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Beyond the Flatline: Procedure-Related Death

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Introduction

Procedure-related death, colloquially referred to as “death on table”, exposes the inherent risks associated with surgery and anaesthesia. Although uncommon, these events leave a lasting impact on many clinicians, lingering in the corner of daily practices. Your experience of a procedure-related death has played a part in refining who you are as a clinician, but the difficult and possible lasting negative impacts cannot be ignored. Appreciating the wider medicolegal and psychological implications of a procedure-related death is necessary, not only to ensure clinical well-being but also to form the cornerstone of prioritising patient safety, maintaining professional performance and strengthening the healthcare team.

Definition

There is currently no universally accepted definition of procedure-related death. It is generally understood that procedure-related death refers to death of a patient during or due to a medical or surgical procedure. Internationally, definitions focus on perioperative mortality which serve as a core indicator of evaluating the quality and safely of national surgical systems (Lancet Commission) (1). In South Africa, the Health Professions Amendment Act 29 of 2007 states that a procedure-related is a death of a person undergoing or following a therapeutic, diagnostic or palliative procedure, where the procedure or any component of the procedure – including the administration of an anaesthetic- has contributed or may have contributed to death, and the death should not be regarded as natural for the purposes of the Inquests Act (2).

The amendment replaced the original Health Professions Act 56 of 1974 which described an ambiguous definition of death, often resulting in numerous incorrectly classified and inconsistently reported deaths due to uncertainty. The amended act no longer confines procedure-related deaths to those occurring within the operating theatre or during the procedure itself. Rather, any death in which the procedure may have reasonably contributed, either directly or indirectly, falls within the current legal definition. Therefore, the timing of the death alone should not determine whether a death is classified as procedure related.

Intraoperative vs perioperative death

Although these terms are frequently used interchangeably, intraoperative and perioperative death describe different clinical entities, each with its own implications regarding patient care, quality improvement and medico-legal investigation.

Perioperative mortality generally refers to a death occurring after a surgical procedure, within a predefined time period. The most widely accepted definition is from the American College of Surgeons National Surgical Quality Improvement Programme which defines perioperative mortality as a death occurring within 30 days of surgery, irrespective of whether the patient has been discharged from the hospital (3).

In contrast, an intraoperative death occurs while the patient remains in the operating theatre. Although every intraoperative death falls within the definition of a perioperative death, not every perioperative mortality occurs intraoperatively.

In South Africa, the Health Professions Act 29 of 2007 does not highlight a specific postoperative time period in which the death must occur. The determining factor of whether a death is deemed procedure-related is rather based on whether the procedure contributed or may have contributed to the death. Therefore, a death occurring hours after surgery may still require investigation as a procedure-related death.

Distinguishing intraoperative from perioperative death gives insight into:

1. The emotional implication and psychological impact on staff:
   Intraoperative deaths are experienced in real-time by the operating team and usually occurs during an intervention. Despite this intervention, clinical deterioration of the patient often progresses, resulting in death. This carries greater emotional distress; feelings of personal responsibility and possible prolonged psychological consequences as compared to the perioperative period.

2. Medicolegal relevance:
   Every intraoperative death should initially be regarded as a potential procedure-related death until medicolegal investigation proves otherwise. Conversely, not all perioperative deaths are automatically classified as procedure-related deaths

3. Accurate identification of system failures:
   Determining whether a death occurred intraoperatively or perioperatively guides system improvement initiatives and assists with quality improvement strategies that are appropriately directed to prevent further morbidity and mortality

Incidence

Procedure-related deaths have become increasingly uncommon in modern operative practice, particularly in elective surgery. Improvements in preoperative optimisation, monitoring and anaesthetic techniques have contributed to a substantial decrease in anaesthesia-related mortality over time. In high-income countries, deaths directly attributable to anaesthesia are estimated to occur in fewer than one per 100 000 anaesthetic procedures (4).

Despite the above advances mentioned, there is still a significant difference in perioperative outcomes worldwide. Surgical mortality remains disproportionately higher in low- and middle-income countries, where limited resources and delayed access to healthcare most likely contribute to poorer outcomes. The GlobalSurg Collaborative Study in 2016 demonstrated a higher 24-hour (high-income countries 1.1% and low-income countries 3.4%) and 30-day mortality (HIC 4.5% vs LIC 8.6%) in low-income countries, in patients undergoing emergency abdominal surgery (5).

The 7th National Audit Project of the Royal College of Anaesthetists (NAP7) highlighted that devastating intraoperative events remain uncommon but do still occur. Approximately one perioperative cardiac arrest was reported for every 3300 anaesthetic procedures, with the leading causes being major haemorrhage, cardiovascular events and airway and respiratory complications (6). While this data originates from a high-income healthcare system, the contributing human factors and the common causes of morbidity and mortality demonstrated by NAP7 are equally applicable to our resource-constrained environment.

