Victorian Institute of Forensic Medicine

Clinical Communiqué

VOLUME 6. ISSUE 1.
MARCH 2019 Edition
ISSN 2204 - 0099

CONTENTS

Editorial 1
Case #1 WITHOUT A TRACE 2
Case #2 A SHADOW OF DOUBT 3
Expert Commentary USING A HUMAN FACTORS AND SYSTEMS LENS TO VIEW WHY THINGS SOMETIMES GO WRONG (BUT OFTEN GO RIGHT) 5

PUBLICATION TEAM

Editor in Chief: Nicola Cunningham
Consultant Editor: Joseph E Ibrahim
Managing Editor: Alexander Gillard
Designer: Samuel Gillard

Address: Department of Forensic Medicine, Monash University, Victorian Institute of Forensic Medicine 65 Kavanagh St, Southbank VIC 3006
Honorary Advisory Board: Adam O'Brien, Carmel Young, David Ranson

FREE SUBSCRIPTION

The Department of Forensic Medicine Monash University and the Victorian Institute of Forensic Medicine will publish the CLINICAL COMMUNIQUÉ on a quarterly basis. Subscription is free of charge and will be sent electronically to your preferred email address.

If you would like to subscribe to the CLINICAL COMMUNIQUÉ, please go to:

http://www.vifmcommuniques.org

Next Edition: June 2019

EDITORIAL

Welcome to the first edition of the Clinical Communiqué for 2019. In this edition, we discuss fixation error, the phenomenon whereby a person or group falls into a pattern of thinking that there is only one possible explanation. This can take on several forms, including task fixation on a procedure, or diagnostic fixation to the exclusion of other possibilities, as unfortunately demonstrated in the two cases presented. The first case sees hospital staff fixate on machine malfunction as the cause of abnormal physiological readings; while in the second, a number of visual and verbal cues lead staff to erroneously fixate on one diagnosis, rather than explore other viable differentials.

We follow these case summaries with a commentary written by two leading experts in the field of human factors. Dr Miranda Cornelissen is a Senior Project Officer with the Incident Response Team in Safer Care Victoria. Dr Cornelissen has a PhD in Accident Research and Human Factors from Monash University and a Master of Science in Cognitive Psychology and Human Factors from Maastricht University in the Netherlands. She has over 13 years of experience applying system safety and human factors principles in transport, defence, emergency management, and more recently in health. Our other expert is Dr Julia Pitsopoulos, a member of the Safer Care Victoria Academy and a Founding Director of HFRM, established in the UK in 2007. With a PhD in Organisational Psychology and 20 years' experience in risk and safety management roles, Dr Pitsopoulos has a successful track record in taking a human-centered, systems approach to building strong safety performance and managing human risk. She has worked across a variety of sectors including transportation, energy, defence and manufacturing, and now brings her extensive experience to health.

Human factors, the study of how humans interact within a system, has become increasingly sophisticated, influencing patient safety improvements and learning from error. The ability to view health events through a human factors lens and identify the sociotechnical systems within which clinicians work is an invaluable one. Cognitive bias, attentional resources, situational awareness, and environmental redesign, are just a few of the important terminologies that have entered the lexicon of patient safety reviews and health educational frameworks. The salient commentary in this edition provides an opportunity for clinicians to hear from two human factors experts who bring their skills from other fields to the extraordinarily complex and high-risk industry that is health care. They outline the importance of a safety culture and systems in reducing patient harm, and provide several key human factors resources for further reading.

Just as it is necessary to resist a temptation to fixate on a task or thought, it is also imperative to avoid the tendency to look to humans as the source of all error. Rather, humans are adaptable creatures trying, and generally succeeding, within complex systems. The study of human factors can help clinicians succeed more often within those systems. The focus on the importance of human interaction was identified by the father of the child [AM] featured in this edition, when he graciously remarked at his son's inquest, "In many ways we see it as our responsibility to ensure [AM's] loss was not in vain. We hope that there are lessons to be learned not just about avoiding tragedies in the future but also about love in general and the importance of humanity and the sense of community".

It is said that human factors engineering seeks to identify and promote the best fit between people and the world within which they live and work. A human factors approach views humanity in the context of community, which is key to ensuring that the lessons are being learned.

