

New guidance to reduce human error and improve safety as UK health service struggles

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The UK National Health Service is being brought to its knees by a perfect storm of difficulties: poor flow through hospitals resulting in crowded emergency departments and long ambulance waits, and

increases in respiratory illnesses causing increased workloads and staff absences, combined with pre-existing staff shortages and strikes due to working conditions and pay in nurses, ambulance crews and potentially in future junior doctors.

More than ever, there is a need to strengthen systems ensuring [patient safety](#) and to reduce the impact of [human error](#) in health care, using so-called "[human factors](#)," an evidence-based scientific discipline used in safety critical industries.

New guidance is being published today in the journal *Anesthesia* for clinicians, departments, hospitals and national health care organizations, to enable them to design and maintain safe systems that will reduce the risk and potential impact of human error by individuals or teams.

Human error, reluctance to challenge authority and reliance on inadequate systems were among key factors in a number of high-profile deaths, including those of Elaine Bromiley (2005) and Glenda Logsdail (2020). Both patients were having straightforward operations but teamworking and communication problems played a significant part in both of their deaths.

"We are not only discussing avoidable deaths here, but also long-term consequences in patients who survive when avoidable errors and adverse events occur," says guidance co-author Dr. Fiona Kelly, Consultant in Anesthesia and Intensive care Medicine at the Royal United Hospitals Bath NHS Foundation Trust, Bath, UK.

"The new guidance has analyzed all the potential areas in anesthesia where human error can creep in with potentially devastating outcomes, and is likely to be applicable to other health care specialties. This 'human factors' approach aims to make it easy for workers to do the right thing, and difficult or ideally impossible, for them to do the wrong thing."

The guidance has been produced by a working party of the Difficult Airway Society and the Association of Anesthetists, and is supported by the Royal College of Anesthetists and other national organizations. The team includes Dr. Kelly and Professor Chris Frerk, Consultant Anesthetist at Northampton General Hospital, University of Leicester Medical School, and Chair of the Clinical Human Factors Group (a charity dedicated to making health care safer). The guidance is also being presented in a special session at the Winter Scientific Meeting of the Association of Anesthetists in London from January 12-13.

The wide-ranging guidance addresses issues including the design of operating theaters; well-designed medical equipment and using the most effective equipment; effective use of checklists before operating; encouraging staff of any seniority to speak up if they have safety concerns; the ability to learn from not only situations where things have gone wrong, sometimes fatally so, but also from situations where things have gone well; and training and education.

Human factors principles and strategies have been incorporated successfully into safety critical industries, including nuclear power, offshore oil and gas, aviation, construction, rail and the military. Implementation of human factors principles, education and methods within health care has made some progress in the past 20 years, including, for example, the adoption of regular team briefings and staff safety huddles. This has been due in part to the work of Martin Bromiley (husband of Elaine), who is an airline pilot fully accustomed to the day-in, day-out use of safety procedures that minimize the risk of air accidents. The incredibly helpful and cooperative approach of Mr. Bromiley and others, including Richard Logsdail (husband of Glenda), in helping address systemic faults involved in the deaths of their partners, has played a huge role in enabling today's new guidance.

Human factors strategies can be categorized into four domains arranged

in a pyramid shape according to their likely effectiveness. Design (of environment, equipment and systems) is the strategy likely to be most effective and forms the base of the pyramid. "Designing out" the chance of an error occurring reduces the requirement for exceptional human performance commonly relied upon in health care. Design strategies are followed in order by barriers (which trap errors to prevent them progressing), mitigations (which reduce the consequences of errors—such as analysis of deaths or critical events) and education and training. However, the authors explain that the current UK health care system is more like the pyramid turned upside-down, with heavy reliance on high levels of human performance and a resultant small and unstable foundation for safety. In the current UK health care climate, the authors say this upside-down pyramid is even more unstable.

After a 5-year-process, the Working Group agreed on 12 recommendations to form the new guidance, split among different areas of the "pyramid."