Closer to home, African Surgical Outcomes Study (ASOS) demonstrated an overall in-hospital mortality rate of 2.1% despite African patients being younger and generally lower risk than patients treated in high-income countries (7). The higher mortality appeared to result mainly from a situation of “failure to rescue”, highlighting deficiencies in recognising and managing complications.

South African data describing intraoperative mortality remains limited. A 10-year retrospective review from a single tertiary centre reported an intraoperative mortality rate of 0.085% among non-obstetric surgical patients (8).

ASOS reported a maternal mortality rate of approximately 0.5%, with the important contributors being haemorrhage and anaesthetic complications (9). A study published by Rout et al in 2012 with regards to the South African Confidential Enquiry data, identified anaesthetic complications as a significant contributor to maternal mortality, accounting for 2.5% of all maternal deaths between 2008 and 2010. Inadequate management post spinal anaesthesia accounted for two thirds of maternal mortality. The most common cause of death following general anaesthesia was difficult or failed intubation, occurring in approximately half of the deaths reported (10).

A more recent Saving Mothers’ Report published in 2023 indicated that anaesthetic complications remain responsible for a significant proportion of maternal deaths (2.3%) despite an overall decline in maternal mortality across the country (11).

Classification

Most deaths are classified according to causation and preventability. Beyond identifying the immediate cause of death, structured classification facilitates clinical governance, quality improvement and medicolegal investigation.

Causation -establishes the medical mechanism of death

"*What caused the death – what happened and why did it happen?"*

1. **Anaesthesia-related:** Death directly attributable to the administration or management of anaesthesia
   Examples include airway management and the failure thereof, administration of anaesthetic drugs (drug errors and side effects) and failure of adequate monitoring

2. **Surgical-related:** Death directly attributable to the surgical procedure, the operative pathology or technical surgical complications
   Examples include massive intraoperative haemorrhage, major vascular injury and cardiac injury

3. **Patient-disease related:** Death due to pre-existing disease despite appropriate surgery and anaesthesia
   Examples include advanced pathology, poor physiological reserve, physiological instability (ruptured abdominal aortic aneurysm, septic shock, cardiogenic shock) and end-stage organ dysfunction

4. **System-failure related**: Organisational or human-factor failures contributing to death
   Examples include lack of appropriately trained staff, delayed availability of blood products and communication breakdown

There is increasing recognition that intraoperative deaths usually an interaction of the above components and is very seldom the direct result of a single cause.

Once the likely cause is identified, the next step is to ascertain whether different management could have reasonably changed the outcome.

Preventability
"Could the outcome reasonably have been different?"

A death is deemed preventable when timely recognition, appropriate management and improved systems would have prevented the outcome.
Examples include:

- unrecognised oesophageal intubation
- delayed diagnosis and treatment of a pneumothorax post-procedure
- erroneous drug administration
- failure to recognise and initiate appropriate treatment of hypoglycaemia or hyperkalaemia

Potentially preventable deaths suggest that although alternative decisions and interventions may have improved the likelihood of survival, it is uncertain whether the patient would have survived.
Examples include:

- delayed activation of massive transfusion protocol
- delayed escalation to a senior clinician

Non-preventable deaths suggest that the death was inevitable despite timely and appropriate evidence-based care and no reasonable intervention would have expected to alter the outcome.
Examples include:

- massive pulmonary embolism
- amniotic fluid embolism (12)

Risk factors for procedure-related death

Patient-related factors

- Increasing age: European Surgical Outcomes Study identified increasing age as an independent predictor of in-hospital mortality (13). Chronological age alone is a poor predictor of perioperative outcome however age of more than 65 is associated with an increased likelihood of multiple comorbidities, increased risk of frailty and impaired physiological reserve, all increasing the risk of perioperative morbidity and mortality (14).

- Higher American Society of Anaesthesiologists (ASA) physical status score: ASA status remains one of the most validated predictors of perioperative mortality. Increasing ASA class is consistently associated with a progressive rise in postoperative morbidity and mortality across a range of surgical specialties (15).

- Cardiovascular disease: Reduced cardiovascular reserve renders patients vulnerable to the haemodynamic stresses associated with surgery and anaesthesia. Increased risk of haemodynamic instability, myocardial ischaemia, perioperative arrhythmias and impaired cardiovascular compensation all contribute to an increased likelihood of mortality.

- Obesity and difficult airway: The association with an increased incidence of difficult or failed airway with resultant airway complications contribute to an increased risk of mortality.

Surgical-related factors

- Emergency surgery: Emergency surgery carries a substantially higher mortality than elective surgery, due to its association with physiological instability, limited opportunity for optimisation and possible advanced underlying pathology. African data confirms emergency surgery as an independent predictor of postoperative mortality (16).

- Major surgery: The complexity and physiological demands of surgery strongly influence perioperative outcomes. Major vascular, cardiac, neurosurgical and major abdominal surgery are associated with increased risks of haemorrhage, large fluid shifts and postoperative organ dysfunction. These are all associated with an increased risk of mortality.

