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Original Article

Death on the operating table: A 10-year retrospective, observational descriptive case series study at Victoria Mxenge tertiary referral hospital in KwaZulu-Natal.

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Abstract

Background
Death on the operating table is a rare occurrence and remains under-researched in South Africa. Multiple factors may contribute to this outcome. This study aimed to identify whether the Shock Index (SI) and ASOS (African Surgical Outcomes Study) risk calculator correlates with intraoperative mortality and explored additional contributing factors.

Methods
A ten-year retrospective case series (2013-2022) was conducted at Victoria Mxenge Hospital. This study included adult patients (Age>18years) who died on the operating table after anaesthetic induction for non-obstetric cases. Of 66920 theatre cases, 57 met our inclusion criteria. Descriptive statistics, including means, interquartile ranges (IQR), and percentages, were used for analysis.

Result
SI data were available for 35 patients; 63% had an SI >1, and 91% of these cases were emergencies. Among patients with ASA 5 status (n=18), 16 (89%) had an SI >1. Of those with ASA 4 (n=11), 6 (55%) also had elevated Shock Indices.
Emergency surgery accounted for 95% of all cases. Among patients with ASOS scores of 10–18 (n=8), 63% were emergencies; all patients with ASOS scores ≥19 (n=49) were emergencies. ASA 4 and 5 accounted for 53% and 37% of all deaths, respectively. Of the six cases classified as ASA 2 or 3, five had ASOS scores of 10–18, and one had a score ≥19.
Hypovolemic shock was the most likely cause of death in 65% of cases, followed by septic shock (19%) and obstructive shock due to pulmonary embolism (9%).

Conclusion
The SI and ASOS risk calculators are useful tools; identifying high-risk surgical patients and guiding escalation of care. Elevated scores correlate with poorer outcomes.

Recommendation
The use of the Shock Index and ASOS risk calculator may facilitate earlier intervention and resource mobilisation, potentially reducing intraoperative mortality.

Keywords: *Shock Index, Intraoperative mortality, ASOS risk calculator*
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Introduction

Intraoperative mortality is a rare event influenced by multiple factors, including the type of surgery performed, anaesthesia administered, and the patient's clinical condition, particularly those with an American Society of Anaesthesiologists Physical Status (ASA PS) >3 (1). Anticipation of those patients at greatest risk of mortality

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may assist in timely referral, resource allocation, mitigating strategies, and appropriate patient counselling. Simple risk strategy tools such as the Shock Index (SI) and the African Surgical Outcomes Study (ASOS) risk calculator may be useful in predicting perioperative mortality (2, 3). The Shock index, calculated as heart rate divided by systolic blood pressure, is a more reliable indicator of haemodynamic instability than using heart rate or blood pressure alone (2, 4). An elevated SI is a predictor of mortality in both the surgical and medical populations (4). However, studies have shown low sensitivity and higher specificity, indicating that SI might be more useful to identify patients with a low risk of mortality (5).
The ASOS Risk Calculator was devised using a multivariable logistic regression model for the outcomes of in-hospital mortality and severe postoperative complications. Preoperative risk factors included in the model are age, sex, smoking status, ASA physical status, preoperative chronic comorbid conditions, indication for surgery, urgency, severity, and type of surgery (3).
While 30-day in-hospital mortality and 24-hour mortality have been well described in South Africa and Africa (6, 7), the causes of on-table deaths are less well described. Two older South African studies by Harrison in 1974 and 1990 described anaesthesia-related causes (such as failure to intubate or ventilate or drug related) and surgically related haemorrhage (secondary to stab or gunshot wounds) as the main causes of on-table death (8, 9) There was an overall drop in anaesthetic-related deaths over ten years compared to 10 years prior, due to improvement in monitoring, training and supervision. (9) However, Harrison refers to a group of patients who died on the table as "inevitable deaths" related predominantly to massive haemorrhage or multiple injuries.
This study aimed to describe on-table deaths at a tertiary referral hospital in a contemporary population of South African patients. The primary objective was to characterise this patient cohort using SI and ASOS risk scores to identify likely causes and contributing factors. We selected the ASOS risk calculator due to its African origin, strong calibration, and relevance to our patient population. (3)

Methods

Study design

The study conducted was a retrospective case series study at Victoria Mxenge Hospital (VMH), formerly King Edward VIII Hospital, over 10 years from 1 January 2013 to 31 December 2022. Due to the rarity of the event, this study design was the most compatible.

