they focus on fixing the individual person. To identify opportunities for system improvement, ask the following questions:

- What people and objects are in this system? How do they interact? What are they trying to achieve?
- What information does each person require to accomplish their tasks? When do they need it? Are they aware of their tasks, and their relationships to others in the system?
- What feedback is provided when information is successfully transmitted, or tasks are accomplished? Is the feedback clear, consistent and accurate?

These questions can be used to understand situation awareness during investigations, or to review the design of procedures, technologies and tools.

## Creating the conditions for poor situation awareness

- **Reliance on recall:** People must remember key pieces of information for a long time, without opportunities to record it for later.
- **Lack of feedback:** There are no opportunities for feedback to determine whether critical information has been accurately received.
- **Chinese whispers:** Critical information must be passed across multiple people or objects before it is finally used.
- **Conflicting records:** The same piece of information is recorded in multiple electronic record systems, and updates to records are not reconciled.
- **Current state ambiguity:** The equipment or technology does not clearly inform the users of its current state (e.g. is it on or off? e.g. is it pumping saline or medication?)

## Further Reading

- Salmon PM, Walker GH & Stanton NA. Broken components versus broken systems: why it is systems not people that lose situation awareness. *Cognition, Technology & Work*. 2015; 17(2): 179-183.
- Stanton NA, Salmon PM, Walker GH, Salas E & Hancock PA. State-of-science: situation awareness in individuals, teams and systems. *Ergonomics*. 2017; 60(4): 449-466.



## Communication

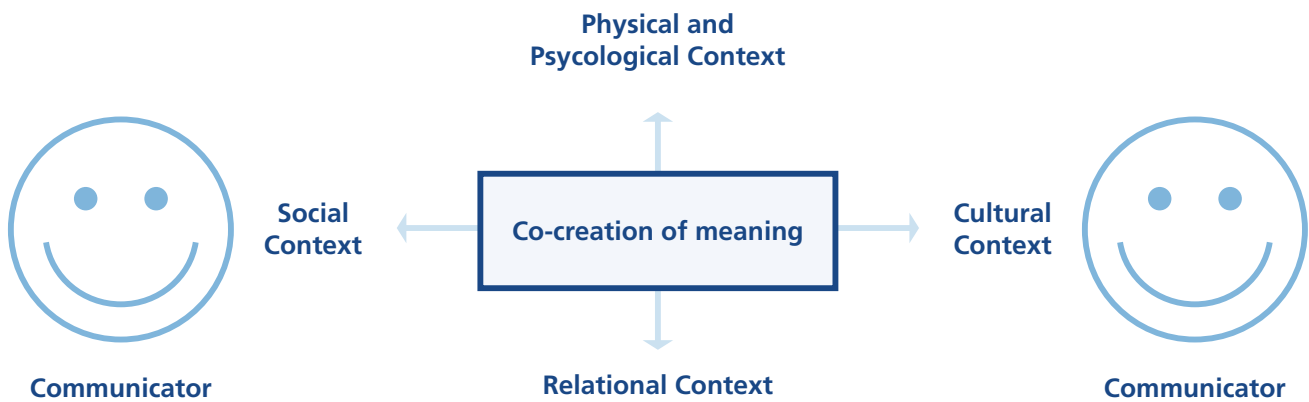
Dr Ari Antonovsky, Christy Pirone, Karen Stead, Roderick Brown, Pauline Spence, Kat Hite, Dr Robyn Clay-Williams

### What is communication?

*'The single biggest problem in communication is the illusion that it has taken place.'* George Bernard Shaw

Humans communicate for a variety of reasons. Communication is critical for relating to others, achieving objectives and understanding the world around us. Communication is defined as a two-way process used to achieve transfer and exchange of information from one communicator to another.<sup>1</sup> It is important to recognise the psychological content and context, as well as the social and cultural contexts in which the communication occurs (Figure 9.1). For communication to be effective, both communicators need to confirm that the original thoughts and feelings have been clearly conveyed and understood.

Information exchange within teams, for example, might consist of the following behaviours: seeking information from all relevant sources, passing relevant information to the appropriate team-member at the right time and providing periodic situation updates that summarise the current situation.<sup>2</sup>



**Figure 9.1** The Transaction Model of Communication recognises the individual influences on perception, which impact how we communicate and interpret information<sup>1</sup>

## Why does communication matter in healthcare?

Effective team communication is essential to patient safety.<sup>3,4</sup> For example, the authors of a survey of 139 emergency department physicians and internists, concluded that “Communication failure was implicated in most errors [relating to handovers from the emergency department] and included failures of message and failures of interpersonal relations” (p.707).<sup>5</sup> In another study, the activities of doctors and nurses in an ICU, as well as attendant errors, over a four-month period were recorded. Despite doctors communicating verbally with nurses in only 2% of these activities, 37% of the reported errors involved doctor/nurse communications.<sup>6</sup>

With the growing use of information and communication technology within the healthcare setting, communication has become more efficient, yet more complex, necessitating a deliberate approach to communication in order to reduce risk of adverse events. This can be achieved by using defined and agreed communication processes to ensure effective communication.

These include:

- Briefings to help establish common team goals
- Structured team rounds to ensure all team members have a shared awareness and understanding of the current situation, with the patient being central to the process and included where possible
- Huddles to update team members on emerging situations
- Use a structured communication tool to communicate essential information from all relevant sources to ensure a succinct handover, e.g. Identify Situation, Background, Assessment Recommendations (ISBAR).
- Seeking information from all available sources, particularly to reduce the reliance on assumptions
- Anticipating the need for information and sharing it within the team
- Providing status updates and other forms of feedback
- Verifying information received
- Checking back to confirm the receiver has interpreted information or instruction accurately<sup>7</sup>

## What do we know about communication?

Within the healthcare environment, the unimpeded flow of accurate and timely information is critical to patient safety and treatment effectiveness. Information must be transferred between clinical staff, and between staff and patients. Information exchange between staff typically includes patient handovers, work instructions, changes to systems and procedures, learning from past mistakes, and feedback to practitioners across various organisational levels (doctors, nurses, support staff, clinical leaders and administrators). From a Human Factors perspective, adequate communication needs to occur at three distinct levels: individual, team and organisational, with risks associated at each level in the absence of effective communication. Further, effective interactions between the clinician and the patient, as well as any carers or family, are essential to safe, quality care.

### Individual communication

At the inter-personal level there is a need for clear and unambiguous information transfer. Any flaws in staff-to-staff communication of patient history, current medication/treatment, contraindications, or safety hazards can put individuals at risk. The main danger, as the quote by Bernard Shaw indicates, is that one or both parties believe that information was communicated, but each party has understood the information differently. For this reason, organisations sometimes have predefined formats for how information is communicated, so that everyone involved knows what format to expect for information transfer. In some cultures, clarifying information by asking questions is not considered respectful. In a hospital environment, 'the only silly question, is the one that was not asked', when it should have been. For example, the wrong limb being amputated based on lack of information that could have been readily obtained.

'The medium is the message' indicates that the method of communicating, for example text messaging, email, phone, or face-to-face, is sometimes as important as the message itself. Tone of voice, choice of words, facial

expression, and body language also significantly affect the way information is communicated and received. This becomes particularly critical when time pressure or other external and personal factors influence interactions. If information is important to a patient's well-being then it is critical to ensure that the receiving party received the information, understood the information, and knows what to do about the information. Irrespective of the means of communication, it is important to close the loop by confirming that this has occurred.

### Team communication

It is well established that effective communication influences important team processes and functions, and it is an explicit component of many models of workgroup performance.<sup>8</sup> Accordingly, there are three 'channels' of communication that are essential for teams providing patient care: (1) inter-team communication, (2) handovers, and (3) briefings and debriefings.

Medical facilities have introduced interventions to bolster the effectiveness of these channels, such as structured communications (i.e. ISBAR), conflict management strategies, closed-loop communication, huddles, and electronic communication systems all to safeguard against miss and near miss events involving communication. This is particularly important when different teams have divergent and potentially conflicting objectives (e.g., patient safety vs cost of services, workload vs staffing costs, following procedures vs need for workarounds).