- Prolonged operative duration: There is no current universal definition of prolonged surgery and operative duration on its own has not been proven to be an independent risk factor of mortality. However, prolonged procedures expose patients to higher risks of physiological insult. Possible increased blood loss, hypothermia, coagulopathy and infection increase the risk of perioperative mortality.

Anaesthesia-related factors

Anaesthetic management has a direct influence on perioperative outcome. Although anaesthetic complications are uncommon, failures in airway management, haemodynamic control, medication administration and anaesthetic monitoring continue to contribute to preventable mortality.

Major anaesthesia-related risk factors include:

- Airway complications, including failed or delayed airway management: NAP4 highlighted major airway complications such as difficult or failed intubation, aspiration and oesophageal intubation are associated with an increased mortality risk (17).

- Persistent haemodynamic instability and cardiovascular collapse

- Medication preparation and administration errors (inappropriate drug selection, incorrect dosing)

- Equipment malfunction

- Deficiencies in human factors and non-technical skills including fixation errors and ineffective communication

System-related factors

- Limited healthcare resources: Limited experienced personnel, blood product shortages and inappropriate equipment

- Delayed presentation and referral

- Organisational factors: inadequate institutional protocols and guidelines as well as inadequate safety systems increase the likelihood of preventable errors and adverse events

Risk prediction
How should I actually assess perioperative mortality risk?

Although procedure-related deaths are uncommon, identifying patients at increased risk facilitates informed consent, appropriate preoperative optimisation, multidisciplinary planning and appropriate allocation of postoperative resources. Currently, there is no available risk prediction model which estimates the risk of intraoperative death specifically. Instead, existing tools estimate the probability of perioperative mortality and must therefore be used alongside clinical assessment rather than serving as a substitute.

The most commonly used perioperative mortality prediction tools are:

- **ASA physical status score**

A universally recognised score whose popularity stems from its simplicity and ability to provide rapid bedside assessment without requiring additional laboratory investigations. Increasing ASA class consistently correlates with higher perioperative morbidity and mortality, making it a valuable initial assessment tool (15).

Despite its strengths, the assignment of an ASA status remains subjective and has significant inter-observer variability. Additionally, it does not account for procedure-specific risk, frailty or objective physiological measurements.

The ASA score should be used in conjunction with clinical findings as well as other risk prediction tools.

- **Surgical Outcome Risk Tool (SORT) (18)**

The Surgical Outcome Risk Tool is a validated preoperative model that estimates the probability of death within 30 days after surgery, using routinely available clinical variables. Variables incorporated include age, ASA physical status, urgency and severity of surgery, surgical specialty and recent malignancy. The higher the SORT score, the higher the predicted risk of 30-day postoperative mortality.

The practicality of this tool is worth highlighting. Risk prediction can be performed during preoperative assessment as all variables are available. Validation studies have demonstrated excellent discrimination, with an AUROC approaching 0.90.

SORT does not account for other possibly important contributors to mortality such as frailty, nutritional status and physiological derangement. As a result, SORT should be used in conjunction with clinical assessment.

- **Portsmouth Physiologic and Operative Severity Score for the enUmeration of Mortality and Morbidity (P-POSSUM)**

P-POSSUM was developed to improve prediction of postoperative mortality by combining physiological variables with operative findings (19). In contrast to SORT, this model incorporates 18 variables, including twelve physiological and six operative parameters. The higher the P-POSSUM score, the higher the predicted risk of postoperative mortality.

Completion of this model requires intraoperative information, making it less useful for preoperative counselling and decision-making. For this reason, P-POSSUM is used predominantly for surgical audits and quality improvement rather than routine bedside risk assessment.

- **ASOS surgical risk calculator (16)**

Risk prediction models like SORT and P-POSSUM developed in high-income countries may not accurately reflect perioperative outcomes within the African healthcare system. Disease burden, healthcare infrastructure and resource limitations limit their direct use and applicability to the South African setting.

The African Surgical Outcomes Study investigators developed and validated a Surgical Risk Calculator using data derived from the African surgical population (16).

The calculator estimates the risk of severe postoperative complications and in-hospital mortality using six preoperative variables namely age, ASA physical status, surgical specialty and indication, severity and urgency of surgery. The higher the ASOS score, the higher the patients' risk of severe postoperative complications and in-hospital mortality.

ASOS surgical risk is the most relevant model for the African population and has an AUROC of 0.805.

Recent prospective evidence comparing these models demonstrated superior calibration and slightly better discrimination with SORT compared to P-POSSUM for preoperative mortality prediction. Importantly, prediction was further improved when objective risk models were combined with clinical judgement rather than used independently (20).

The immediate aftermath

Immediate management following a death on table should prioritise confirmation of death, preservation of dignity, objective documentation and preservation of evidence, medico-legal compliance and compassionate communication with the patients' family.