CASE #1
WITHOUT A TRACE

Case Number: Not listed in finding

Case Précis Author:
Libby Newman, Clinical Nurse Specialist, Forensic Pathology, Tasmania

CLINICAL SUMMARY

AM was a 3 year old boy who was fully immunised and healthy. His family travelled overseas for a holiday during winter, where he developed bronchitis that appeared to resolve by the time they returned home. A week later, he developed a cough that gradually worsened. Over eleven days, AM's parents took him to three different medical centres where various clinicians reviewed him. It was initially believed AM had a chest infection and he was commenced on antibiotics. On his second review, he was diagnosed with a viral upper respiratory tract infection and his parents were advised to give him paracetamol and ibuprofen. When he presented to the third centre with symptoms of fever and nausea, the clinician diagnosed him with otitis media and prescribed a further course of antibiotics.

AM's case highlights a reliance often placed by clinicians on monitoring equipment where a 'hands on' assessment is required.

AM's condition continued to deteriorate over the next three days so his parents took him to a private hospital emergency department. There, they were told by a doctor to present urgently to the emergency department of a nearby local public hospital. At the public hospital, AM was triaged as a category one and diagnosed with sepsis secondary to left lower lobe pneumonia. His respiratory rate was 28 breaths per minute and he required a non-rebreather mask at 8-10L flow to maintain oxygen saturations of 97%. He was commenced on oxygen, antibiotics and intravenous fluids, and a urinary catheter was inserted to monitor his fluid balance. Over the next two days, AM's condition failed to improve. Although he appeared more alert and was able to eat and drink in small amounts, he had increasing puffiness around his eyes and seemed to tire very easily.

His respiratory rate was 30 breaths per minute and his oxygen saturations were 97% on 2L via nasal prongs. His pathology results showed hypoalbuminaemia and hyponatraemia.

Consultation about his condition with another senior paediatrician as well as a nephrologist from a children's hospital ensued, and his biochemical abnormalities were thought to be more consistent with intravascular depletion than SIADH (Syndrome of Inappropriate Antidiuretic Hormone). On day three of his admission, the treating team discussed the possibility of using intravenous albumin and oral salts as well as continuing AM's crystalloid fluid maintenance. On the same day, AM's catheter was removed as staff were concerned that it was blocked.

During its removal, AM passed a large amount of urine and a loose bowel motion, soaking himself which distressed him. Nursing staff decided to shower him, removing his supplemental oxygen in the process. AM's father showered him whilst he sat in a chair. AM stood briefly at the end of the shower but then collapsed and his father carried him back to his bed. Two nursing staff re-applied the supplemental oxygen and a saturation monitor. The monitor did not show a trace and the nurses thought the monitor was faulty, so a second monitor was sought which did not show a trace either. A faint heart rate was eventually detected by the second monitor and an oxygen saturation reading of 95% was shown. AM's father left the ward for approximately 10-15 minutes around this time. On his return to the ward, the nurses were still checking the equipment. Another family member then noticed that AM's chest was not moving. AM's father went to the bedside and asked the nursing staff to examine him. AM was non-responsive and in cardiac arrest. The nurses activated the emergency button but despite resuscitation AM was unable to be revived.

PATHOLOGY

AM's cause of death was attributed to Influenza A (Type H3N2) with the manner stated as, "Cardiovascular collapse as a result of a combination of hypovolaemia, hypotension and hypoxaemia in the setting of a warm shower (with possible vasodilation) and period without supplemental oxygen."

INVESTIGATION

AM's death was investigated by an inquest held four years after his death with a focus on the fixation errors made by the nursing staff. Two expert witnesses, a senior staff specialist in paediatric intensive care and a consultant paediatrician, provided opinions at inquest that focussed on the care AM received during his hospital admission.

The coroner heard that the nurses had incorrectly focused on the monitoring equipment to the exclusion of recognising any other cues. Abnormal findings were then attributed to faulty equipment rather than the clinical condition. Both witnesses agreed that the management of AM's dehydration and biochemical abnormalities could have been more proactive and instituted earlier, but they were nevertheless not overly critical of the treating team.