Handovers are a special case of inter-team communication, in which an out-going team hands over responsibility for patients to an in-coming team. Typically, a large amount of critical information is associated with a patient's care and so there is a need to ensure clear and unambiguous knowledge transfer. Hospitals have developed systems and processes to reduce the likelihood of errors during handover of patient data, using systems that are designed to ensure that the requisite information has been collected, recorded, and transferred to another care provider.



### Box 9.1 Case study 5

Mrs Ball has been an inpatient on an Acute Medical ward. Her daughter arrived early this morning to catch the medical officers on the ward round to find out the plan of care, as post hospital care may need to be arranged. When the team arrive at Mrs Ball's room, the registrar informs the patient that her recent test results indicate a change in her pathology and that further investigations are required. The registrar's pager goes off indicating an emergency elsewhere, he instructs the resident medical officer to organise additional tests and leaves. There were no introductions of the team members attending the bedside ward round and the patient is visibly upset and the daughter has many questions. What happens next is dependent on good communication.

Similar to handovers, briefings and debriefings are becoming more common as a means of ensuring that team members have a shared situation awareness of emerging challenges, organisational learnings, changes to procedures and other knowledge required for coordination and collaboration within and between teams. Regular briefings and debriefings at the start and end of a shift are an important part of developing and maintaining effective team coordination<sup>9</sup> and ensuring safety in the prioritisation and performance of tasks.<sup>10</sup> Team briefings also enable team members to collectively make sense of emerging situations and to develop a shared mental model for how to proceed.<sup>11</sup>

## Organisational communication

"Communication is the Achilles Heel of most organisations"<sup>12</sup>, and is an organisational factor that must be addressed in order for a healthcare provider to be effective, efficient and safe. The two most important forms of organisational communication are the specification of procedures and processes, as well as the feedback of organisational learnings into a change management process.

Procedures define the way that an organisation collectively views the best practice in executing their goals, in this case patient care and safety. Consequently, it is critically important that procedures are accurate, up-to-date, understandable, and easily accessible. If any of these are not the case, then it is highly likely that staff will not follow specified safeguards, creating unintended risks. It is therefore equally important that any inaccurate, ambiguous or unavailable procedures are brought to the attention of the administration.

Equally, any failures, errors, conflicts or poor practices need to feed back into a reporting and continuous improvement system to capture, record, analyse and ultimately disseminate 'lessons learned.' Failure to learn from these incidents means they can and will be repeated, potentially resulting in a sequence of adverse events. Similarly, near misses are a free lesson, but only if the lessons are reported and become common knowledge to relevant hospital staff.

Due to the complexity of modern organisations and systems of work, there are many aspects of communication between all stakeholders (including patients, families, and regulators) that need to be considered. The principles of effective communication at the individual, team and organisational levels will support the effective and safe management of most other aspects of patient care.

## Communication between clinician and patient/carers/family

Most clinicians over-estimate the effectiveness of their communication skills.<sup>13</sup> Improving communication skills is fundamental to achieving patient-centred care, as it “engages patients in decision making and care planning. It is tailored, open, honest and respectful and there is an opportunity for clarification and feedback”<sup>14</sup> As a result, effective clinician-patient communication leads to greater trust in the clinician, increased patient and clinician satisfaction, and ultimately improved health outcomes.

The way in which clinicians engage and interact with a patient can have a significant effect on the experience and quality of care. The following are essential elements for effective patient-clinician communication:

- Introduce yourself
- Request permission from the patient before doing anything to or for them
- Describe the roles of each person in the care team
- Let the patient know who is responsible for their care at any point in time, and keep them informed about their care plan
- Invite the patient to participate in their transition of care; let them know they are welcome to ask questions or raise concerns
- When possible, involve the patient’s family and carer in communication about their care
- Let the patient know about any expected transitions of care, why they are happening and approximate timeframes (e.g. shift changes, moving wards, or going for a test or procedure)
- Re-check the patient’s needs, preferences and goals and allow them time to tell you of any changes, concerns or questions about their care
- Acknowledge and address their pain, discomfort or distress
- Notify the family and carer of any moves and/or changes to the patient’s care or health status.”<sup>15</sup>

Transitions in care introduce additional clinical risks, which can be minimised through effective communication. Organisational systems can be designed to support clinician-patient communication processes through multi-disciplinary ward rounds and clinical handovers that involve patients, carers and family. These communication events can provide opportunities to verify information, identify and resolve uncertainties, correct assumptions, support shared decision-making, and re-assess goals of care.

Leaders that value and enable patient-centred care need to ensure effective systems and training are in place for this. Many resources for effective communication can be found at the Australian Commission on Safety and Quality in Healthcare Communicating for Safety web-based portal: <https://www.c4sportal.safetyandquality.gov.au/resources>

## Negotiation

In healthcare, clinicians frequently need to convince others, over which they have no authority, of the need to pursue a specific course of action. Success can often be achieved through deliberate negotiation, where all parties reach a consensus on the means of addressing a problem. Integrative bargaining negotiation offers a framework for increasing value in the organisation without incurring extra cost, by promoting integrative win-win outcomes. Win-win outcomes are those that achieve the aim, but also preserve positive relationships between the negotiating parties. Lack of resources is an ongoing problem in healthcare. Clinicians can often find themselves in situations where, in order to maximise resources, they need to negotiate with their colleagues and patients, and sometimes a range of other stakeholders. Standardising the negotiation processes across the health service and implementing formal negotiation skills training are likely to support clinicians as they adopt negotiation skills in the workplace.<sup>16</sup>

**Table 9.1** Signs and symptoms of good and bad communication

Exemplary communication	Poor communication
Handover is structured and timely	Critical information is frequently lost following patient handover.
Individuals and teams communicate thoughtfully and respectfully	There is inadequate, off-hand or sloppy communication between individuals or teams. Units may neglect or refuse to pass on information.
Standardised language is agreed upon and used consistently.	Individual practitioners use different jargon, acronyms and units of measurement.
Handwritten orders are written carefully and clearly.	Handwritten notes are illegible.
Electronic records are completed in their entirety, with no shortcuts or jargon.	Data are missing from patient records.
Clinicians use only approved communication channels to maintain data integrity and patient privacy.	Patient privacy and data integrity is compromised by the use of personal communication channels i.e. sending photos of test results via SMS.
Clinicians use closed-loop communication by repeating back verbal information/instructions.	Clinicians frequently misinterpret instructions.

## References

1. A Primer on Communication Studies. Section 1.2. The communication process. 2012. <https://2012books.lardbucket.org/books/a-primer-on-communication-studies/s01-02-the-communication-process.html#>
2. Smith-Jentsch KA, Cannon-Bowers JA, Tannenbaum SI, Salas E. Guided team self-correction: Impacts on team mental models, processes, and effectiveness. *Small Group Research*. 2008; 39(3): 303-327.
3. Brock D, Abu-Rish E, Chiu C-R, et al. Interprofessional education in team communication: working together to improve patient safety. *BMJ Qual Saf*. 2013;22(5):414-423.
4. Brock D, Abu-Rish E, Chiu C, et al. Republished: Interprofessional education in team communication: working together to improve patient safety. *Postgraduate Medical Journal* 2013; 89: 642-651.
5. Horwitz, L. I., Meredith, T., Schuur, J. D., Shah, N. R., Kulkarni, R. G., & Jenq, G. Y. Dropping the baton: A qualitative analysis of failures during the transition from emergency department to inpatient care. *Annals of Emergency Medicine*, 2009; 53(6), 701-710.
6. Alvarez G, Coiera E. Interdisciplinary communication: an uncharted source of medical error? *Journal of critical care*. 2006; 21(3): 236-242.
7. TeamSTEPPS. Content last reviewed January 2014. Agency for Healthcare Research and Quality, Rockville, MD. (cited 2019 October 11). <https://www.ahrq.gov/teamstepps/instructor/essentials/pocketguide.html>
8. Stevens MJ, Campion MA. The knowledge, skill, and ability requirements for teamwork: Implications for human resource management. *Journal of management*. 1994; 20(2): 503-530.
9. Flin R, Fletcher G, McGeorge P, Sutherland A, Patey R. Anaesthetists' attitudes to teamwork and safety. *Anaesthesia*. 2003; 58(3): 233-242.
10. Crichton MT, Lauche K, Flin R. Incident command skills in the management of an oil industry drilling incident: A case study. *Journal of Contingencies and Crisis Management*. 2005; 13(3): 116-128.
11. Smith-Jentsch KA, Cannon-Bowers JA, Tannenbaum SI, Salas E. Guided team self-correction: Impacts on team mental models, processes, and effectiveness. *Small Group Research*. 2008; 39(3): 303-327.
12. Muchinsky P. *Psychology applied to work: an introduction to industrial and organizational psychology*. Belmont. CA: Thomson/Wadsworth. 2003.
13. Chou, C., Time to Start Using Evidence-Based Approaches to Patient Engagement, *N Engl J Med - Catalyst* [Internet]. 2018 March [cited 2019 Oct 04]; Available from: <https://catalyst.nejm.org/evidence-based-patient-provider-communication/>
14. Communicating for Safety resource portal [Internet]. Sydney NSW: Australian Commission on Safety and Quality in Healthcare; 2019. Communicating with your Healthcare Provider [cited 2019 Oct 4]. Available from: <https://www.c4sportal.safetyandquality.gov.au/>.
15. Communicating for Safety resource portal [Internet]. Sydney NSW: Australian Commission on Safety and Quality in Healthcare; 2019. Communicating with patients and colleagues [cited 2019 Oct 4]. Available from: <https://www.c4sportal.safetyandquality.gov.au/>.
16. Clay-Williams R, Johnson A, Lane P, Li Z, Camilleri L, Winata T, Klug M. Collaboration in a competitive healthcare system: Negotiation 101 for clinicians. *Journal of Health Organization and Management*. 2018; 32(2): 263-278.