- **Immediate actions**
  - Official confirmation of death (as per institutional guidelines) with clear documentation of time and findings
  - Inform senior consultant (surgical and anaesthesia), South African Police Services as well as forensic services of procedure-related death
  - Prevent non-essential handling of the body and preserve potential evidence: turn off ventilator, monitors, infusion pumps and forced air warming devices. Ensure endotracheal tubes, all intravenous lines, surgical drains and catheters remain in-situ.
  - Syringes, infusions and anaesthetic drugs should not be discarded (unless instructed by forensic services)
  - Surgical wound should be appropriately covered. Patient should be cleaned and covered appropriately while awaiting further instructions from the mortuary or Forensic Pathologist.

- **Medico-legal actions**
  - Complete documentation promptly: GW24/7, unnatural death form and Patient Safety Incident (PSI) report
  - Documentation should be objective and chronological, entailing exact sequence of events, timing, drugs administered, monitoring trends, operative findings, resuscitative efforts and all personnel involved
    Amendments should be recorded separately, signed, dated and timed.
    Ensure copies are made of all documents.

- **Family communication**
  - Senior members of the team
  - Private setting
  - Compassionate disclosure
  - Clear, factual information
  - Avoid speculation
  - Allow opportunity for questions
  - Ongoing support throughout the process

- **Body handling**
  - Transfer appropriately as guided by mortuary/ forensic pathology services
  - Be mindful of religious and cultural sensitivities

South African law mandates a medico-legal investigation of all procedure-related deaths. However, cultural and religious sensitivities must be considered. Compassionate communication with families and early communication with forensic services may assist with expediting the procedure and releasing the body timeously to respect religious and cultural obligations.

South African Law

In South Africa, procedure-related death is regulated by comprehensive medico-legal legislation aimed at prioritising patient protection, ensuring transparency and promoting professional accountability. The primary legal framework is the Health Professions Council of South Africa, with the most recent act being the Health Professions Act 29 of 2007. Despite the existence of clear legislation, knowledge of the legal requirements among perioperative clinicians remains limited.

Moodley et al demonstrated this knowledge gap in a 2019 survey assessing clinicians' understanding and application of legislation relating to perioperative deaths. The authors noted that both specialist and non-specialist state practitioners had poor knowledge of the legal framework governing procedure -related deaths. Difficulty was generally demonstrated in distinguishing natural from unnatural deaths and applying the legislation to common perioperative scenarios. Additionally, the authors noted that clinicians reported feeling inadequately prepared by both undergraduate and postgraduate training to appropriately classify deaths within the perioperative setting (21).

The first step in the medicolegal process is determining whether the death is natural or unnatural (22). This principle is supported by the Births and Death Registration Act (Act 51 of 1992) which requires a medical practitioner to issue a Notification of Death (BI 1663). Section 15 of the Act gives guidance regarding issuing the notification of death. It stipulates that a medical practitioner who is satisfied that the death was due to natural causes may issue the prescribed death certificate. However, if the practitioner believes the death resulted from causes other than natural, the death certificate should not be issued, and the matter must be reported to the South African Police Service.

Conflicting opinions between medical practitioners regarding the classification of death should prompt a discussion regarding clinical concerns, circumstances of the death and relevant legal criteria. Should uncertainty persist despite this discussion, the situation should be further escalated through the appropriate institutional channels and further advice should be sought from the forensic pathologist.
Under South African Law, the duty to report a suspected unnatural death is not confined to the medical practitioner completing the death notification. Where reasonable doubt exists about the classification of a death, the appropriate reporting process should be initiated to allow the medicolegal investigation to determine the final classification.

In terms of the National Health Act (act 61 of 2003), several categories of death are regarded as unnatural (23):

- Any death due to physical or chemical influence, direct or indirect, and/or related complications
- Any death, including those deaths that would normally be considered to be death due to natural causes, which is the opinion of the medical practitioner, has been the result of an act of commission or omission which may be criminal in nature
- Any procedure-related (including anaesthesia-related) death
- Where the death is sudden and unexpected, or unexplained or where the cause of death is not apparent

The amendments introduced by the Health Professions Amendment Act 29 of 2007 significantly reduced the uncertainty surrounding procedure-related deaths. The Act broadened the definition to include deaths in which a procedure or the administration of anaesthesia may have contributed either directly or indirectly to the outcome, even if the death occurs sometime after completion of the procedure. This wider definition ensures that deaths with a possible procedural contribution undergo formal medicolegal investigation, transferring the responsibility of determining causation from the treating physician to the South African legal process.

An inquest is a legal inquiry undertaken to establish the circumstances surrounding the death and to determine whether further legal proceedings are appropriate and necessary. The complexity of the case will determine the type of inquiry undertaken. An inquest may proceed either as a paper- based review or a formal hearing involving witness testimony in the presence of a magistrate.