This reliance can lead to a fixation error – which occurs when a clinician's focus is centred on one facet of a case causing them to lose sight of other relevant information about the case.

The Director of Clinical Services of the hospital where AM had been admitted provided evidence in regard to system improvements in the area health service since AM's death. These included: oxygen and/or monitoring not to be discontinued by nursing staff without prior discussion with the medical team, and an early tertiary opinion is to be sought for complex cases. In addition, a number of measures had been introduced to improve multidisciplinary team work, including: multidisciplinary training sessions, daily Patient Safety Huddles on the ward; and Paediatric Clinical Issues meetings, Patient Safety Meetings and Morbidity and Mortality meetings.

CORONER'S FINDINGS

The coroner stated, "the nurses fell into error in focusing too long on the monitoring equipment, without checking the physical signs of whether [AM] was breathing… the time between [AM] collapsing and the time of calling for medical review was unacceptably long, as a result of the fixation on the monitoring equipment".

CASE #1 WITHOUT A TRACE (Continued)

The coroner recommended that a component of the training for nursing staff across the health district address 'fixation errors', with particular reference to assessment of monitoring equipment results.

AUTHOR'S COMMENTS

AM's case highlights a reliance often placed by clinicians on monitoring equipment where a 'hands on' assessment is required. This reliance can lead to a fixation error – which occurs when a clinician's focus is centred on one facet of a case causing them to lose sight of other relevant information about the case. This phenomenon has been documented in various professions including healthcare, aviation and other fields where reliability of practice is essential. Enhancing a clinician's awareness of their surroundings – or their 'situational awareness' – is an important strategy to countering fixation error.

Incorporating situational awareness into training of all healthcare providers would foster a mindset of vigilance and an openness to assessing other possible causes of an issue. The healthcare setting is dynamic, and technology can assist in monitoring and diagnostic processes, however, this case compellingly highlights the importance of a basic physical assessment every time.

RESOURCES

Rodriguez A, Lee D, Makic MBF. Situational Awareness in Critical Care: An Aviation Approach to Reduce Error. *J Perianesth Nurs* 2017; 32(6): 650-652.

Sitterding M, Broome M, Everett L, Ebright P. Understanding Situation Awareness in Nursing Work: A Hybrid Concept Analysis. *ANS Adv Nurs Sci* 2012; 35(1): 77-92.

KEYWORDS

Influenza A, hypoxaemia, fixation error, equipment, dehydration, situational awareness

CASE #2 A SHADOW OF DOUBT

Case Number: 11/2016 SA

Case Précis Author:
Rohit D'Costa FRACP FCICM,
Intensivist,
Royal Melbourne Hospital
Medical Director,
DonateLife Victoria

CLINICAL SUMMARY

Mr EM was an 83 year old man who had a number of chronic conditions including ischaemic heart disease, congestive cardiac failure, and chronic obstructive pulmonary disease. Approximately one month prior to his death, Mr EM attended his general practitioner's (GP's) clinic on two occasions, three days apart, with symptoms of worsening abdominal pain, vomiting, weight loss, lethargy and anorexia. At the second review, his GP attributed the symptoms to a possible subacute bowel obstruction and wrote a request for an abdominal ultrasound. Mr EM and his wife attended the radiology centre (based at the local hospital) the following morning, where they discovered that the requested ultrasound could not be performed due to there being no sonographer in the centre. It was also a day that his GP's clinic was closed. Reluctant to leave without some form of imaging, Mr EM and his wife sought assistance from a nurse on duty, who organised for the hospital's doctor (a locum) to alter the imaging request to one for a chest X-ray and abdominal X-ray.

The diagnostic process of evidence gathering, test ordering, and loop closure are core to medical training at every level.

Mr EM was subsequently seen in the emergency department of the hospital by the locum doctor, who examined him and felt he was dehydrated. He advised Mr EM to drink more fluids and sent him home that afternoon. A few hours then passed before the report for Mr EM's x-rays arrived at the hospital by facsimile. The contents of the report included: "Moderate to extensive air space opacity in the right lower lobe and lesser extent the right middle lobe favouring pneumonia or potentially aspiration."

