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Safer surgical practice: a guide for surgeons (not just for pandemics)

A.G.C. Hay-David^{a,*}, J.B.T. Herron^b, P.A. Brennan^c

^a Queen Elizabeth University Hospital, Glasgow, UK

^b Faculty of Health Sciences and Wellbeing Sunderland University, Chester Road, Sunderland SR1 3SD, UK

^c Queen Alexandra Hospital, Portsmouth Hospitals NHS Trust, UK

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Abstract

The surgical working environment has changed considerably since the World Health Organisation (WHO) declared the coronavirus outbreak, COVID-19 (SARS-CoV-2), a pandemic on 11 March 2020. Measures remain in place to reduce the risk of spread from patients to surgeons, nosocomial infection and amongst healthcare workers. However, despite these protective measures, healthcare staff are at risk with the number of health workforce deaths increasing worldwide. This article sets out to explore the roles and responsibilities of the surgeon during these extraordinary times and discuss how we can improve our practice to reduce the risk of harm to patients, surgical staff, and ourselves.

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Introduction

In the space of just six weeks, the coronavirus outbreak known as COVID-19 (SARS-CoV-2) advanced from being a public health emergency of international concern to a pandemic. Globally (September 26, 2020) there have been 32,344,734 confirmed cases and 984,902 confirmed deaths in 235 countries, areas or territories.¹ The ICN (International Council of Nursing) has estimated that 6% of all confirmed COVID-19 cases have affected healthcare workers and have called for standardised reporting of healthcare infections and deaths.²

Care has needed to be rationed to reflect need in order to better protect our patients and staff: social distancing and personal protective equipment (PPE) has resulted in the cancellation of elective (or ‘non-urgent’) operations and clinic appointments; telephone consultations replace face to face

interactions where feasible; emergency and trauma services continue to run but with guidance in place.

Wearing PPE for long periods is uncomfortable, can affect both individual and team situational awareness and requires enhanced vigilance to ensure our own and other’s safety. Dame Clare Marx, Chair of the UK medical regulator, the General Medical Council (GMC), emphasised the importance of applying basic principles, flexibility, and to ensure we look after ourselves and others.³ Our responsibilities and duties to our patients remain the same in accordance with the GMC Good Medical Practice during this time.

Errors: how they occur and how to reduce them

The well-known Swiss cheese model of error published over 25 years ago by James Reason is one method to understand how mistakes occur through a complex process of levels.⁴ It provides a simple visual analogy that highlights how easily deficiencies in barriers can lead to harmful events occurring. It is rare that medical error is the sole fault of one individual:

* Corresponding author.

E-mail address: a.hay-david@nhs.net (A.G.C. Hay-David).



Fig. 1. Ugandan forces on a training exercise.

it is the duty of all to safeguard patients and ensure mistakes do not occur. One highly effective way is by engaging with the WHO Surgical Safety Checklist that ensures safer practice and reduces the potential for error through team briefing – effective communication and teamwork.⁵ There is a growing body of evidence that the implementation of the checklist has led to a reduction in the rate of postoperative complication, such as, surgical site infection, readmissions, and mortality.^{6,7}

Civilian medical practice has much to learn from the military. There, the catastrophic consequence of getting things wrong is death - negatively affecting operational effectiveness and all human factors. Ways to reduce the human elements and safety include an operational brief and walkthrough, ensuring every soldier knows the plan and where other team members will be located (Fig. 1); standard operating procedures in check points; extensive training on weapons; and, rules of engagement for raids. Recent British examples from the Iraq war include fratricide ('blue-on-blue', the death of personnel under friendly fire) where there were five confirmed incidents, three involving armoured vehicles such as tanks, one during a raid, and the last approaching a check point;⁸ another incident related to a lack of training on the weapon system combined with a deficit of body armour that subsequently led to a change in policy.⁹

Safety in the preoperative setting

Mental resilience is a key factor in surgical performance. Factors such as civility, valuing staff members and support from those in power, when faced with adversity, can reduce stress.¹⁰

Knowledge and application of human factors (HF) can help recognise and reduce the likelihood of potential errors. There is increasing evidence to support the importance of adequate rest, hydration, and sleep.^{11,12}

At a time when trainees' operating and experience is still being impacted, there is a wealth of opportunity in the form of



Fig. 2. An A380 airbus going in to the hangar for maintenance.