Importantly, the Health Professions Amendment Act 29 of 2007 does not stipulate when a procedure starts or ends however, within perioperative practice, it is assumed that the surgical procedure commences once anaesthetic monitoring begins in the operating room and concludes when the patient is transferred to the recovery room.

Once the death has been deemed to be unnatural, the Inquests' Act (Act 58 of 1959) is then applicable (22). Section 2 and 3 of this Act require any individual who believes that the death is due to causes other than natural causes to report this death to the South African Police Service, unless there is evidence that another person has already done so. Post-notification of a possible procedure-related death, the SAPS is legally obligated to investigate the circumstances surrounding the death.

The investigation of a procedure-related death begins with the opening of a formal police case, collecting of statements and compilation of all relevant documentation by the investigating officer. Any further information or requests are communicated through the investigating officer.
The deceased is transferred to a government facility where a full medicolegal post-mortem examination is done.

Following completion of the investigation, all available evidence is reviewed by the magistrate with the aim to assess liability of the parties (22). The magistrate will then decide whether the circumstances surrounding the death justify a referral for formal prosecution of the parties involved. Where this is deemed appropriate, the matter will proceed through a legal hearing in court over which a judge presides, determining a guilty or innocent verdict.
A non-guilty verdict does not protect against civil litigation, where the practitioner may still be sued for damages by the patients' family.

Irrespective of outcomes of criminal and civil proceedings, the practitioner may also be subject to further disciplinary processes conducted by the Health Professions Council of South Africa (22).

Negligence

In the South African public sector, a civil claim arising from alleged medical negligence is ordinarily instituted against the relevant provincial Member of Executive Council (MEC) for Health based on the principle of vicarious liability for negligent acts committed by an employee acting within the scope of their employment (24).
This does not exempt the individual practitioner from professional disciplinary proceedings, criminal prosecution or personal civil liability.

Four key elements must be established in order to prove negligence. These include:

- **Duty of care**: This confirms that the healthcare provider had a legal responsibility to treat the patient with reasonable care. This duty is automatically confirmed once the clinician-patient relationship exists. In anaesthesia, this duty usually begins at the first preoperative consultation, when a therapeutic relationship is formed between clinician and patient (25).

- **Breach of duty:** The healthcare provider has failed to meet the accepted standard of care as would be expected of a reasonably competent practitioner in a similar situation

- **Causation:** A causal relationship between the breach of duty and injury, illness or death

- **Damages:** The patient or their family have suffered physical, financial or emotional harm as a consequence of the breach of duty

Physiological effects on the theatre team

"Death on table" triggers an immediate physiological response within the perioperative team involving the activation of the sympathetic nervous system and the hypothalamic-pituitary-adrenal (HPA) axis. Although evolutionarily protective, the intensity of activation during an intraoperative event may impair both technical and non-technical performance at a time when concise decision-making and cohesive teamwork is essential

The acute stress response is characterised by a rapid release of catecholamines, specifically adrenaline and noradrenaline. Commonly known as the "fight-or-flight" response, clinical manifestations include:

- Hypertension
- Tachycardia
- Tremors
- Diaphoresis
- Hyperventilation
- Dry mouth
- Nausea
- Reduced fine motor control

In the operating theatre, the excessive sympathetic activation may impair decision making, task execution and communication.

This can further affect higher cognitive functioning which may lead to reduced situational awareness, difficulty processing information, profound tunnel vision, fixation errors and incorrect decision-making. Cognitive overload may also compromise communication and teamwork, both of which are fundamental to effective crisis management.

Post-event, the hypothalamic-pituitary-adrenal axis activation results in sustained cortisol release which further contributes to ongoing physiological and psychological effects. Repeated catecholamine activation after trauma has been associated with sleep disturbances, emotional exhaustion, fatigue, anxiety and the development of burnout.

The physiological effects extend beyond the individual clinician and may negatively influence overall team performance by increasing tension between team members which decreases team cohesion as well as impairs effective communication.

Identifying the normal physiological response is important, as early identification assists with appropriate support strategies and helps minimise the adverse effects on the practitioner as well as the perioperative team and team dynamics.

Psychological and emotional effects on the theatre team

Traditionally, the operating theatre is regarded as an environment defined by precision, preparation and coordinated teamwork where the common goal surmounts to preserving life and ensuring patient safety. Despite the advancement of technologies, anaesthetic practice and surgical techniques, a procedure-related death remains an unfortunate situation an anaesthesiologist will find themselves in, at some point during their career. For many practitioners, this event remains one of the most difficult situations to navigate in the theatre environment. Beyond the immediate clinical and medico-legal responsibilities and consequences, the sometimes “silent” psychological impact on the healthcare team is profound and often overlooked.

For the perioperative team, a procedure-related death may trigger debilitating emotional responses including shock, intense sadness, helplessness, self-doubt and defeat. The above feelings mentioned remain common, indicating the emotional burden stems primarily from the loss of the patient rather than the surgical context. Todesco et al demonstrated the lasting impact of these events, reporting that 25% of anaesthesiologists experienced feelings of blame following an unexpected death, while 10% continued to think about the event daily for more than one year afterwards (26).