The report was not looked at until many hours later, at which point the locum doctor was satisfied that any treatment initiation could wait until Mr EM's planned return to his GP the following day.

That night, however, Mr EM deteriorated further. When he visited his GP the next morning he was febrile, hypoxic and hypotensive. Aided by the X-ray report that had been sent electronically to the clinic the previous day, the GP made a diagnosis of aspiration pneumonia and called an ambulance to transport Mr EM to hospital. Once again Mr EM was treated for a few hours at the local hospital, prior to being transferred to a regional hospital. At the local hospital, he was treated by the same locum doctor, who, influenced by a conversation with Mr EM's GP, the chest X-ray report, and the history of vomiting, proceeded to treat for aspiration pneumonia and commenced dual antibiotic therapy with intravenous ceftriaxone and metronidazole.

The antibiotics that were administered at hospital did not provide coverage for legionella, and the appropriate antibiotic was not given until many hours later at the regional hospital.

Mr EM was eventually transferred to a large metropolitan hospital but continued to deteriorate and died some days later.

PATHOLOGY

Mr EM's cause of death was pneumonia and severe acute respiratory distress syndrome. The cause of his pneumonia and consequent septic shock was the bacterium Legionella, identified by way of a blood culture.

INVESTIGATION

The coroner conducted an inquest into Mr EM's death to address a number of issues relating to the diagnosis of pneumonia and choice of antibiotic therapy. Although his death may not have ultimately been preventable, there were questions concerning process, communication and diagnostic fixation that were raised.

CASE #2
A SHADOW OF DOUBT
(Continued)

When Mr EM was first seen at the local hospital, there was no clinical suspicion of pneumonia, and whilst the X-rays revealed just that, they were not reviewed by the locum doctor prior to Mr EM being sent home or the films being sent offsite for reporting. When the locum doctor became aware of the X-ray findings, expeditious review of Mr EM was not arranged. When the GP subsequently reviewed Mr EM and the X-ray report the next day, aspiration pneumonia became the focus because Mr EM had been vomiting, the pneumonia was in the right lung, and his deterioration had been rapid – all features the GP attributed to aspiration rather than community-acquired pneumonia. The antibiotics that were administered at hospital did not provide coverage for legionella, and the appropriate antibiotic was not given until many hours later at the regional hospital.

With regard to process and communication concerns, loop closure in the X-ray ordering, reporting, and clinical review sequence was explored in detail, particularly with respect to there being unexpected findings. With the issue of diagnostic fixation, the coroner stated that the locum doctor's "fixation on a diagnosis of aspiration pneumonia was inappropriate…" with the wrong antibiotic regimen being prescribed as a consequence. An independent expert (emergency physician) provided written and oral evidence at the inquest that commented on the much greater likelihood of community acquired pneumonia (for which empiric therapy would have covered Legionella) given the clinical circumstances and risk factors.

CORONER'S FINDINGS

The coroner made a number of conclusions concerning Mr EM's management:

1. That there should have been more urgent notification of the X-ray findings to the clinicians, through attempts by both the radiology provider and the clinician/s for this to occur,
2. There was suboptimal care at the local hospital through insufficient attention to symptoms/signs and the X-rays findings themselves (even when they did come to the attention of the doctor),
3. There was diagnostic fixation on aspiration being the cause of the pneumonia partly due to it being listed as a possibility on the X-ray report,
4. There were further delays at the local hospital in administration of antibiotics notwithstanding the fact that the wrong antibiotics were prescribed,
5. Whilst it could not be certain whether Mr EM would have survived had his care been different, it was felt that on the balance of probabilities his chances of survival would have been greater.

The coroner's recommendations were directed to a number of health entities. Firstly, there were a number of recommendations to the hospital and South Australia Health concerning training of staff and appropriate procedures in the identification of deteriorating patients, triage, observations and monitoring, and pathology and radiology results notification. Secondly, the Court recommended that the radiology centre staff (and the Royal Australian and New Zealand College of Radiologists) update their processes with regards to immediate telephone notification of unexpected findings. The recommendations also extended to one of installation of an electronic image transfer system at the hospital to expedite this part of the process. Finally, the coroner reminded doctors to independently re-evaluate the differential diagnosis whenever a patient handover occurs.