## Further reading

- Fisher R, Ury WL, Patton B. *Getting to yes: Negotiating agreement without giving in*. USA: Penguin; 2011.



## Interruptions

Sue Gardiner and Samantha Harrison

### What are interruptions?

Workers frequently experience interruptions or disruptions which may arise from a variety of sources such as colleagues, mobile phones, medical equipment/alarms, pagers, patients, and patients' families. An interruption is a prompt that breaks one's attention from the primary task at hand.<sup>1</sup> Response strategies may include task-switching, multitasking, delaying action, blocking the prompt and acknowledgement.<sup>2</sup>

### Why do interruptions matter in healthcare?

Interruptions are associated with a number of detrimental effects including increased workload, fatigue, stress and

frustration.<sup>3,4</sup> It has been shown that stress increases with the number of distractions experienced - a phenomenon called the 'distractions-stress ladder'.<sup>5</sup> In addition, workers who experience regular interruptions may perceive their work to be less controllable and predictable.<sup>3</sup>

In healthcare, research has shown that the more frequently someone is interrupted, the more errors they make. For example, in a study of nurses, each additional interruption that occurred during medication administration was associated with a 12% increase in medication administration errors.<sup>6</sup> In operating theatres, interruptions have been shown to decrease clinical performance, hinder surgery progress and completion, and lead to errors in surgery (e.g. wrong site surgery).<sup>7-9</sup> In the ED, medication error rates increase significantly if doctors are interrupted while prescribing.<sup>10</sup>

## How big of a problem are interruptions?

Some attempts have been made to quantify the rate at which workers experience interruptions in healthcare. For example, studies have shown that:

- Nurses experience 57 interruptions per 100 medication administrations<sup>11</sup>
- Nurses are interrupted between 1 and 4 times per hour, depending on the unit they work in<sup>12</sup>
- Surgical teams experience interruptions on average 10 times per hour<sup>1</sup>
- Clinicians in EDs experience interruptions between 3 and 43 times per hour<sup>13</sup> and on average 9 times per hour while prescribing in the ED<sup>10</sup>
- Junior doctors are interrupted 7 times an hour on the weekend, twice per hour on the weekend and once per hour on night shifts<sup>14</sup>
- Nuclear medicine technologists experience on average 4 interruptions per hour<sup>15</sup>

## What do we know about interruptions?

Workers can be interrupted while undertaking a variety of tasks for a variety of reasons. For example, one study found that nurses were most frequently interrupted with questions about patient care and professional issues.<sup>12</sup> In another study, nuclear technologists were frequently interrupted by other technologists to convey important information or to offer assistance.<sup>15</sup> This latter example shows that not all interruptions are negative.

In healthcare, some interruptions are necessary to minimise errors and associated harms.<sup>16</sup> For example, workers need to be interrupted in emergency situations (e.g. when a patient is deteriorating), when time-critical information needs to be conveyed, when the interruption is a higher priority than the task being interrupted, when senior staff provide advice and supervision to junior or new staff or when calling for help. These kinds of interruptions are viewed as necessary because they can have a positive impact on patient care, functioning of the unit and professional activities. But how do we reduce unnecessary interruptions, those that have a negative impact on patient care? Although there have been limited evaluations of interventions to reduce interruptions, Table 10.1 below shows some examples of proposed strategies that may be effective.

**Table 10.1** Strategies that may be effective in reducing unnecessary interruptions in healthcare

Context	Strategies
Medication administration	<ul style="list-style-type: none"> <li>• “No interruption zones” for some tasks</li> <li>• “Protected hour” where no interruptions are permitted</li> <li>• Wearing a ‘do not interrupt’ vest or sash</li> <li>• Dedicated rooms for medication tasks</li> <li>• Barriers to make staff less visible</li> <li>• Education strategies for staff, patients and visitors</li> </ul>
Surgical areas	<ul style="list-style-type: none"> <li>• Provide interruption free periods for certain procedures, such as the preparation of the operating table</li> </ul>
Communication (e.g. pagers, mobile phones)	<ul style="list-style-type: none"> <li>• Use alternative communication methods for non-urgent tasks</li> <li>• Have policies on the use of mobile phones and guidelines to regulate their use at work, e.g. implement an alert system so that only urgent messages or those from certain people can get through and other messages can be received later.</li> </ul>



It has also been suggested that teams that work closely together (e.g. in theatres, ICU, ED) should discuss and identify potential sources of interruptions and develop local strategies to reduce or manage them.<sup>7,8</sup> Overall, facilities and units should ensure that interruptions that are critically important are encouraged and allowed, and identify and implement ways to manage unnecessary communication and interruptions, especially during high-risk tasks that require focused concentration.

## References

1. Rivera-Rodriguez A, Karsh B-T. Interruptions and distractions in healthcare: review and reappraisal. *BMJ Quality & Safety*. 2010;19(4):304-312.
2. Walter SR, Raban MZ, Dunsmuir WT, Douglas HE, Westbrook JI. Emergency doctors' strategies to manage competing workload demands in an interruptive environment: An observational workflow time study. *Applied ergonomics*. 2017;58:454-460.
3. Weigl M, Müller A, Vincent C, Angerer P and Sevdalis N. The association of workflow interruptions and hospital doctors' workload: a prospective observational study. *BMJ Quality & Safety*. 2012; 21: 399-407.
4. Potter PL, Wolf L, Boxerman S, Grayson D, Sledge J, Dunagan C and Evanoff B. Understanding the cognitive work of nursing in the acute care environment. *Journal of Nursing Administration*. 2005; 35(7): 327-335.
5. Sevdalis N, Sonal A, Undre S, Vincent C. Distractions and interruptions in the operating room. *Safer Surgery: Distractions and Interruptions in the Operating Room*. 2009:405-419.
6. Westbrook JI, Woods A, Rob MI, Dunsmuir WTM and Day RO. Association of Interruptions with an Increased Risk and Severity of Medication Administration Errors. *Archives of Internal Medicine*. 2010; 170(8): 683-690.
7. Antoniadis S, Passauer-Baierl S, Baschnegger H and Weigl M. Identification and interference of interoperative distractions and interruptions in operating rooms. *Journal of Surgical Research*. 2014; 188:21-19.
8. Elfering A, Nützi M, Koch P and Baur H. Workflow Interruptions and Failed Action Regulation in Surgery Personnel. *Safety and Health at Work*. 2014; 5:1-6.
9. McKinley J, Dempster M and Gormley GJ. 'Sorry, I meant the patient's left side': impact of distraction on left-right discrimination. *Medical Education*. 2015; 49:427-435.
10. Westbrook JI, Raban MZ, Walter SR, Douglas H. Task errors by emergency physicians are associated with interruptions, multitasking, fatigue and working memory capacity: a prospective, direct observation study. *BMJ Quality and Safety*. 2018; 27(8): 655-663.
11. Westbrook JI, Li L, Hooper TD, Raban MZ, Middleton S and Lehnbohm EC. Effectiveness of a 'Do not interrupt' bundled intervention to reduce interruptions during medication administration: a cluster randomised controlled feasibility study. *BMJ Quality and Safety*. 2017; 26: 734-742.
12. Monteiro C, Avelar AFM and da Luz Goncalves Pedreira M. Interruptions of nurses' activities and patient safety: an integrative literature review. *Revista Latino-Americana de Enfermagem*, 2015; 23(1): 169-79.
13. Werner NE and Holden RJ. Interruptions in the wild: Development of a sociotechnical systems model of interruptions in the emergency department through a systematic review. *Applied Ergonomics*. 2015; 51: 244-254.
14. Richardson LC, Lehnbohm EC, Baysari MT, Walter SR, Day RO, Westbrook JI. A time and motion study of junior doctors' work patterns on the weekend: a potential contributor to the weekend effect? *Internal Medicine Journal*. 2016; 46(7): 819-25
15. Larcos G, Prgomet M, Georgiou A, Westbrook J. A work observation study of nuclear medicine technologists: interruptions, resilience and implications for patient safety. *BMJ Quality and Safety*. 2017; 26(6): 466-74.
16. Bennett J, Dawoud D and Maben J. Effects of interruptions to nurses during medication administration. *Nursing Management*. 2010; 16(9): 22-23.