Following a procedure-related death, clinicians are frequently expected to resume professional duties with often very minimal opportunity to process the event. Therefore, many clinicians suppress their emotional distress and difficulties in order to continue with the demands of the theatre environment. Although temporary relief from the clinical environment has been proposed as a coping strategy, the optimal duration is currently uncertain and should be individualised according to the individual and the clinical circumstances surrounding the procedure-related death. Jithoo et al explored the experiences of South African registrars following perioperative death and described the phenomenon of desensitisation (27). Several participants believed this emotional distancing improved their professional functioning and facilitated the acceptance of the outcome with greater ease. Other participants regarded desensitisation as a maladaptive response, expressing concern that this detachment from the event may contribute to diminished empathy. Within an already resource-constrained healthcare system, where relief from clinical duties is often impractical, it becomes important to identify alternative opportunities to assist the perioperative team post procedure-related death.

Whether clinicians should continue operating post procedure -related death is another avenue worth exploring. Goldstone and colleagues investigated the attitudes of cardiac surgeons and anaesthetists towards continuing clinical work following an intraoperative death and examined whether subsequent patient outcomes were affected (28). Approximately 25% of participants believed that they should stop operating for the day. Although no increase in mortality rate was observed among subsequent patients operated on in the next 48 hours, these patients experienced a significantly longer length of intensive care and overall hospital stays.

A cross-sectional study by Todesco et al in 2010 echoed this statement regarding relief of clinical duties, where 62% of anaesthesiologists believed colleagues should not continue with subsequent elective operating lists after an unexpected perioperative death (26). Nevertheless, almost half of the participants continued working, most commonly because no alternative clinician was able to assume responsibility for the remaining cases. Other participants reported feeling external pressure to continue with the operating list despite the emotional impact of the procedure-related death, particularly in environments where clinical demands were high and staffing limited (26).

Although not every clinician exposed to a procedure-related death develops long-term psychological morbidity, repeated exposure to catastrophic events may have an effect on emotional wellbeing and professional functioning. Some psychological consequences reported include emotional exhaustion, burnout, depression, sleep disturbances and symptoms consistent with post-traumatic stress disorder (PTSD). In a South African observational study, van Niekerk et al reported that approximately 28.8% of participating anaesthetists met the criteria for probable PTSD post procedure-related death. The likelihood of developing these symptoms was independent of age, years of anaesthetic experience, level of qualification and workplace environment. The authors also noted that most participants continued with their operating lists despite believing that a period away from clinical duties would be beneficial. Of those who favoured time away from work, most recommended either the remainder of the day or based on the individual and the circumstances surrounding the procedure-related death (29).

Similar observations have been reported in Africa. Ogunbiyi et al demonstrated that 86% of anaesthetists who had experienced a procedure-related death described significant psychological effects following the event (30). Persistent recollection was most common in participants (38%), while other participants reported depression (28%), sleep disturbances (18%), guilt (10%) and a reluctance to return to clinical practice (4%).

These studies demonstrate that the consequences of procedure-related death extend beyond the operating room. Minimal attention has been directed towards recognising and addressing the psychological impact on the practitioner involved. Recognition of these effects form the foundation of the “second victim phenomenon”, which has recently gained attention for its contribution to patient safety and perioperative medicine.

The second victim phenomenon

The second victim phenomenon was first described by Albert Wu in 2000 to describe healthcare professionals who experience significant emotional trauma following adverse patient events. This concept also serves to highlight that the consequences of an intraoperative death extends beyond the patient and the emotional burden may be amplified by the suddenness of death, high-stakes environment and concerns regarding professional and legal scrutiny.

The second victim phenomenon reflects the emotional and professional consequences experienced by members of the perioperative team after a procedure-related death. When patients die despite the efforts to preserve life, the perioperative theatre team may perceive the event not only as a patient loss (“first victim”), but also a personal and professional loss (“second victim”).

The grief experienced is often only one aspect of the psychological burden. Other feelings commonly described include persistent self-questioning, failure, guilt and fear, underlined by the overwhelming thought of whether different or earlier management would have affected the outcome. These feelings are often accompanied by insomnia, impaired concentration, emotional withdrawal, hypervigilance in future cases and avoidance of certain procedures.

Secondary stressors may compound the second victim phenomenon and further intensify the psychological burden. These additional stressors include morbidity and mortality meetings, fear of litigation, perceived blame, criticism of clinical decision-making and loss of professional confidence.

Awareness of the risk of second victim phenomenon emphasises the importance of implementing structured support systems following a procedure-related death. Appropriate interventions aim to reduce stress and anxiety, restore self-esteem and preserve professional self-sufficiency. Commonly recommended strategies include structured debriefings, peer support programmes and institutional policies that facilitate timely access to psychological support. Conversely, inadequate support following an adverse event has consistently been associated with an increased likelihood of persistent second victim symptoms.