teaching webinars and online conferences. The Royal College of Surgeons have provided a virtual learning environment to encourage online learning (www.vle.rcseng.ac.uk): Systemic Training in Acute Illness Recognition and Treatment for Surgery (START) course that includes a HF presentation; Non-Technical Skills for Surgeons (NOTSS) course presentations; Training the Trainers (TTT). This can lead to better preparation, a reduction in bandwidth spent on surgical tasks as they become more familiar, allowing HF principles to safeguard patients and teams. This approach to learning takes the form of enhanced discovery learning – consolidation of existing knowledge with assimilation of new knowledge, aiding retention, and, eventually, reduces working memory.¹³

Operating

Personal protective equipment (PPE)

Standing for prolonged periods especially if wearing lead aprons and full PPE in the operating theatre can be uncomfortable, with spatial awareness affected and hearing impaired.¹⁴ Instructions must be clear and ideally read back or confirmation given to the initiator to ensure messages or instructions are heard. This is standard practice in general aviation as well as in military medicine (Figs. 2 and 3).

Prior to COVID-19, it was reported that only 18% of staff correctly apply surgical facemasks thereby reducing their effectiveness.¹⁵ Issues can occur when a mask is not shaped correctly to the nose and, if the surgeon wears glasses, loupes or face guards, they can become steamed up and reduce vision during the operation.

PPE that is correctly fitted, applied, and disposed of, is important to ensure adequate protection to ourselves and others during the COVID-19 pandemic. Surgery in patients with COVID-19 carries up to a 24% mortality if the patient subsequently develops pulmonary complications.¹⁶ It is therefore vital for staff and patient safety that appropriate PPE is worn and, in the case of operating, this should be a minimum of a FFP2/N95 mask, eye protection, theatre gown, and gloves.¹⁷



Fig. 3. HF at work: a high level of caution is required to manoeuvre a large aircraft (Airbus A380) in to a small space. Good communication and complete trust between all team members is vital to prevent a costly damage.

Regional anaesthesia

It is important to discuss with anaesthetic colleagues the safest options for surgery. Regional anaesthesia reduces many risks associated with general anaesthesia such as airway instrumentation resulting in aerosol generating pulmonary complications, postoperative delirium (secondary to opioids), and, nausea and vomiting.

Wide awake local anaesthetic no tourniquet (WALANT) is not new.¹⁸ There are valuable free resources available with evidence to support its safe and effective use during COVID-19 and for our wider practice.¹⁹

Noise

Noise in theatre can include operating machinery, instruments, telephones, conversations and music. While many of these are unavoidable, there will be times when music and conversation unrelated to the case should be reduced to ensure concentration. The risks of distraction, hampered communication and a poorer auditory performance are known and safety decibel parameters have been suggested.^{20,21}

The sterile cockpit is a concept that comes from aviation. It prohibits the performance of non-essential duties in the cockpit during critical times such as take-off and landing (below 10,000 ft in commercial aviation). This includes non-essential conversations, all team members are required to have enhanced situational awareness, establishment of defined safety critical exceptions that are allowable in the protocol, and, how to communicate these exceptions.²² This concept can be used during difficult/time-critical parts of a procedure to allow a surgeon to focus, however, when these conditions apply and cease to apply must also be briefed before the procedure begins.

The surgeon

Factors that can affect a surgeon's performance can be remembered by the mnemonic "IM SAFE": Illness, Medication, Stress, Alcohol, Fatigue and Emotion – these should be considered before, during and after surgery.²³ Vigilance of physical wellbeing is important but frequently overlooked possibly due to the lack of institutional reporting by the surgeons of their occupational injuries.²⁴ There is evidence that intraoperative micro-breaks with exercise can improve physical performance and mental focus, with no increase in operation duration.²⁵

Decision making is a critical part of surgery and can be categorised as analytical, rule based, recognition primed and creative. Analytical requires situational awareness, knowledge of options and the ability to select the appropriate one. Rule based deploys an algorithm or published rules, for example, Advanced Trauma Life Support (ATLS®) or antibiotic guidelines. Recognition primed decisions relies on experience and familiarity with problems; made rapidly by experts on an intuitive basis/subliminal level, it has been extensively studied in a military setting.²⁶ Here surgeons must stabilise and manage the situation, with parallel rapid decision making and evaluation of options. It requires minimal use of working memory and reduces bandwidth. Creative is unique and rarely encountered. It occurs when no rules are available – high risk situations, when all else fails and a novel solution is required.

In terms of bandwidth, analytical requires substantial amounts (multiple factors to consider); rule based requires less (protocol driven); and, recognition primed requires least. Creative requires almost all of the bandwidth and concentration due to consideration of a novel situation. These differences in decision making must be accounted for, particularly with respect to training juniors and making provisions for potentially longer operative times.