## Teamwork

Kat Hite, Karen Stead, Roderick Brown, Christy Pirone, Pauline Spence

### What is teamwork?

*'Teamwork is the ability to work together toward a common vision, the ability to direct individual accomplishments toward organisational objectives. It is the fuel that allows common people to attain uncommon results'* Andrew Carnegie

### Why does teamwork matter in healthcare?

Healthcare teams work in a variety of environments such as in hospitals, community, administrative offices, research, training, finance, funding, and governance. Teamwork is critical to safe patient care and safe working environments for providers. Higher team functioning is associated with better patient outcomes and cost savings.<sup>1-2</sup>

## What do we know about teamwork?

### Team culture

Working towards established team goals (caring for the patient/family and for your team members) with a safe, supportive, adaptable and responsive approach can promote a positive team culture.

This requires that healthcare staff:

- Communicate with, and support, their team members.
- Support the team mental model (objective) so they can work toward team goals.
- Allow team members to develop innovative solutions to address risks or inefficiencies.
- Willingly demonstrate mutual support by:
  - Enabling team members to speak up if they or another team member are unable to perform safely. For example, using the I'M SAFE checklist<sup>3</sup> when a team member is not performing at their best within the team to acknowledge and seek support from their team members.
  - Asking for and offering task assistance when needed.
  - Acknowledging when conflict gets in the way of effective communication, resolving team conflict in a professional manner, using agreed conflict resolution tools and strategies (for example using the assertive statement\* to address patient care concerns if existing attempts to communicate have not been successful).
  - Concentrating on 'what' is right for the patient – not on establishing 'who' is right.
  - Cross-monitoring self and other team members to promote safety.
  - Seeking clarification when unsure, to help reduce risk of error.
  - Providing and receiving peer feedback, as an individual and as a team
  - Actively participating in team debriefs to acknowledge what went well and what could be improved both operationally and psychologically.

### \* Assertive statement

An assertive statement is a respectful, non-threatening way of to ensure concerns or critical information is addressed. It is a five step process:

1. Open the discussion,
2. State the concern,
3. State the problem (real or perceived),
4. Offer a solution,
5. Obtain an agreement

## Team performance

Team structure varies and changes depending on the clinical requirements of care delivery. In any given day, a patient may receive care from multiple teams. For example, in an acute care setting, the day shift nursing team, the medical home team, the surgical team, the medical emergency team, and the acute pain management team may all contribute to the patient's care.

Due to complex team structure across the healthcare system it is essential that healthcare workers:

- Understand the distribution of unique knowledge and skill across team members.
- Understand how teams are structured and know the 'normal' and the 'urgent' communication process of the teams they need to engage in.
- Anticipate the needs of others, to adjust to each other's actions in a changing environment.
- Facilitate a shared understanding of the plan of care.
- Understand the importance of team leadership and its role in:
  - Guiding team performance and promoting shared understanding through the team.
  - Ensuring accountability for individual performance and contribution to team goals.
- Understand the internal and external influences that affect individual and team performance including:
  - Organisational priorities and limitations.
  - Working memory, selective attention, and technology and their influence on situation awareness, decision making and one's ability to cross-monitor individual and team performance and behaviours.
  - Preconceptions, distractions and cultural norms that lead to bias and error.

To be a team member in a dynamic environment people need to know:

- The patient, including their background, assessment, goals of care, concerns.
- The names of other team members. Introductions are helpful (including everyone's role, responsibilities and delegated tasks within the team) as are prominent name badges (e.g. the TheatreCapChallenge has encouraged theatre staff to put their name and profession on their scrub caps).
- The individual(s) who has overall accountability and responsibility for the care of the patient and how to contact them to escalate concerns.

## Team training

In addition to formal training programs, teamwork skills can be learnt and practiced through existing clinical training programs<sup>3</sup>, or through simulation, where teamwork skills are a learning objective. Some examples of teamwork skills that can be trained include:

- Situation awareness – the ability to recognise the contributing factors that affect performance.<sup>3</sup> See chapter on '[situation awareness](#)' p.35.
- Shared mental models – the perception, understanding or knowledge of a situation or process that is shared among all team members<sup>3</sup>
- Mutual support
- Prioritisation
- Collaboration
- Communication

**Table 11.1** How to assess team effectiveness

Examples of exemplary teamwork	Assessment tools
Conflicts are resolved immediately, and win-win resolutions negotiated	<ol style="list-style-type: none"> <li>1. <b>Surveys.</b> These can be used as a snapshot, or as before-after tools to assess an intervention. A commonly-used healthcare teamwork survey is the Safety Attitudes Questionnaire (SAQ). There are different versions of this questionnaire for specific contexts, such as acute, surgery, ICU, nurses, etc.<sup>4</sup></li> <li>2. <b>Interviews/focus groups.</b> Semi-structured interviews or focus groups can be used to understand teamwork in healthcare. Talking to team members can be useful for understanding problems and exploring potential interventions to fix teamwork issues that may have been identified via surveys.</li> <li>3. <b>Observations.</b> This is the gold standard for measuring teamwork, as self-reported team behaviours via staff survey or interview can be inaccurate. Observations can be time consuming, however, and a good understanding of team skills is required of the observer. An evidence based tool to guide teamwork observations is the NOTECHS system. Like the SAQ, there are different versions depending on context.<sup>5</sup></li> <li>4. <b>Patient experience surveys</b> provide a performance measure of healthcare quality. This measure is not solely focused on healthcare and related outcomes, but also includes the non-clinical aspects of the patient's experience.<sup>6</sup></li> </ol>
Staff enjoy coming to work	
Staff and patients have the information they need	
Staff are happy to question, and listen to each other	
Supportive work environment	
Positive patient experiences	