Despite the growing awareness regarding the second victim phenomenon, formal support following a procedure-related death remains inadequate and inconsistent. Ogunbiyi et al reported that although most anaesthetists experienced significant psychological distress after an intraoperative death, almost 90% received no formal debriefing or psychological support following the incident (30). Similarly, Todesco et al demonstrated that fewer than half of participants underwent a structured review of the event through a formal morbidity and mortality meeting (26). More recently, High and Forest found that although emotionally distressing workplace events are commonly observed by healthcare professionals, only one in five participants believed adequate support was available within their institution (31).

South African data reflects similar concerns. Van Niekerk et al were unable to demonstrate whether debriefing reduced the incidence of probable PTSD because relatively few participants had actually received formal debriefing following the event. Regardless, the majority of clinicians-both those with probable PTSD and those without – expressed a desire for structured debriefing after experiencing a death on the operating table (29).

Several barriers may limit clinicians from seeking support following a traumatic event. These include heavy clinical workloads, confidentiality concern and the fear of personal judgement. Although attitudes towards clinician wellbeing are gradually changing, there is still the lingering perception that requesting help reflects personal weakness, which may further contribute to the poor utilisation of available support services.

Structured debriefings provide an open opportunity for the perioperative team to process the event both clinically and emotionally. It serves to openly discuss the sequence of events and express emotions in a supportive environment, aiming to reduce feelings of isolation and self-blame as well as restoring personal and professional confidence.

According to the ASA, both event reviews and peer support debriefings should be conducted, both serving their own purpose in the management of a procedure-related death. An event review analyses the facts of the case, highlighting contributing factors and evaluating the systems of care. In contrast, peer support debriefings aim to assist the perioperative team with emotional validation, providing coping strategies and enhancing psychological recovery after a procedure-related death.

Current literature proposes a staged approach to debriefings. The initial “hot debrief” should be conducted in the immediate period, typically lasting approximately five minutes, ideally once all clinical responsibilities have been completed by the perioperative team. The debrief aims to provide emotional support, reinforce positive aspects of the case and highlight opportunities for improvement.

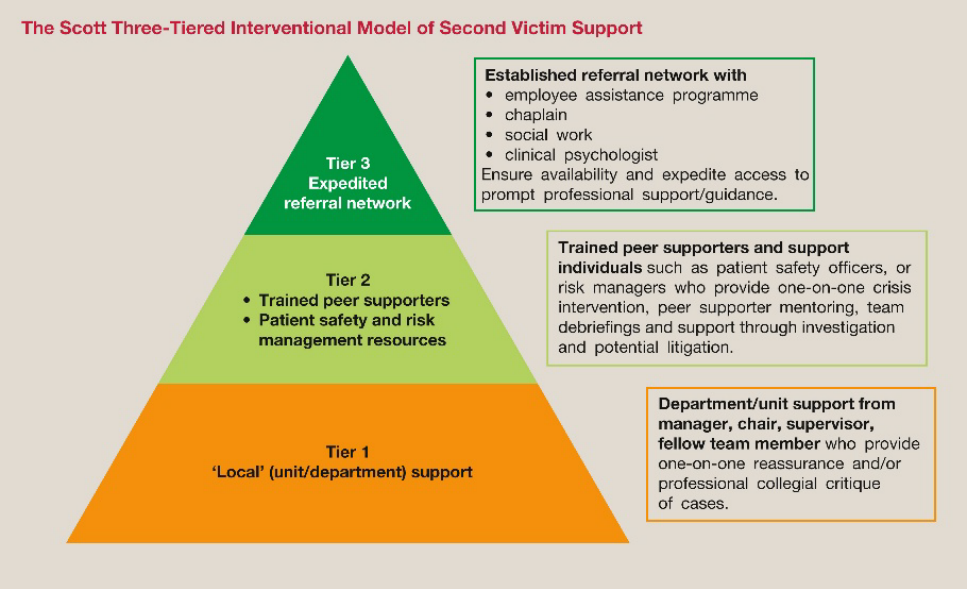
The subsequent “cold debrief” is generally completed 24-72 hours post procedure-related death, once the perioperative team has had an opportunity to process the event emotionally (32). This debrief is a more comprehensive discussion, geared towards the identification of anaesthesia-, surgical- and patient factors which may have contributed to the case. Additionally, the ongoing psychological wellbeing of the perioperative team is assessed during this debrief, aiming to identify members of the team at risk of the second victim phenomenon.

Ideally, a senior experienced clinician, not emotionally involved in the case or a trained psychologist trained should facilitate the debriefing. Where this is not possible, the senior clinician should ensure the initial debrief occurs, with the subsequent debrief facilitated by an independent individual. Literature recommends that debriefings should be a multidisciplinary team approach, allowing for shared learning, strengthening interprofessional communication and reducing the potential for blame-orientated discussions.