AUTHORS COMMENTS

The diagnostic process of evidence gathering, test ordering, and loop closure are core to medical training at every level. In an increasingly information-laden environment it is harder to keep track and tempting to simply go with one's impressions. Technology and process can help, as can the simplest of reminders from the coroner – avoid fixation and remain open to multiple clinical possibilities when trusted with the care of a patient.

KEYWORDS

Diagnostic fixation, loop closure, Legionella pneumonia, X-ray, general practitioner, antibiotic

ACKNOWLEDGEMENTS

This initiative has been made possible by collaboration with the Department of Forensic Medicine (DFM), Monash University, Victorian Institute of Forensic Medicine (VIFM) and Victorian Managed Insurance Authority (VMIA).

REPRODUCTION & COPYRIGHT

This document may be reproduced in its entirety for the purposes of research, teaching and education and may not be sold or used for profit in any way. You may create a web link to its electronic version.

Permission must be obtained for any modification or intended alternative uses of this document. If referring to this publication, the following citation should be used:

Clinical Communiqué [electronic resource]: Department of Forensic Medicine, Monash University, Victorian Institute of Forensic Medicine. Available at:

www.vifmcommuniques.org

DISCLAIMER

All cases that are discussed in the Clinical Communiqué are public documents. A document becomes public once the coronial investigation process has been completed and the case is closed. We have made every attempt to ensure that individuals and organizations are de-identified. The views and conclusions are those of the authors and do not necessarily represent those of Victorian Managed Insurance Authority, the individual Coroner, the Coroners Court, Department of Health, Department of Forensic Medicine, Victorian Institute of Forensic Medicine or Monash University. If you would like to examine the case in greater detail, please contact us and we will provide the relevant website for the Coroners Court jurisdiction.

FEEDBACK

The editorial team is keen to receive feedback about this communication especially in relation to changes in clinical practice. Please email your comments, questions and suggestions to:

cc@vifmcommuniques.org

EXPERT COMMENTARY: USING A HUMAN FACTORS AND SYSTEMS LENS TO VIEW WHY THINGS SOMETIMES GO WRONG (BUT OFTEN GO RIGHT)

Dr Miranda Cornelissen
Senior Project Officer,
Incident Response Team,
Safer Care Victoria

Dr Julia Pitsopoulos
Founding Director of HFRM Pty Ltd
Safer Care Victoria Academy Member

The two cases presented both reference fixation; one related to a diagnosis and one related to equipment malfunction. Another prominent case where fixation occurred, is the case of Elaine Bromiley, where fixation on attempting to intubate and ventilate and a failure to recognise a 'cannot intubate, cannot ventilate situation' resulted in the team not considering and changing to another strategy.

With the benefit of hindsight, it is sometimes difficult to imagine how these adverse events can happen. However, applying human factors thinking - considering interactions between people (with their physical and cognitive capabilities and limitations) and all other elements of the system within which they work (such as the environment, conditions, pressures and demands) - helps us to understand how and why these situations occur. Most importantly, human factors knowledge helps us to design our systems to support and enhance human performance and set our people up for success.

UNDERSTANDING WHY DECISION-MAKING OFTEN GOES RIGHT BUT SOMETIMES GOES WRONG.

Making decisions and solving problems is a core part of a clinician's role. It involves considering multiple pieces of information, determining what the information represents or means, and selecting the best course of action.

Pieces of information from the environment enter into our working memory, which then: generates a hypothesis (guesses what the information means by retrieving information from long-term memory); evaluates how likely the hypothesis is to be correct (often by gathering additional information from the environment to confirm or disconfirm the hypothesis); and if found to be adequately supported forms the basis for action (possible actions are retrieved from long-term memory, and depending on time one or more options for action are generated, considered and evaluated).

But there are many challenges and factors that influence this process. The information is not always available when we need it, or we may get bits and pieces in a random and chaotic manner. It may not be complete and is often complex and unclear. Also, we cannot process every piece of information in our environment. Stress, workload, competing tasks and other demands further impact our attentional resources. We prioritise what we pay attention to, based on knowledge and experience, and we rely on retrieving relevant previous knowledge and mental models from our long-term memory to understand what is in front of us. These mental models can be incomplete or inadequate, particularly if we are less experienced in a certain task or have not seen this situation before and have not built up a store of cues present and actions taken in similar situations. In addition, our working memory is limited in its capacity to consider multiple pieces of information, hypotheses, and costs and benefits of different actions.