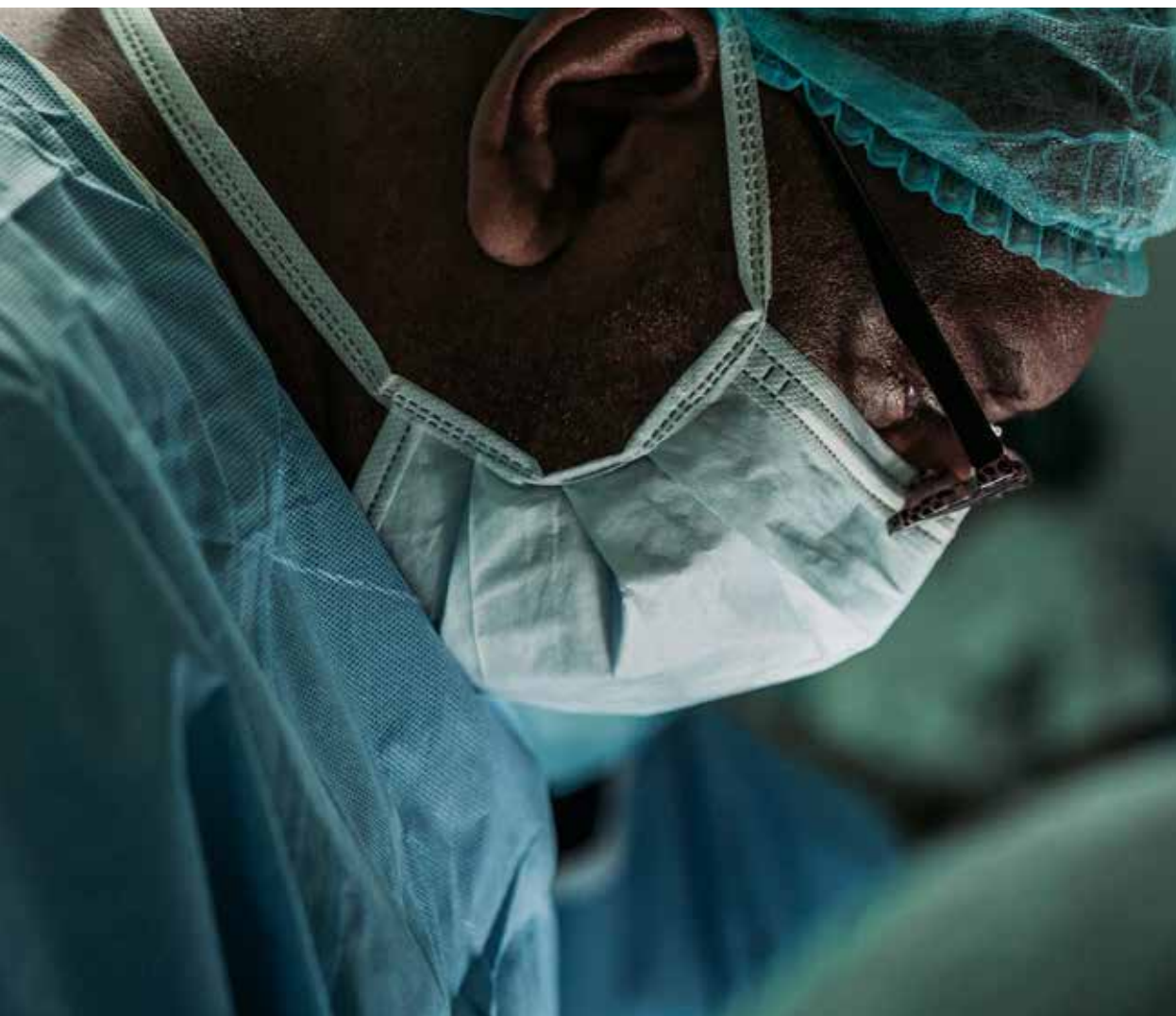
## References

1. Weller J, Boyd M and Cumin, D. Teams, tribes and patient safety: overcoming barriers to effective teamwork in healthcare. *Postgrad Medical Journal*. 2014; 90: 149 – 154.
2. Rosen MA, DiazGranados D, Dietz AS, Benishek LE, Thompson D, Pronovost PJ and Weaver SJ. Teamwork in Healthcare: Key Discoveries Enabling Safer, High-Quality Care. *American Psychology Journal*. 2018; 73: 4: 433 – 450.
3. TeamSTEPS® 2.0 Content last reviewed October 2017. Agency for Healthcare Research and Quality, Rockville MD. <https://www.ahrq.gov/teamstepps/instructor/index.html> (accessed 15 February 2018).
4. Sexton JB, Helmreich RL, Neilands TB, Rowan K, Vella K, Boyden J, Roberts PR and Thomas EJ. The Safety Attitudes Questionnaire: psychometric properties, benchmarking data, and emerging research. *BMC health services research*. 2006; 6(1): 44.
5. Flin R, Martin L, Goeters KM, Hormann HJ, Amalberti R, Valot C and Nijhuis H. Development of the NOTECHS (non-technical skills) system for assessing pilots' CRM skills. *Human Factors and Aerospace Safety*. 2003; 3: 97-120.
6. NEJM Catalyst 2018, Patient Satisfaction Survey. <https://catalyst.nejm.org/patient-satisfaction-surveys/> (accessed 09/10/2019).

## Further reading

- Shuffler M, DiazGranados D, Salas E. There's a Science for That: Team Development Interventions in Organizations. *Psychological Science*. 2011; 20(6): 365-372.
- World Health Organization. Being an effective team player. [http://www.who.int/patientsafety/education/curriculum/who\\_mc\\_topic-4.pdf](http://www.who.int/patientsafety/education/curriculum/who_mc_topic-4.pdf)





## Leadership

Sue Gardiner

### What is leadership?

Leaders use relationships to empower and motivate others to bring out their best. Leaders provide a vision for a better future and influence others to join in.

Leadership is not the same as Management. Managers manage resources, such as time, budget and staff, to meet targets and Key performance indicators (KPIs). Management maintains control and stability; leadership inspires innovation, change and improvement. Some say that managers 'do things right' whereas leaders 'do the right thing'. Both are needed - ideally all managers will have good leadership skills, just as good leaders also need to have management skills, in order to complete tasks and meet deadlines.

Anyone who displays effective leadership behaviours can be a leader - they do not need to be in a position of formal authority. Leadership should be cultivated and distributed throughout all levels of the organisation. Some say that one of the responsibilities of formal leadership roles is to help foster the development and competence of informal leaders.<sup>1</sup>

## Why does leadership matter in healthcare?

*“There is clear evidence of the link between leadership and a range of important outcomes within health services, including patient satisfaction, patient mortality, organisational financial performance, staff wellbeing, engagement, turnover and absenteeism, and overall quality of care”<sup>2</sup>*

Effective leadership benefits patients, staff, teams and the organisation through three areas of impact: recruitment and retention, productivity and cost effectiveness (e.g. creating a more positive work environment and reducing absenteeism), and positive patient outcomes.<sup>3</sup>

## What do we know about leadership?

Broadly speaking, there are two types of leadership styles: person-oriented styles, that focus on relationships with staff, and task-oriented styles. Those with a task-oriented style of leadership tend to focus on managerial tasks, short-term goals and task completion. Individuals with this style are typically effective at meeting budgets and deadlines. They can prioritise and make decisions quickly, so can be effective in a crisis. However, optimum outcomes cannot be achieved by a leadership style that focuses on task completion alone.<sup>4</sup>

Research strongly supports person-oriented leadership characteristics and behaviours and, in particular, an approach called “transformational leadership”. Individuals who engage in transformational leadership build relationships with staff and adjust their leadership behaviours to suit the individual and the context. This style has been linked to improved organisational outcomes in health and other industries.<sup>1</sup>

There are many published lists identifying desirable qualities, characteristics and behaviours of effective leaders, which can be overwhelming for individuals who are interested in developing their leadership skills. However, almost all identify the following leadership functions as being critical: promoting a vision, valuing individuals and their well-being and development, encouraging collaboration, and inspiring others to do their best through engagement and empowerment.

The following is one list of effective leadership, taken from West et al (2015) “Leadership and Leadership Development in Healthcare: The Evidence Base”. This list captures the key behaviours relevant to healthcare:<sup>2</sup>

1. Help to interpret the meaning of events. “Effective leaders help their followers make sense of change, catastrophes, successes and the future. They provide a narrative which both makes sense to people and inspires them to give of their best and make a positive difference.”
2. Create direction and alignment around strategies and objectives. This includes clarifying and ensuring others understand their key priorities.
3. Nurture commitment and optimism. This includes having an inspiring sense of purpose and encouraging positive attitudes and experiences.
4. Encourage trust and cooperation. Includes developing mutual respect, supporting and valuing each other.
5. Create a sense of collective identity (for the team or organisation). This includes helping individuals to feel pride and see the value of their contributions.
6. Organise and coordinate work efforts. This includes being clear about team member roles and working together to achieve success.
7. Enable collective learning. Sharing and learning together, e.g. from errors and successes, for improvement.
8. Ensure necessary resources are available.
9. Develop and empower people. This includes showing trust, providing high levels of autonomy and allowing others to develop their effectiveness and confidence.
10. Promote social justice and morality. This includes modelling ethical behaviour, fairness, honesty and speaking up if things aren't right.