Situational awareness is vitally important in theatre, everyone must know what is happening. For example, during a critical moment, it allows for the team to become aware when the surgeon or anaesthetist are task focussed. The best situational awareness occurs in teams who think ahead and ask the 'what if?' questions so that they are fully conversant and do not usually suffer a startle reaction should such a problem arise.

When mistakes happen

When examining for mistakes we can use a model developed by Rosenorn-Lang which considers different factors using the mnemonic SHEEP: Systems, Human Interaction, Environment, Equipment, Personal.²⁷

Root cause analysis (RCA) can be applied to learn from incidents and put measures in place to prevent a similar event occurring. It utilises four elements: identifying and describing the problem faced, establishing a clear timeline leading to the event, distinguishing between the root cause and other

Table 1
Tips for Safer Surgical Practice.

Pre Op	<ul style="list-style-type: none"> - Prior to the day of surgery: review your patients' notes and plan your operation and potential back-up plans. - Do you require up to date imaging? - Any particular kit requests (if not already discussed). - Night before the day of surgery: self care (sleep, hydrate, eat) - Am of surgery: last minute checks on patients (anything changed since they were last reviewed in clinic?), consented and marked: countersign the consent form if done in advance, examine the patient's skin/operative field for skin rashes/local infection that may impede healing/be detrimental, are their obs all normal? - Theatre brief: introductions and to discuss all cases, plans from a surgical, anaesthetic and nursing point of view. Any issues/potential pitfalls/factor in breaks/lunches - Check set up in theatre: positioning of the table and scrub nurse (are they within the laminar flow?); anaesthetic machine; image intensifier – c arm and screen where are they and do they have room to swing through for a lateral, is the table radio opaque or does it warrant an extension? Is suction, diathermy, tourniquet machine out of the way? - Surgeon's responsibility to ensure safe set up of the patient on the operating table to avoid iatrogenic injuries: potential risks include burns from diathermy and pooling of flammable skin prep; compartment syndrome placing a limb in the lithotomy position.
Op	<ul style="list-style-type: none"> - LA vs GA - Consideration of non-essential noise in theatre - Added COVID19 challenges: heat/discomfort in PPE; situational awareness; clear communication with repetition of clear instructions - What things go wrong: alert the anaesthetist + scrub team. language used. Not a time for blame/accusation – reassure team members
Post Op	<ul style="list-style-type: none"> - Surgeons responsibility to stay to ensure safe patient transfer from operating table to bed - Appropriate doffing technique - Operation note to be written by the operating surgeon with clear post op instructions. Mnemonic "OVERCOMES DOMES" - such as further doses of antibiotics have been prescribed; check thromboprophylaxis has been prescribed/time to be given; instructions for observations; removal of drain - Check on the patient in recovery and later on the ward - Debrief in theatre – at the end of the session; following a complication/intra op event; feedback to colleagues/juniors (constructive, not personal nor destructive, ways to improve performance); issues with kit.

causal factors, and, to subsequently establish a causal graph between the root cause and the problem.

The CUSS model (I am concerned, I am uncomfortable, I am seriously concerned, stop)²⁸ can greatly add to a surgeon's safety toolbox. This empowers those in junior positions and ensures that everyone can be the voice of safety. This must be explained in a team brief and an environment created that facilitates this. Bullying negatively impacts on safety and it has been proven that civility saves lives,²⁹ rudeness reduces the amount of working memory, and, even observation of rudeness to other members of staff can reduce working memory.³⁰

Postoperative setting

Some theatres routinely debrief to discuss issues and how the day could have run better. This should not be viewed in a negative way to identify failings. Used positively, it can identify how care can be improved and theatre utilisation optimised.

Verbal and written communication is important to ensure safe handover. A clear operation note with postoperative instructions, for example, using the mnemonic OVERCOMES DOMES: Omissions/additions in medications, VTE prophylaxis, Escalation policy, Removal of sutures, COVID status/isolation requirements, Observation ranges (including flap observations), Mobilisation policy, Eating and drinking, Samples taken/imaging, Discharge conditions,

Opportunity for follow-up, MDT instructions, Expected dressings, Special instructions (such as removal of drains, laxatives if bowels not open).

A further summary of examples for preoperative, operative and postoperative considerations are included in Table 1 Tips for Safer Surgical Practice.

Conclusion

While not an exhaustive guide, this article provides a framework to consider your own (and others') performance within the team. We advocate good communication, team working and creating a safe environment in which anyone can speak up without fear of recrimination. In addition, we reinforce the importance of maintaining your own physical and mental wellbeing (not just during pandemics).

Conflict of interest

Nil.

Ethics statement/confirmation of patients' permission

Not required.

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