As a result, we rely on simpler and less complete means of selecting hypotheses or actions, called heuristics. If we are experienced in a task and are working under time pressure, we often rely on rapid pattern matching such as 'this worked last time I saw something similar', known as 'recognition-primed decision making'. Heuristics and recognition-primed decision-making are usually very powerful and efficient but, unfortunately, biases can sometimes creep in.

Some common biases in hypothesis generation, evaluation and selection are:

- Availability: we focus on what comes easily to mind. Hypotheses are retrieved more easily if they have been considered recently or frequently. Hypotheses are considered more likely to be true if the information supporting it comes easily to mind.
- Representativeness: if the information in this situation closely matches information typical for similar situations seen before, then the hypothesis is evaluated as a more likely candidate.
- Cognitive fixation: once a hypothesis has been generated or chosen, people tend to ignore or underuse subsequent pieces of information and remain fixed on their initial hypothesis.
- Confirmation bias: people tend to seek out information that confirms their hypothesis. People ignore, fail to seek, undervalue and/or fail to remember disconfirming information (even if that would be more useful in evaluating the hypothesis).

DESIGNING TO SUPPORT AND ENHANCE DECISION-MAKING

We will always have biases because we are human. It is important to remember that they often serve us well, e.g. by helping to simplify information in an otherwise complex array of stimuli. We can set people up for success by using our understanding of biases to design work so it supports and enhances decision-making. For example, we can:

- Avoid sharing our preliminary or working hypothesis too soon (unless there is an imminent risk to staff or patients) as this may limit the generation of alternative hypotheses and lead to premature confirmation of the generated hypothesis. Work systems should not force a staff member to conclude an initial hypothesis prematurely.
- Provide prompts in our processes and systems to re-orientate and (re)consider alternative hypotheses or courses of action.
- Design the system to minimise the likelihood of time pressure and excessive workload, as this will exacerbate cognitive tunnel vision, premature pattern matching and 'jumping to conclusions'. Ensure workload, staffing, and fatigue levels are proactively monitored and managed.
- Create a culture where challenging and being challenged is accepted, particularly across specialty areas and hierarchies. Consider a team mix with an appropriate authority gradient where junior staff members have the capability and confidence to speak up and challenge more senior decision-makers.

– Invite fresh points of view regularly. Consider using consumers, staff who are not familiar with the task or process, or others from other professions such as human factors to play an active role.

– Empower someone to play the 'devil's advocate' or divide the team up to challenge each other's decision-making processes and outcomes.

WHAT IS A SYSTEM?

Human factors professionals take a systems perspective to problems. Our health system is a complex sociotechnical system; a system where people and things (processes, procedures, technology, equipment, policy and regulatory environment) have to work together to meet many conflicting and demanding goals.

Think of the health system like an onion (Figure 1). At the core are staff, patients and task and technology. This is often the focus of investigations. The care delivered does not happen in a vacuum and is influenced by factors across all layers of the onion. Team (e.g. stability, leadership, skill mix), work environment (e.g. design, workload, lighting, temperature), and organisational and management factors (e.g. decisions made, policies and procedures, culture) influence what happens at the front end. A health service does not operate in a vacuum and the context in which the organisation exists influences how it operates.

For example, aspects of and actions of the community, referring health services, patient transfer organisations, and government agencies, all influence what happens at a health service. To understand a problem, we have to peel back all the layers of the onion to understand what happens at the different layers and how this influences what happens at other layers.

TAKING A SYSTEMS PERSPECTIVE

Most adverse events or hazardous situations are never the fault of a single person. They are a symptom of deficiencies within the system. Even though people frequently place a high level of responsibility on their own shoulders, the reality is that they cannot control all aspects of the work and context around them. Almost always, people are acting with the best intentions to achieve a successful outcome, in an environment that can make this a challenge.

