

Review

Good people who try their best can have problems: recognition of human factors and how to minimise error

Peter A. Brennan^{a,*}, David A. Mitchell^b, Simon Holmes^c, Simon Plint^d, David Parry^e

^a Maxillofacial Unit, Portsmouth Hospitals NHS Trust, Portsmouth, PO6 3LY, UK

^b Maxillofacial Unit, Bradford Teaching Hospitals NHS Foundation Trust, UK

^c Medical Director, Portsmouth Hospitals NHS Trust, Portsmouth, PO6 3LY, UK

^d Postgraduate Medical Dean, Health Education Wessex, Southern House, Otterbourne, Winchester, UK

^e Department of Anatomy, Guy's Campus, London, UK

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Abstract

Human error is as old as humanity itself and is an appreciable cause of mistakes by both organisations and people. Much of the work related to human factors in causing error has originated from aviation where mistakes can be catastrophic not only for those who contribute to the error, but for passengers as well. The role of human error in medical and surgical incidents, which are often multifactorial, is becoming better understood, and includes both organisational issues (by the employer) and potential human factors (at a personal level). Mistakes as a result of individual human factors and surgical teams should be better recognised and emphasised. Attitudes and acceptance of preoperative briefing has improved since the introduction of the World Health Organization (WHO) surgical checklist. However, this does not address limitations or other safety concerns that are related to performance, such as stress and fatigue, emotional state, hunger, awareness of what is going on situational awareness, and other factors that could potentially lead to error. Here we attempt to raise awareness of these human factors, and highlight how they can lead to error, and how they can be minimised in our day-to-day practice. Can hospitals move from being “high risk industries” to “high reliability organisations”?

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Introduction

Over 70% of air-crashes are the result of human error rather than technical failure. Pilots are often blamed, but many other people may be involved including air traffic controllers, engineers, and the aviation companies themselves.¹ The recognition and appreciation of factors that lead up to these human errors, including tiredness, repetition, stress, and fatigue has resulted in considerable improvements in

air safety. These lessons have been applied to the operating theatre.^{2,3}

The 1999 USA Institute of Medicine report *To err is human* and subsequent publications have highlighted deaths from preventable medical errors, and found that surgical errors were second only to errors in medication as the most common causes of error-related death.^{4,5} Up to 90 000 deaths are associated with medical errors each year in the USA^{4,5} - equivalent to two fatal crashes of A320 airbuses every three days (the same aircraft that had widespread coverage in the media after an emergency landing on the Hudson River in January 2009 by Captain Sully Sullenberger).

The risk of death from serious medical error in a hospital in the UK remains at almost one a day (1:300),⁶

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* Corresponding author. Tel.: +44 2392 286099; fax: +44 2392 286089.

E-mail address: Peter.brennan@porthosp.nhs.uk (P.A. Brennan).

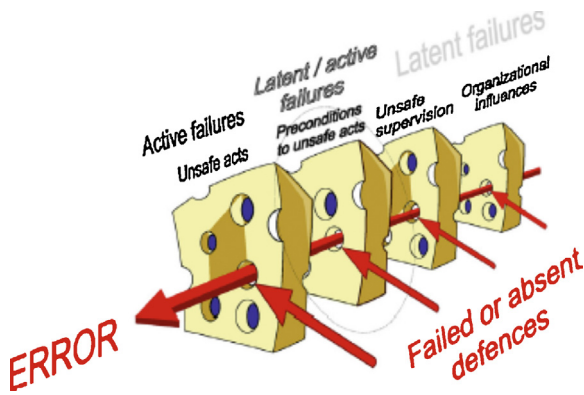


Fig. 1. Diagram of Reason's "Swiss cheese" model of human error.¹⁵ Each of the cheese slices acts as a barrier or block to the error, with the final chance for stopping it being the elimination of the unsafe act itself.

and the operating theatre is a particularly high-risk area because disproportionately more harm is caused by errors in theatre than elsewhere in the hospital.^{2,3} Staffing limits, high turnovers, and site-specific and side-specific operations, make the operating theatre a high-risk environment. Despite the introduction of the WHO checklist, the number of events that should never occur ("never" events) in theatre is also increasing.⁷ While iatrogenic mistakes are relatively rare, near misses are far more common, and an analysis of the root causes that follows any incident can help to prevent errors in future.⁸

Where do potential human-related problems come from?

Several identifiable human factors are common to both aviation and medicine and are crucial in helping to minimise error. These include stress, fatigue, and tiredness,^{9–11} effective team working¹², communication,^{13,14} and leadership.³ Most colleagues are familiar with the "Swiss cheese" model proposed by Reason,¹⁵ in which various factors when lined up can cause an adverse event or error. Such human failure can be broadly categorised into four levels: organisational influences, unsafe supervision, preconditions to unsafe acts, and unsafe acts. The Human Factors Analysis and Classification System (HFACS),^{16,17} which was originally designed for aviation but is now used in medicine and by other organisations (such as shipping¹⁸ and mining¹⁹), is based on the "Swiss cheese" model.

The HFACS used in medicine includes both active failures (decisions, actions, or attitudes of people at delivery), or latent failures (results of deficiencies in organisation and management), or both. The four levels of the cheese are shown diagrammatically in Fig. 1, and those that might be relevant to surgeons are listed in Table 1. You can appreciate how an error might begin to develop long before it actually happens as a result of failures by employers or hospital managers, or other people's behaviour. Such failures could include: increased

Table 1

Simplified Human Factors Analysis and Classification System (HFACS) that is relevant to practising surgeons. The different levels are analogous to the holes in the "Swiss cheese" model (Fig. 1) that can cause an error.

Organisational influences within the Trust/employing authority

- *Climate, process, and management of resources within the Trust.
- *Communication, training, and recognition of human factors that may be responsible for possible error.
- *Trust targets and pressures to deliver results (either perceived or real).

Unsafe supervision

- *Loss of awareness of what is happening, particularly if not recognised by the theatre team.
- *Inadequate supervision of junior staff.
- *Failure of the team to know what to do when things go wrong.
- *Failure of briefings or complacency with WHO checklist.

Preconditions of unsafe acts

- *Environmental factors: background noise, distractions, lighting, ambient temperature.
- *Fatigue, hunger, and nutritional state.
- *Emotional influences (anger or personal issues).
- *Tiredness, boredom, communication issues.
- *Panic.

Unsafe acts (less likely)

- *Unfamiliar with changes from what is seen as a "normal" event.
- *Multitasking.
- *Operating outside one's expertise.

pressure (either real or perceived) being placed on a team to meet targets, operating on more patients on an list, seeing more patients in a busy outpatient clinic, working long hours without a break, and so on.

Organisational compared with personal human error

Errors within an organisation can initiate or precipitate human error at a personal level. The senior executives in an employing organisation have an important leadership role in the safe delivery of training across the organisation, and creating an environment for healthcare professionals to voice concerns without future prejudice or repercussions. An open and transparent culture should be central to any Trust's agenda. There is considerable evidence to suggest that the commitment of senior management is core to the development of human factors in many organisations, not just in healthcare.^{20,21}

There is an obvious dichotomy here when little or no accountability is held by those in authority. The reports generated by the events at Mid-Staffordshire Hospitals in the UK show that the unaccountable, but authority-wielding, management who used a "blame culture" to render those without authority responsible for the errors, is the antithesis of a "human factors" approach.

Patients and staff must be confident with the processes in place for the management of human error and its minimisation, and these should be encouraged both from a top-down and a bottom-up approach, as in aviation. Pilots, ground engineers, and other safety personnel can freely question any safety issues related to their charge of an aeroplane, and the

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