The authors say, "health care relies on high levels of human performance, as described by the 'human as the hero' concept. However, human performance varies and is recognized to fall in high-pressure situations, meaning that it is not a reliable method of ensuring safety. Other safety-critical industries embed human factors principles into all aspects of their organizations to improve safety and reduce reliance on exceptional human performance; there is potential to do the same in anesthesia and in health care in the broader sense."

Adding that improving human factors is in no way a substitute for proper funding and resourcing of hospitals and health care systems, the authors conclude, "Although applying human factors science has the potential to save money in the long term, its proper implementation may require investment before reward can be reaped."

Professor Frerk adds, "Care given within the NHS has become increasingly complex over the last 20 years, and is now delivered by teams of nurses, physiotherapists, pharmacists, doctors and other support staff. As many as 1 in 10 patients are harmed during their interactions with the NHS; this is not because staff don't care or don't try hard to do the right thing. The old model of health care where we assumed that having knowledge (and experience) about the heart, lungs, cancer or arthritis would be enough to keep patients safe is just not the case anymore. Adopting a 'human factors' approach across health care, to eliminate the risk and impact of human error, has been on the national agenda for more than 10 years. With this guidance, we want to start to move this approach into everyday practice for everyone in the NHS."

The 12 recommendations

Design

1. Design of medical equipment should include input from human factors experts at an early stage (where it is possible to still change the design if necessary—this is not currently always the case). The medical equipment procurement process should include human factors assessments.
2. Design of drug ampules and packaging should incorporate human factors principles to optimize readability and reduce the risk of incorrect selection: anesthetists, pharmacists and procurement departments should ensure that these principles are prioritized during their purchasing processes. Improvements that could make a difference include making the drug name more prominent than the manufacturer's name and logo, prioritize generic drug names over trade names and consider standardized use of color, while being mindful of the impact of color blindness.
3. Design of safe working environments should incorporate human

factors principles. Regular reviews should be carried out to ensure that safety has not been compromised—this can cover anything from the design of the whole hospital to operating theater design, and how moveable equipment is used in each operation.

Barriers

1. Operating theater list planning and scheduling should include additional time allocated for complex cases and for high turnover lists to enable adequate preparation and reduce time pressures on staff.
2. Cognitive aids, including algorithms and checklists, should be designed and tested using human factors principles to ensure usability and efficacy.
3. Non-technical skills can be learned and developed, and should be practiced during everyday work to ensure that staff become skilled in their use and are able to use them effectively. (Many examples exist and include all staff wearing a name badge and using first names of team members, and situational awareness—being aware of what has happened in a situation, what is currently happening, and what could happen in the coming moments.)

Mitigations

1. Investigation of critical incidents and adverse events should be performed by teams that include members with human factors training using a human factors investigative tool. Lessons identified should be shared. An example of this is: A new patient safety incident response framework (PSIRF), based on human factors principles, is replacing the existing root cause analysis

investigation tools that are currently in use in the UK health care system. (Hospitals have been given until autumn 2023 to implement this.)

2. Morbidity and mortality meetings should be part of the regular work of all anesthetic departments and should also include learning from cases that go well. Time within job plans should be allocated to enable staff to prepare for and attend these meetings.

Education and training

1. Human factors education and training should be provided at an appropriate level for all anesthetists and all members of operating theater teams. It should include the role of good design in [health care](#), an appreciation of a systems perspective, the importance of non-technical skills and strategies to improve these.
2. Non-technical skills training and interprofessional simulation training: Teams that work together should train together. Non-technical skills should be learned during classroom and in-theater teaching, woven into all anesthetic workshops and courses and rehearsed during regular interprofessional simulation training. Time and resources should be allocated to allow for this.

Well-being

1. Staff well-being should be optimized by hospitals and anesthetic departments by implementing organizational strategies.

Strategy

1. Each anesthetic department should have a human factors lead with an appropriate level of training. Every hospital should have patient safety leads with appropriate training and qualifications;

in England, this is already included in Health Education England recommendations.

More information: Implementing human factors in anaesthesia: guidance for clinicians, departments and hospitals, *Anaesthesia* (2023).

Guidelines: doi.org/10.1111/anae.15941

Review: doi.org/10.1111/anae.15920

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