Therefore, from a human factors and system safety perspective, human error is not the end but the start of the investigation. We want to understand 'why it made sense at the time'. We want to understand whether someone else with similar knowledge and experience might find themselves in a similar situation with a similar outcome one day and how we can prevent this from happening. We want to understand factors across the system that influenced what happened.

And we want to identify holes in the system defences that were not able to prevent it from happening. As such, we should not stop at finding and labelling human error. We should not simply target interventions at the error, decision-making or cognitive biases alone. We should always aim to understand the system context in which work (and errors) occur, so that our interventions address these underlying influencing factors (e.g. factors associated with the patient, staff, task and technology, team, work environment, organisational and management and institutional context).

We should aim to strengthen the defences in the system that prevent, trap and manage inevitable errors. Only then can we support and enhance the work of health care professionals to enable high quality, safe care for patients. We can't change the human condition, but we can change the context in which humans work.

RESOURCES

Elaine Bromiley case

'Just a routine operation' available at vimeo.com/86978963.

Bromiley, M. (2015). The husband's story: from tragedy to learning and action. *BMJ Quality and Safety* (24) 425-427.

Bromiley, M. (2017). "I wouldn't have done what they did". *Hindsight* 2017: 55-57.

Human factors, decision making, human error and safety resources

Dekker, S. (2014) The field guide to understanding 'human error' (3rd ed). Boca Raton, FL, United States: CRC Press.

Kahneman, D. (2011) Thinking, Fast and Slow. New York, United States: Farrar, Straus and Giroux.

Reason, J. (1997) Managing the risks of organizational accidents. Aldershot, United Kingdom: Ashgate Publishing Limited.

Wickens, C.D., Gordon Becker, S.E., Liu. Y. & Lee J.D. (2017) Designing for people: An introduction to Human Factors Engineering (3rd ed). Charleston, SC, United States: CreateSpace.

Human factors associations

Clinical Human Factors Group UK: https://chfg.org/.

Australian Health Human Factors group: http://www.ahhfg.org/.

Chartered Institute of Ergonomics and Human Factors: https://www.ergonomics.org.uk/.

Human Factors and Ergonomics Society: https://www.hfes.org/home.

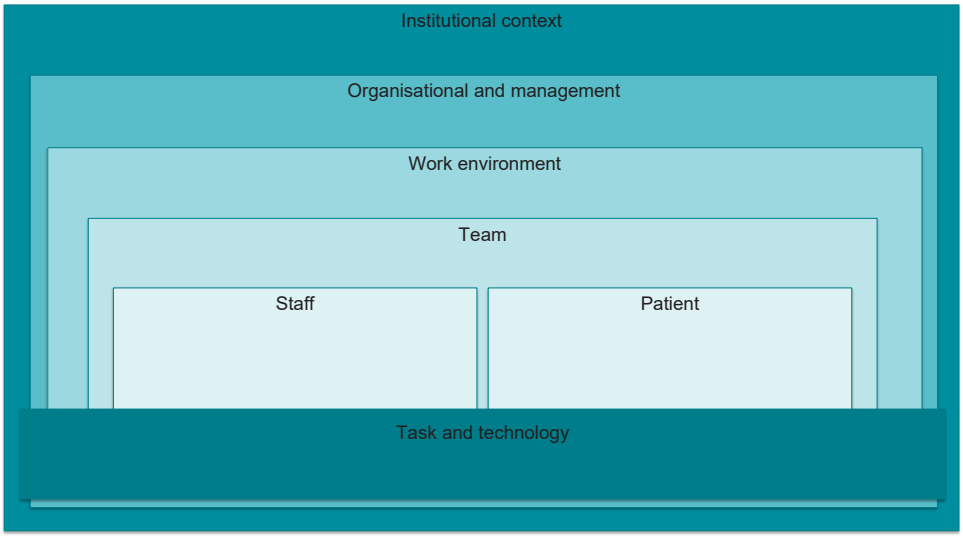

Figure 1. The Health System Onion

Based on Taylor-Adams S., Vincent C. (2004) *Systems analysis of clinical incidents: the Lond on Protocol.* London, United Kingdom: Clinical Safety Research Unit, Imperial College London.