Study setting

Victoria Mxenge Hospital (VMH) is a tertiary referral centre that manages a high volume of trauma and sepsis cases from multiple feeder hospitals. The ICU caters to a significant proportion of high-risk surgical patients who frequently require emergency surgical intervention.

Bias

To avoid selection bias, the study followed strict inclusion and exclusion criteria from an existing theatre database. The results were moderated by the study's supervisors.

Statistical planning

This study anticipated a heterogeneous group of patients with potentially low numbers due to the rarity of intraoperative deaths. No a priori sample size calculation was feasible.

Sampling strategy

This study used convenience sampling to include all patients who died on the operating table after an anaesthetic induction, as recorded in the operating theatre register for the specified 10-year period.

Sample size

Due to death on the table being a rare event occurring approximately every 1-2 months. Based on departmental records, the study expected between 60 to 100 cases. Ultimately, 57 eligible cases were included in the final analysis.

Inclusion/exclusion criteria

All adult patients (>18 years) who were demised on the operating table after receiving an anaesthetic were included. Patients who were declared dead on arrival to theatre, undergoing cardiopulmonary resuscitation (CPR) before anaesthetic induction, or younger than 18 years were excluded. The paediatric cases were excluded from the study due to low numbers and the distinct physiological and perioperative considerations.

Study definitions and tools

- Shock index (SI): Defined as the heart rate divided by systolic blood pressure (2).
- The ASOS risk calculator: Applied based on variables described in Table 1 to predict risk of

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severe complications and in-hospital mortality. (3)

Ethical consideration

Ethical approval was obtained from the University of KwaZulu-Natal Biomedical Research Ethics Committee (Protocol reference number BREC/00005922/2023) on 26/09/2023, and further gatekeeper approvals were obtained from the site (VMH Ref: KE 2/7/31; 08/2023) and National Health Research Directory (NHRD approval NHRD Ref: KZ_202308_015)

Table 1. ASOS risk calculator

Feature	Category	Score
Age (yr)	18-29	0
	30-69	+1
	≥ 70	+3
ASA physical status	ASA 1	0
	ASA 2	+2
	ASA 3	+5
	ASA 4 and more	+8
Surgery timing	Elective surgery	0
	Urgent surgery	+3
	Emergent surgery	+4
Surgery severity	Minor	0
	Intermediate	+2
	Major	+4
Indication for surgery	Non-communicable disease	0
	Caesarean section	-2
	Trauma	+1
	Infection	+2
Surgery type	Gynaecology/obstetrics	-1
	Plastics and breast	+1
	Urology	+2
	Ear, nose, and throat, gastrointestinal, hepato-biliary, cardio-thoracic, vascular	+3
	Neurosurgery	+4
	All other types of surgery	0
High-risk patient	**Score ≥ 10**	
Score	**Severe complications [%, 95% confidence interval (CI)]**	
≤ 3	1.2 (0.70 – 1.69)	
4 – 6	1.39 (0.96 – 1.81)	
7 – 9	4.11 (3.25 – 4.97)	
10 – 12	8.25 (6.58 – 9.91)	
13 – 15	17.87 (14.68 – 21.06)	
16 – 18	35.02 (28.98 – 41.08)	
≥ 19	83.08 (76.34 – 89.81)	

ASA= American Society of Anaesthesia

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Data collection and analysis

The names and hospital numbers were extracted from an existing departmental register, which records all deaths on the operating table. Data from the electronic health records and patient charts were retrieved for the ten-year study period and collected onto a data collection sheet. Data was anonymised and entered into a password-protected Excel spreadsheet and analysed using Statistical Package for the Social Sciences 28.0 (IBM® SPSS®).

