

Experience of head and neck theatre staff and attitudes to human factors using an aviation-based analysis and classification system—a pilot survey

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Abstract

The role that human factors have in contributing to air crashes is well known and is included as an essential part of training. Awareness of human factors in surgery is increasingly being recognised but surprisingly few papers have come from head and neck specialties. We circulated a questionnaire on human factors based on an aviation model to 140 head and neck medical and ancillary staff who work in operating theatres in 3 large UK hospitals.

Most positive responses were found in the consultant group followed by trainee doctors and support staff. A significant difference was found in the subcategories of Unsafe Supervision ($p=0.002$) and Preconditions to Unsafe Acts ($p=0.001$). This work will help to identify multi-system deficiencies that can be corrected, and highlights aspects that may yield the greatest reduction in surgical errors.

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Introduction

Over 70% of air crashes are due to human rather than technical error.¹ Accidents and errors have been significantly reduced by an appreciation of the importance of human factors in air safety.^{1,2} This concept has been adopted into aviation practice for more than 30 years, and has resulted in the development of a robust and integrated crew resource management (CRM) system, which uses tried and tested methods to reduce errors.^{3,4} Instruction in the system has

been mandatory for commercial flight crews since the late 1990s, and performance is usually assessed every 6 months.

The risk of death from medical error in a UK hospital remains 1 in 300.⁵ The 1999 Institute of Medicine report “To Err Is Human” highlighted death from preventable medical errors and showed that errors in surgery were second only to those in medication as the most common causes of error-related death.² The operating theatre was highlighted as a special high-risk area as disproportionately more harm is caused by errors in theatre than by those elsewhere in the hospital. The number of events that should never occur (never events) in theatre is also increasing.⁶

While iatrogenic mistakes are relatively rare, near misses are far more common, and an analysis of the root causes can help to prevent otherwise inevitable errors.⁷ Several clearly identifiable human factors common to aviation and medicine

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Table 1

Description of the 4 levels of human factors that influence errors.

Organisational influences:
Climate: vision within the organisation
Process: means by which the vision of an organisation is carried out
Resource management: how all the resources (human, monetary, and equipment) necessary to do the task are managed
Unsafe supervision:
Inadequate supervision: oversight and management of personnel and resources
Failure to correct problems: instances where deficiencies are “known” to the supervisor, but are allowed to continue
Inappropriate planning: management of work including aspects of risk management, crew pairing, and operational tempo
Preconditions to unsafe acts:
Environmental factors: aspects of the technological and physical environment, lighting, checklists, layouts
Adverse mental states: conditions such as fatigue, misplaced motivation, and pernicious attitudes that negatively affect performance
Adverse physiological states: conditions such as illness that affect performance
Physical or mental limitations: disabilities that have an adverse effect on performance
Teamwork (CRM): communication, coordination, and other teamwork issues that have an impact on performance
Personal readiness: off-duty activities such as adhering to requirements for rest that are necessary for optimal performance
Unsafe acts:
Decision errors: intended behaviour that proceeds as designed but the plan proves inadequate for the situation.
Skill-based errors: highly practiced behaviour that occurs with little or no conscious thought
Routine violations: “bending the rules”
Exceptional violations: departures from authority, neither typical of the individual nor condoned by authority

CRM, crew resource management.

are crucial for minimising error: teamwork, communication,⁸ leadership,⁹ stress, burnout, and fatigue.^{10,11} Despite several studies linking these aspects in healthcare with human performance, results are still often seen by many in the medical profession as equivocal. Many clinicians doubt the validity of a direct comparison of the techniques used to manage error in aviation and medicine, and cite the need to recognise the innate uniqueness of each profession when doing so.¹²

The Human Factors Analysis and Classification System (HFACS) is widely accepted in aviation and has been adapted to include active failures (decisions made by individuals at delivery, or latent failures, or both), which are the result of organisational and managerial deficiencies.^{13,14} Such human failure can be broadly categorised into 4 levels (Table 1).

While it is clear that there are many opportunities for human error or failure to occur, it is usually only when they combine to cause a “multi-system dysfunction” (the often quoted Reason’s “Swiss cheese” phenomenon) that an adverse incident occurs (Fig. 1).^{13,14}

The cockpit management attitudes questionnaire, which is widely used in aviation to assess attitudes towards human factors such as stress, leadership, and communication, is reliable and can accurately predict performance.¹⁵ An operating

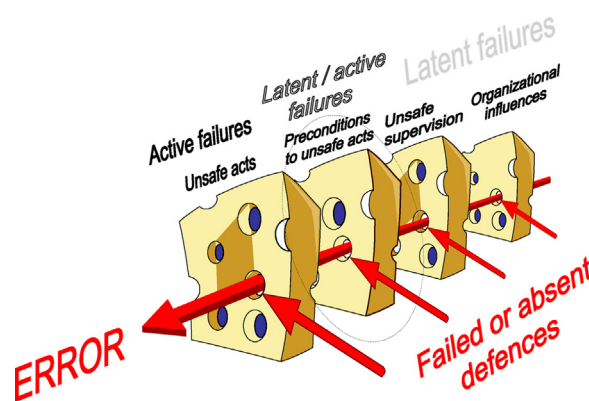


Fig. 1. “Swiss cheese” model of the causes of error relating to the Human Factors Analysis and Classification System (HFACS).

room management attitudes questionnaire (ORMAQ) has been modelled on it,^{11,16,17} but surprisingly, we know of few publications on human factors in head and neck surgery.¹⁸

Our preliminary survey aimed to describe the experience and attitude of head and neck theatre staff towards human factors and to assess whether they differ among the 3 defined clinical subgroups (support staff, trainees, and consultants).

Materials and methods

We designed a questionnaire to address issues (analogous to the HFACS model for latent, and latent or active failures) that could potentially contribute to human error. They included “organisational influences”, “unsafe supervision”, and “preconditions to unsafe acts” (Fig. 1).^{13,14}

The questionnaire included 59 statements derived from the widely used operating room management attitudes questionnaire^{16,17} with additional questions to allow for comparisons across all members of a head and neck theatre team. The emphasis was to evaluate issues that relate to “preconditions to unsafe acts” such as adverse mental states and teamwork (communication, coordination) as they minimise error in aviation and medicine.^{8,10,11}

Since the respondents were not directly involved in creating hospital policies or in resource management, the organisational influences level was examined using questions about experiences of these areas. The remaining levels (“unsafe supervision” and “preconditions to unsafe acts”) were assessed by questions related to the attitudes of staff. A 3-point Likert scale (agree, neutral, or disagree) was used for each question. The order of the questions relating to a particular HFACS level was random. Questions were asked about the generic theatre environment and about factors specific to head and neck surgery. A positive response (suggesting a respondent’s positive experience or attitude towards the HFACS safety model) was indicated by ticking either agree or disagree, depending on the nature of the question (Fig. 2).

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