In addition to the list above, ergonomics and Human Factors has a strong emphasis on “safety” and most practitioners would advise that effective leadership in healthcare is about creating a shared vision for a safe organisation. This vision must include prioritising worker safety along with patient safety;<sup>5,6</sup> it is difficult for people who feel unsafe to provide safe care for others. Establishing a shared vision for safety in an organisation requires commitment from the Executive, as well as strong and visible leadership from management.

## References

1. Health Workforce Australia. Leadership for the sustainable of the health system part 1 - A literature review. 2012. <http://www.springboard.health.nsw.gov.au/content/uploads/2014/07/leadership-for-sustainability-of-health-sector-literature-review-012012.pdf>
2. West, M, Armit, K, Loewenthal, L, Eckert, R, West, T and Lee, A. Leadership and Leadership Development in Healthcare: The Evidence Base. Faculty of Medical Leadership and Management. 2015. [https://www.kingsfund.org.uk/sites/default/files/field/field\\_publication\\_file/leadership-leadership-development-health-care-feb-2015.pdf](https://www.kingsfund.org.uk/sites/default/files/field/field_publication_file/leadership-leadership-development-health-care-feb-2015.pdf) (accessed 7 July 2018).
3. Australian College of Nursing. Nurse Leadership White Paper by ACN. 2015. [https://www.acn.edu.au/wp-content/uploads/2017/10/acn\\_nurse\\_leadership\\_white\\_paper\\_reprint\\_2017\\_web.pdf](https://www.acn.edu.au/wp-content/uploads/2017/10/acn_nurse_leadership_white_paper_reprint_2017_web.pdf)
4. Cummings GG, MacGregor T, Davey M, Lee H, Wong CA, Lo E, Muise M and Stafford E. Leadership styles and outcome patterns for the nursing workforce and work environment: A systematic review, *International Journal of Nursing Studies*. 2009; 47(3): 363-85.
5. Royal College of Physicians. Work and Wellbeing in the NHS: Why Staff Health Matters to Patient Care. 2015. <https://www.rcplondon.ac.uk/guidelines-policy/work-and-wellbeing-nhs-why-staff-health-matters-patient-care>.
6. Victorian Auditor-General. Occupational Health & Safety Risk in Public Hospitals. Victorian Auditor-General's Office, Melbourne. 2013. <https://www.audit.vic.gov.au/report/occupational-health-and-safety-risk-public-hospitals>



# Safety Management Systems

Dr Thomas Loveday and Dr Robyn Clay-Williams

## What is a Safety Management System?

The International Civil Aviation Authority (ICAO) defines a Safety Management System (SMS) as “A systematic approach to managing safety, including the necessary organizational structures, accountabilities, policies and procedures.”<sup>1</sup> Safety systems have been implemented in safety critical industries including maritime, rail, oil and gas, and aviation. The SMS framework deliberately shifts accountability for safety from regulators to the

organisation, which has direct control of its activities. At first glance, this might seem like more work for the organisation, but in practice, this allows for more flexibility to tailor safety mechanisms to suit the organisation’s operations, rather than high-level ‘one size fits all’ risk management strategies that emerge from regulation.

## Why do Safety Management Systems matter in healthcare?

Beginning in the 1990s it was increasingly recognised that many incidents occurred due to latent (hidden) factors in the environment under the direct control of the organisation, including: policy, planning, communication, allocation of resources, and supervision. This was eventually described by James Reason, Professor of Psychology, as the organisational accident (refer to Figure 1.3 on page 6), referring to those accidents with “multiple causes involving many people operating at different levels of their respective companies”<sup>2</sup>. The SMS framework was developed as a means of describing how to manage the myriad of organisational factors that could potentially contribute to an incident and patient harm.

The healthcare sector is as susceptible as any other to the organisational accident or incident. As an example, in March 2015 Victoria’s Consultative Council of Obstetric and Paediatric Mortality and Morbidity noticed that Djerriwrrh Health Services had a higher than expected number of stillbirths and newborn deaths. In the subsequent investigation, it was determined that the most immediate common cause was “misuse and/or misinterpretation of foetal surveillance by

cardiotocography (CTG)”. However, the investigators concluded there were also organisational factors contributing to poor outcomes, including: inadequate staffing to support midwifery education; lack of out-of-hours cover for neonatal resuscitation and care; reduced vigilance in monitoring and failing to respond to adverse clinical outcomes in a timely manner. This incident, and others like it, demonstrate the need for a functional SMS in healthcare to ensure that consideration of safety outcomes is embedded in organisational decision-making.

## What do we know about Safety Management Systems?

There are several SMS frameworks. An example of a framework is documented in the Safety Management Manual published by International Civil Aviation Organization (ICAO).<sup>3</sup> This framework identifies four main components comprised of twelve elements. These elements are summarised in Figure 13.1. Broadly speaking, each component is intended to help foster a culture of safety (for more information, see the section entitled ‘[Safety culture](#)’ p.62) in the organisation and to help leaders monitor, identify and manage risk within the organisation.



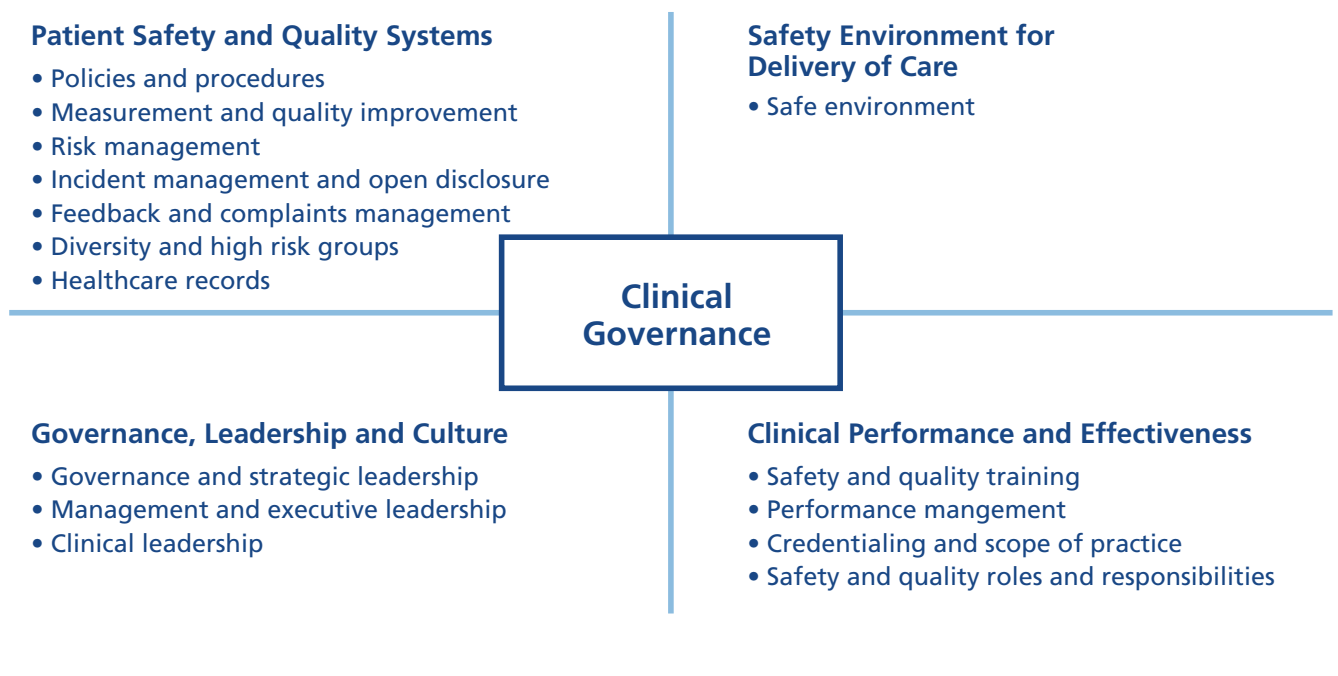
**Figure 13.1** International Civil Aviation Organisation Safety Management Framework<sup>3</sup>

The SMS framework covers a broad range of safety-related functions, including defining key roles and accountabilities, risk management processes, safety performance measurement, training and education. However, a key feature is that it recognises and emphasises the critical role of organisational and local leadership in implementing and maintaining effective safety management processes. Specifically, the ICAO framework acknowledges that effective safety management requires managers at all levels to communicate, model and monitor the key safety-related responsibilities and accountabilities of their staff. More information about the importance of leadership from a Human Factors perspective is provided in the chapter entitled '[Leadership](#)' p.54.