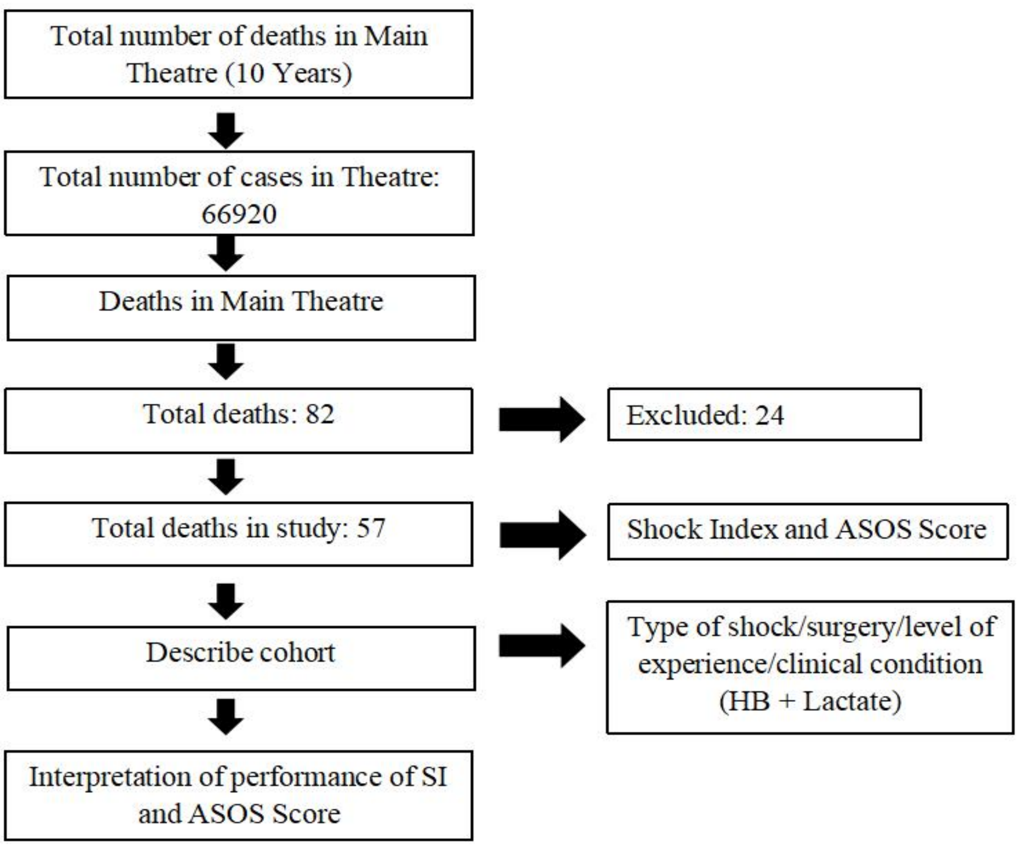
Data on patient characteristics, including gender, age, American Society of Anaesthesiologists Physical Status (ASA PS), urgency of surgery (elective or emergency), surgery type, type of anaesthesia, time of surgery, primary indication for surgery (trauma, sepsis, non-communicable), and presence of comorbidities, were recorded. Likely causes of death and contributory factors, including the type of anaesthesia, were recorded. SI and ASOS scores were calculated for each patient using available clinical data.

Comparisons between normally distributed data were performed using Student's T-test, and for data not normally distributed, the Wilcoxon Mann-Whitney test. Categorical data were analysed using the Chi-squared test or Fisher's exact test as applicable. For all analyses, a p-value of <0.05 was considered significant.

Results

Of the 66,920 theatre cases performed during the study period, there were 82 intraoperative deaths. 24 cases due to death on arrival, ongoing CPR before induction, or age <18 years were excluded. The final cohort included 57 patients (Figure 1), yielding an overall intraoperative mortality of 0.09%. Annual mortality ranged from 2 to 8 cases, with the most deaths in 2020 (n=8) and the least number of deaths (n=2) in 2022 (Table 2).

Figure 1 – Recruitment and study flow Diagram



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Description of cohort

The median patient age was 35 years (IQR 20). Most (62.5%) were aged 30 - 69 years, and only 7% were ≥70 years. Male patients predominated (42/57; 73.7%). Most patients presented for emergency surgery (94.7%; p>0.001) and had a higher ASA PS with almost 90% of ASA PS ≥ 4 (89.4%; p<0.001). No ASA PS 1 cases were identified (Table 2).