Scotts’ three-tiered interventional model for second victim phenomenon is a practical solution that may be applied to the South African setting. The initial debrief forms part of tier one, a multidisciplinary structured debriefing geared at minimising the acute physiological response (33).

Tier two encompasses the subsequent debrief, which is a more detailed discussion of the case. This debrief further allows the opportunity to identify members of the team who are at risk of developing the second victim phenomenon.

Tier three highlights that professional psychological help should be made available to individual members of the perioperative team, especially those displaying features of suicidal ideation, substance use, severe anxiety or symptoms of PTSD as well as inability to return to theatre. Although structured debriefings provide an opportunity for immediate emotional processing, they should not replace access to formal psychological support where required.



Scott's three-tiered interventional model for second victim support. Adapted from Scott et al. (2010)

Post event, Kolbe et al described the TALK framework in 2024 as a practical approach to assist clinicians with conducting self- or team-debriefings (32). Designed to address the time challenges and inconsistent debriefing practices, the framework provides a concise method for facilitating reflection, promoting team cohesion and enhancing learning.
The TALK framework encompasses four domains: Target, Analysis, Learning and Key actions and can typically be completed within 15-20 minutes.

The **Target phase** establishes the focus of the discussion. Common issues which may be highlighted during this phase include inadequate preparation and communication failures.

The **Analysis phase** encourages reflective discussion, with the aim to identify the factors that contributed to the outcome, what went well and what could have been improved.

The **Learning phase** highlights key learning points from the event with the aim of reducing similar events occurring in the future.

The **Key actions** phase translates the learning phase into specific action. Examples include addressing equipment issues, revising institutional protocols, allocation of responsibilities and scheduling formal morbidity and mortality meetings.

Following debriefing, ongoing support should be a continuum of care. Beyond individual interventions, healthcare institutions should foster an organisational culture that prioritises clinician wellbeing post adverse event. The implementation of structured peer support programmes, clear institutional policies and accessible psychological services may improve recovery of the perioperative team post adverse event while simultaneously strengthening patient safety.
Supporting healthcare professionals during this time represents an essential part of delivering safe and sustainable perioperative care.

Simulation-based training represents an additional strategy for preparing clinicians to cope with both the technical and non-technical challenges post intraoperative death. Although simulation-based training cannot eliminate the emotional impact of these events, repeated exposure to high-fidelity scenarios improves technical skills as well as problem-solving and communication skills. Familiarity with structured crisis management, leadership roles and post-event debriefings may reduce uncertainty during real events and improve confidence when managing the acute event and the immediate aftermath. Incorporating simulation-based training into departmental education allows an opportunity to strengthen clinical performance as well as normalise the discussion surrounding the emotional consequences of catastrophic perioperative events

Overall, simulation-based training is increasingly recognised not only as a patient safety intervention but also as a strategy to enhance and instil psychological resilience, reduce team distress and support recovery following unfortunate intraoperative events.

The third victim phenomenon

Originally, the third victim phenomenon described the healthcare institution or organisation. More recent literature has broadened this definition to include subsequent patients who may be indirectly affected by the psychological distress or impaired performance of healthcare professionals following a critical event.

Following a procedure-related death, the emotional burden experienced by the perioperative team may unintentionally affect the management of subsequent patients. Persistent anxiety, diminished confidence and the fear of repeating a similar event may alter clinical decision-making, communication and overall performance. Clinicians may become hesitant in their management, avoid higher-risk procedures or practice defensive medicine in an attempt to avoid the perceived risks of future adverse outcomes. While these adaptations often arise from an inherent desire to improve patient safety, they may inadvertently influence clinical efficiency.

The psychological effects of cognitive overload, reduced confidence, anxiety, fatigue and emotional exhaustion as well as impaired concentration may influence further decision-making and clinical performance. Healthcare professionals who receive appropriate emotional support are more likely to regain confidence, maintain clinical performance and continue to provide safe care.

CONCLUSION

Procedure-related death remains an event with significant psychological and physical effects on the perioperative team. In addition, procedure-related death encompasses profound clinical, medicolegal and psychological implications that extend beyond the patient.

Members of the perioperative team frequently experience psychological stress, with some developing persistent symptoms consistent with the second victim phenomenon. When left unrecognised or unsupported, these effects subsequently influence future patients, through the third victim phenomenon.

Managing a procedure-related death requires more than clinical judgement. It encompasses communication, meticulous documentation, multidisciplinary collaboration and a culture which promotes organisational learning and clinician support.

Structured debriefings, peer support, simulation-based training and access to psychological services are a few strategies that can be employed to assist with post-event management.

Although not every procedure-related death is preventable, each death provides an opportunity to improve systems of care and enhance future patient safety. Our objectives should aim to preserve the dignity of the first victim, heal the second victim and prevent the possibility of a third victim.

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