Another important element of the SMS framework relates to the need to support open reporting of incidents, usually enshrined in the organisations just culture policy. This recognises that organisational risks can only be managed if they are visible to local managers and organisational leaders. For this reason, the ICAO SMS framework also

recommends formally documenting the key safety and quality responsibilities of all staff in documents like position descriptions, employee contracts and third-party vendor contracts.

Healthcare organisations, in general, have not formally adopted the SMS framework. However, most modern clinical governance frameworks cover many of the same core functions. The definition of clinical governance used in the National Safety and Quality Health Service Standards describes a system for maintaining safety and quality standards: "a system through which organisations are accountable for continuously improving the quality of their services and safeguarding high standards of care".<sup>4</sup> However, there is significantly less international agreement regarding the core elements of clinical governance in health compared to the SMS industry model. An example of a framework relevant to the Australia healthcare sector is the National Safety and Quality Health Service Standards Standard 1 – Clinical Governance (see Figure 13.2).



**Figure 13.2** ACSQHC National Safety and Quality Health Service Standards: Standard 1 Clinical Governance<sup>4</sup>



Like Safety Management Systems in other sectors, Standard 1 emphasises the important role of organisational leaders in establishing and communicating incident reporting and risk management processes and structures. It also requires that safety responsibilities and accountabilities are defined across the organisation, ideally formally.

A notable difference between the ICAO SMS framework and Standard 1 is that the latter also incorporates quality management and continuous improvement processes. In many safety critical sectors, safety management and quality management have been separated, with the latter focusing on reducing variation. However, in healthcare safety is often treated as a dimension of quality and hence most models of clinical governance include both safety management and quality management functions. This has a flow on effect to frontline healthcare roles - it is increasingly the norm that healthcare workers have formal continuous improvement responsibilities in addition to safety management responsibilities.

Another key difference between the national standards and the ICAO SMS framework is that clinical governance is generally limited to 'patient safety and quality', with worker safety being managed through different structures. This delineation does not exist in other sectors, where the worker is often the primary person at risk of harm. Consequently, the ICAO SMS framework manages worker and consumer safety through the same structures and processes. In general, most Human Factors researchers and practitioners assume that a safe workforce delivers safer care.

There are several actions healthcare workers can take to support effective clinical governance. The first, and perhaps most important, is to report local incidents and near misses in the organisation's incident reporting/management system. All safety management systems fundamentally depend on open reporting. Related to this point, staff can also support clinical governance by conducting risk assessments in their work area and implementing appropriate risk reduction strategies. This information can also be fed up via the organisations incident reporting/management system in most healthcare organisations.

**Table 11.1** Characteristics of good and bad SMS

Effective SMS	Ineffective SMS
Senior Management are aware of operational risks and mitigation strategies	Senior management have a weak understanding of operational tempo and risks in the system
Organisations are confident in their ability to pass accreditation at any time	Organisations muster resources at the last minute to pass accreditation
Leaders talk about the importance of safety and model safety behaviours	Leaders talk about efficiency and budget, safety is rarely discussed
Staff understand incident management processes and are treated consistently post-incident	Staff are unclear of how to manage and report incidents and are treated inconsistently (or unfairly post incident)
The organisation proactively assesses risk and implements mitigation strategies to reduce the risk to as low as reasonably practical	The organisation does not routinely engage in risk assessments
Lessons are learned from incidents and strong intervention strategies are implemented and monitored	Incidents repeat with no meaningful change



## References

1. International Civil Aviation Organisation, "Safety Management Manual".
2. Reason J. Introduction to Human Factors and Ergonomics. In: Managing the risks of organizational accidents. Taylor & Francis Ltd. 1997.
3. Civil Aviation Safety Authority. Safety Management System kit (2nd edition). 2014. <https://www.casa.gov.au/education/standard-page/sms-resource-kit>
4. Australian Commission on Safety and Quality in Healthcare. Safety and Quality Improvement Guide Standard 1: Governance for Safety and Quality in Health Service Organisations. 2012.



## Safety culture

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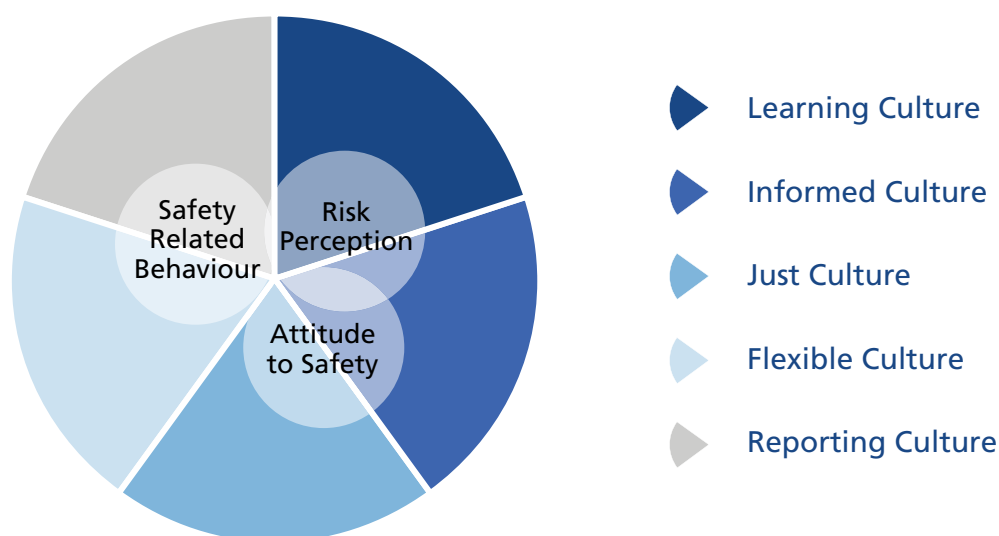
### What is a safety culture?

The term 'safety culture' came into use after the Chernobyl nuclear disaster in 1988, to highlight the managerial and organisational factors that are important to safety. Since then, the concept has been widely adopted, especially in safety-critical industries such as aviation and nuclear power,<sup>1</sup> to denote the attitudes and behaviours around safety in an organisation.

One of the most commonly used definitions of safety culture is: "The product of individual and group values, attitudes, perceptions, competencies, and patterns of behaviour that determine the commitment to, and the

style and proficiency of, an organisation's health and safety management".<sup>2</sup> Guldenmund<sup>3</sup> suggested that safety culture consists of the following key characteristics: it is relatively stable, shared by groups of people, consists of various aspects or dimensions, and constitutes practices that can be learned.

Safety culture may be characterised by eight key elements (Figure 14.1): Informed Culture, Reporting Culture, Just Culture, Learning Culture, Flexible Culture, Risk Perception, Attitudes to Safety and Safety-Related Behaviour.



**Figure 14.1** Elements of a safety culture (from CANSO, 2008. Safety Culture Definition and Enhancement Process)<sup>4</sup>

Safety culture is a component of the overall culture of an organisation, which has been loosely described as “the way we do things around here” or the “personality” of an organisation. Safety culture has psychological aspects (attitudes or how people feel), behavioural aspects (what people do), and situational aspects (what the organisation has, such as policies and procedures).<sup>4</sup> Most people aren’t consciously aware of the shared beliefs and assumptions that influence their behaviour, making organisational culture hard to define, hard to analyse and measure, hard to manage, and often invisible. Nevertheless, the benefits of having a positive safety culture are well reported and have been shown to predict workplace safety and organisational performance outcomes. Organisations with a positive culture of safety have been described as having communications among co-workers that are founded on trust, a shared valuing of the importance of safety, and confidence in the effectiveness of organisational prevention initiatives.<sup>2</sup> One prominent model for understanding safety culture, the Manchester

Patient Safety Assessment Framework (MaPSAF) draws from a model of organisational culture maturity by Ron Westrum<sup>5</sup>. He argues that a deciding factor in safety is how organisations treat information; it can either be: 1. pathological (e.g. shoot the messenger), 2. bureaucratic (e.g., listen to the message if it arrives) or 3. generative (e.g., train and value the messenger). Hence, this model facilitates self-reflection on where one’s organisation sits in regard to safety, and how it can improve.