Table 2. Description of Cohort

Year	Total	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Theatre cases											
Total N (%)	**66920 (100.0)**	7362 (11.0)	6928 (10.4)	6447 (9.6)	7516 (11.2)	6199 (9.3)	5217 (7.8)	7413 (11.1)	6294 (9.4)	6434 (9.6)	7110 (10.6)
Died on the operating table. N (%) of cases	**57 (0.09)**	7 (0.09)	6 (0.09)	4 (0.06)	6 (0.08)	7 (0.11)	5 (0.09)	5 (0.07)	8 (0.13)	7 (0.10)	2 (0.03)
Age (died on the operating table)											
Median (IQR)	**35.0 (20)**	34.5 (25)	32.5 (31)	36.5 (35)	30.0 (23)	35 (44)	28.0 (4)	43. 0 (25)	45.0 (26)	37 (26)	27.5 (n/a)
Age groups (years) N =56; n (%)											
18-29	**17 (30.5)**	2 (11.8)	2 (11.8)	1 (5.9)	3 (17.6)	2 (11.8)	3 (17.6)	1 (5.9)	1 (5.9)	0 (0.0)	2 (11.8)
30-69	**35 (62.5)**	4 (11.4)	4 (11.4)	2 (5.7)	3 (8.6)	4 (11.4)	2 (5.7)	4 (11.4)	6 (17.1)	6 (17.1)	0 (0.0)
≥70	**4 (7.0)**	0 (0.0)	0 (0.0)	1 (25.0)	0 (0.0)	1 (14.3)	0 (0.0)	0 (0.0)	1 (12.5)	1 (14.3)	0 (0.0)
Gender N (%)											
Female	**15 (26.3)**	2 (28.6)	1 (16.7)	2 (50.0)	3 (50.0)	3 (42.9)	1 (20.0)	2 (40.0)	0 (0.0)	1 (14.3)	0 (0.0)
Male	**42 (73.7)**	5 (71.4)	5 (83.3)	2 (50.0)	3 (50.0)	4 (57.1)	4 (80.0)	3 (60.0)	8 (100.0)	6 (85.7)	2 (100.0)
Urgency of surgery N (%)											
Elective	**3 (5.3)**	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	1 (14.3)	0 (0.0)	0 (0.0)	0 (0.0)	2 (28.6)	0 (0.0)
Emergency	**54 (94.7)**	7 (100.0)	6 (100.0)	4 (100.0)	6 (100.0)	6 (100.0)	5 (100.0)	5 (100.0)	8 (100.0)	5 (71.4)	2 (100)
American Society of Anesthesiologists Physical Status N (%)											
2	**2 (3.5)**	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	1 (12.5)	1 (14.3)	0 (0.0)	0 (0.0)
3	**4 (7.0)**	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	2 (25.0)	2 (28.6)	0 (0.0)	0 (0.0)
4	**30 (52.6)**	7 (100.0)	5 (83.3)	3 (75.0)	2 (33.3)	5 (71.4)	2 (40.0)	2 (40.0)	2 (25.0)	2 (28.6)	0 (0.0)
5	**21 (36.8)**	0 (0.0)	1 (16.7)	1 (25.0)	4 (66.7)	2 (28.6)	3 (60.0)	3 (60.0)	3 (37.5)	2 (28.6)	2 (100.0)

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Surgical and clinical characteristics

Trauma was the primary indication in 57% of cases, followed by non-communicable disease (22.8%) and sepsis (19.2%) (Table 3). Most patients underwent major surgery (93%; p=0.004). General surgery had the most patients (91.2%). Of these patients, 31.5 % patients underwent a thoracotomy following trauma, 14.0% had upper gastrointestinal (UGI) surgery for bleeding, and 33.3% of patients had a laparotomy for various indications. Patients were commonly transferred from high care (47.4%) or from casualty to theatre in 36.8% of cases. An equal proportion of cases were done during the day versus after hours (51 % vs 49% respectively).

Table 3. Surgical data and patient comorbidities, and blood results

Parameter	Number (%)
Patients	57 (100)
Surgical variables	
Primary indication for surgery	
Non-communicable	13 (22.8)
Sepsis	11 (19.2)
Trauma	34 (57.8)
Primary discipline	
General surgery	52 (91.2)
Gynaecology	2 (3.5)
Orthopaedic	2 (3.5)
Multiple disciplines	1 (1.8)
Severity of surgery	
Intermediate	4 (7.0)
Major	53 (93.0)
Patient location before surgery	
Casualty	21 (36.8)
High Care	27 (47.4)
ICU	1 (1.8)
Ward	8 (14.0)
Timing of surgery	
Daytime (07h00 – 17h00)	29 (50.9)
Afterhours (17h01 – 06h59)	28 (49.1)
Patient blood results	
Preoperative comorbidity (n=54)	
No	39 (72.2)
Yes	15 (27.8)
Starting haemoglobin (g/dL) (n=46)	
≤ 3	5 (10.9)
3.1 – 7	8 (17.4)
7.1 – 10	20 (43.5)
10.1 – 13	12 (26.1)
>13	1 (2.2)
Starting lactate (mmol/L) (n=14)	
0 – 2	1 (7.1)
2.1– 5	5 (35.7)
5.1 - 10	2 (14.3)

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>10.1	6 (42.8)
Anaesthesia	
Mode of Anaesthesia	
General Anaesthesia	11 (19.0)
General Anaesthesia with invasive monitoring	45 (77.6)
Regional	2 (3.4)
Inotropes commencement (n=56)	
Preoperative/arrived on an inotrope	21 (37.5)
Induction	4 (7.1)
Intraoperative	31 (55.4)

Laboratory and preoperative data

Haemoglobin was <10g/dL in 71% of patients, and <7g/dL in 28.3%. 14 patients that had lactate data, 93% were elevated, and 42.8% had lactate levels >10.1mmol/L. (Table 3).
Documented preoperative comorbidities were present in 27.8% (n=15), including TB, diabetes, renal failure, and malignancy.