At the same time, it is important to understand that an organisational culture, particularly in healthcare, does not always have an integrated or unified approach to safety. It is possible for an organisation to be differentiated, even fragmented, possessing diverging norms and values based on group difference, rather than one overarching organisational safety culture. Such subcultures may develop, for example, along professional or unit lines. In attempting to understand the safety culture within an organisation, it is therefore important to look for possible differentiation or fragmentation.

## Why does safety culture matter in healthcare?

In healthcare, safety culture gained traction with the landmark “To Err is Human” report in 1999.<sup>6</sup> Since then it has been increasingly studied. Generally, safety culture is thought to suggest something about the status of, or propensity for, safety in a work area. Hence, managers and leaders may assess safety culture to understand their team better, as a diagnostic tool to manage problems, or in evaluating quality improvement activities. For example, Stephen Muething and colleagues at the Cincinnati Children’s Hospital Medical Center assessed safety culture as one of the outcomes of an intervention to improve the incidence of serious safety events.<sup>7</sup> Safety culture assessment is also increasingly required by regulatory bodies, such as being assessed for accreditation purposes.<sup>8</sup> As recognition of the importance of safety culture in healthcare has grown, attempts to directly intervene and even improve have also proliferated.<sup>9</sup> Such interventions typically target proposed dimensions of safety culture, such as teamwork or leadership.<sup>1</sup>

## How can we assess safety culture?

Assessing safety culture depends on the aspect of culture to be measured (Figure 14.2), and may consist of a combination of surveys, interviews, observation and audits.

Safety culture in healthcare settings is usually assessed through quantitative self-report questionnaires, using simple Likert scales. This is a practical, time-efficient and effective way to gather large amounts of data across

one or more participant groups. In addition to the MaPSAF mentioned above, the following tools are those most widely used in healthcare settings:

- Agency for Healthcare Research and Quality’s Hospital Survey on Patient Safety Culture (HSOPSC)<sup>10</sup>. The HSOPSC includes 12 dimensions of safety culture including: management support for patient safety; teamwork within units; teamwork across units; communication openness; frequency of events reported; feedback and communication about errors; organisational learning - continuous improvement; nonpunitive response to errors; handoffs and transitions; staffing; supervisor/ manager expectations and actions promoting patient safety; and overall perceptions of patient safety.
- Safety Attitudes Questionnaire (SAQ)<sup>11</sup> which includes six elements of safety culture: teamwork climate; safety climate; job satisfaction; perceptions of management; working conditions; and stress recognition.

While regulatory and accreditation bodies have been quick to adopt and promote the use of these tools, there are questions around their psychometric rigor for the measurement of healthcare safety culture. Furthermore, the instruments differ in content (number and type of dimensions they assess), emphasis and length. Poor response rates and incomplete surveys in healthcare are also an issue.<sup>12</sup> Response rates to safety culture surveys vary considerably, with research identifying a range between 23% and 100%.<sup>12</sup> When response rates fall below 60%, the data represent opinions rather than culture and the results should be used with caution.<sup>13</sup> A mixed method approach, using interviews and observations in addition to self-report surveys, may give a fuller picture of safety culture.



Figure 14.2 Possible measurement tools (CANSO, 2008)<sup>4</sup>

## Current issues in the field of safety culture

Following rapid expansion of the field of healthcare safety culture over the past two decades, the following issues have emerged. First there has been a lack of consensus in the definition and use of the term “safety culture”, with some preferring “safety climate”. Researchers argue that culture represents the more enduring attitudes and behaviours around safety, whereas climate better reflects what is commonly assessed by survey tools, which is a snapshot or “mood” of an organisation at a specific time.<sup>14</sup>

Second, there are differing opinions about the dimensions of safety culture. Some assessment tools like the SAQ, for example, include staff job satisfaction, while others, including the HSOPSC, do not. Third, current assessment approaches have limitations; it is difficult to attain large and representative samples in quantitative surveys, and guidance on how to rigorously assess safety culture through qualitative approaches is limited.<sup>7</sup> Fourth, how safety culture fits into the broader

organisational culture, and is influenced by contextual factors like the environment and resources, has been undertheorised.<sup>15</sup> Finally, despite the widespread adoption of the concept, the extent to which assessments of safety culture are indicative of actual safety is not always clear.<sup>16</sup> Nevertheless, safety culture provides a valuable window into the quality and functioning of groups of care providers, with a positive safety culture (Box 14.1) something to aspire to.

While it’s often spoken about in healthcare that “one bad apple spoils the barrel”, it’s also possible for individuals to contribute to the creation of a positive safety culture by modelling best practice in patient safety. Leadership, including line managers, middle managers and senior management, are paramount in contributing to a positive safety culture through continuously demonstrating their commitment to safety.

**Table 14.1** Signs and symptoms of positive and negative safety culture

Positive safety culture	Negative safety culture
<p>In Ward A, staff feel comfortable reporting any issue they identify that might impact the safety and quality of care provided to patients. There are clear channels for doing so. If errors are made, they are seen as an opportunity for learning and improving. Leaders encourage reporting, prioritise safety, and model best practice. Doctors, nurses and other staff follow the rules, and do not take shortcuts to get work done faster. They also support one another and work well together. There is high morale in the ward and all agree they would feel comfortable being treated here.</p>	<p>In Ward B, staff are reluctant to speak up if they notice any issue that might affect patient safety. The same mistakes keep happening and the individuals deemed responsible are reprimanded for their actions. Those in leadership roles sometimes make flippant comments about safety procedures being purely for accreditation purposes and seem to flout rules when they interfere with efficiency. More junior staff follow suit. Doctors and nurses are competitive and dismissive of one another. Many staff are burnt out, and morale on the ward is low.</p>

## References

1. Halligan M, Zecevic A. Safety culture in healthcare: a review of concepts, dimensions, measures and progress. *BMJ Quality and Safety*. 2011; 20(4): 338-343.
2. Health and Safety Commission. ACSNI Human Factors Study Group Third Report: Organising for Safety. HMSO, London; 1993.
3. Guldenmund FW. The nature of safety culture: a review of theory and research. *Safety science*. 2000; 34(1-3): 215-257.
4. Civil Air Navigation Services Organisation. Safety Culture Definition and Enhancement Process. CANSO 2008. <https://www.canso.org/sites/default/files/Safety%20Culture%20Definition%20and%20Enhancement%20Process.pdf>
5. Ashcroft, D. M., Morecroft, C., Parker, D., & Noyce, P. R. (2005). Safety culture assessment in community pharmacy: development, face validity, and feasibility of the Manchester Patient Safety Assessment Framework. *BMJ Quality & Safety*, 14(6), 417-421.
6. Kohn LT, Corrigan JM, Donaldson MS. *To Err Is Human: Building a Safer Health System*. Institute of Medicine. Washington, DC: The National Academies Press; 1999.
7. Muething SE, Goudie A, Schoettker PJ, Donnelly LF, Goodfriend MA, Bracke TM et al. Quality improvement initiative to reduce serious safety events and improve patient safety culture. *Pediatrics*. 2012; 130(2): e423-e431.
8. Hodgen A, Ellis L, Churruca K, Bierbaum M. *Safety Culture Assessment in Healthcare: A review of the literature on safety culture assessment modes*. Sydney: Australian Commission on Safety and Quality in Healthcare. 2017.
9. 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(5\_Part\_2): 369-374.
10. Agency for Healthcare Research and Quality. *Hospital Survey on Patient Safety Culture*. 2010.
11. Sexton JB, Helmreich RL, Neilands TB, et al. The Safety Attitudes Questionnaire: psychometric properties, benchmarking data, and emerging research. *BMC health services research*. 2006; 6(1): 44.
12. 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(5 Pt 2):369-74.
13. Pronovost, P., & Sexton, B. (2005). *Assessing safety culture: guidelines and recommendations*.
14. Flin R, Burns C, Mearns K, Yule S, Robertson E. Measuring safety climate in healthcare. *Quality and safety in healthcare*. 2006; 15(2): 109-115.
15. Reiman T, Oedewald P. *The assessment of organisational culture. A methodological study* VTT Research Notes, VTT Industrial Systems, Espoo. 2002.
16. Farup PG. Are measurements of patient safety culture and adverse events valid and reliable? Results from a cross sectional study. *BMC health services research*. 2015; 15(1): 186.

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