Anaesthetic and inotropic support

Most patients (95%) received general anaesthesia, with 77.6% requiring invasive monitoring. Two received regional anaesthesia. Inotropic support was initiated preoperatively in 37.5%, during induction in 7.1% and intraoperatively in 55.4%.

Personnel

The most senior surgeon present was a consultant in 70% of cases, followed by a registrar (24%) or senior medical officer (SMO) (3%). Anaesthetic care was led by a specialist in 54% of cases, a registrar in 32%, and a senior medical officer in 14% (To note the anaesthetic SMOs had all obtained specialist exams but were awaiting specialist posts or registration). All daytime cases had consultant anaesthetic cover. The anaesthetic personnel present in the 57 deaths comprised 35% consultants and registrars who worked together, 18% registrars alone, 14% consultants and senior medical officers working together, and other anaesthetist personnel.

Risk scoring

Table 4 displays the calculated ASOS Risk score and SI for the recruited patients. An ASOS risk score was calculated for all cases, and none had an ASOS risk score ≤ 13. 86% cases had an ASOS risk score ≥19, which is associated with a greater than 83% chance of major complications, (3) and the remainder of cases (14%) were also in higher risk groups (ASOS Risk scores 13 to 18) with a predicted complication rate of 8 to 35%. (3)
The SI calculations for 35 (61%) patients showed that 62.8% had a shock index of ≥1.1; 45% patients with moderate shock, and 17.1% patients with severe shock.

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Table 4. African Surgical outcome study risk score and shock index scores

ASOS RISK SCORES			
Parameter	**All Cases (n=57)**	**ASOS Risk Score**	
		13-18	**≥ 19**
Died on table N (%)	57 (100.0)	8 (14.0%)	49 (86.0)
Urgency of surgery n (%)			
Elective	3 (5.3)	3 (37.5)	0 (0.0)
Emergency	54 (94.7)	5 (62.5)	49 (100.0)
ASA PS			
2	2 (3.5)	2 (25.0)	0 (0.0)
3	4 (7.5)	3 (37.5)	1 (2.0)
4	30 (52.6)	3 (37.5)	27 (55.1)
5	21 (36.8)	0 (0.0)	21 (42.9)
Likely mechanism of death (n=56)			
Hypoxia	2 (3.6)	2 (25.0)	0 (0.0)
Bone cement implantation syndrome	1 (1.8)	1 (12.5)	0 (0.0)
Hypovolemic shock	36 (64.3)	0 (0.0)	36 (76.6)
Obstructive shock (PE)	5 (8.9)	3 (37.5)	2 (4.3)
Septic shock	11 (19.6)	2 (25.0)	9 (19.1)
Other (metastases)	1 (1.8)	0 (0.0)	0 (0.0)

SHOCK INDEX					
	All Cases (n=35)	**Shock Index**			
		0 – 0.6 (normal)	**0.61 – 1.0 (mild shock)**	**1.1 – 1.4 (moderate shock)**	**> 1.4 (severe shock)**
Died on table N (%)	35 (100.0)	2 (5.7%)	11 (31.4%)	16 (45.7%)	6 (17.1%)
Urgency of surgery n (%)					
Elective	3 (8.6)	1 (50.0%)	1 (9.1%)	0 (0.0%)	1 (16.7%)
Emergency	32 (91.4)	1 (50.0%)	10 (90.9%)	16 (100.0%)	5 (83.3%)
ASA PS					
2	2 (5.7)	1 (50.0%)	1 (9.1%)	0 (0.0%)	0 (0.0%)
3	4 (11.4)	0 (0.0%)	4 (36.4%)	0 (0.0%)	0 (0.0%)
4	11 (31.4)	0 (0.0%)	5 (45.5%)	4 (25.0%)	2 (33.3%)
5	18 (51.4)	1 (50.0%)	1 (9.1%)	12 (75.0%)	4 (66.7%)
Likely mechanism of death					
Hypoxia	2 (5.8)	0 (0.0)	0 (0.0)	0 (0.0)	1 (16.7)
Bone cement implantation syndrome	1 (2.9)	0 (0.0)	1 (9.1)	0 (0.0)	0 (0.0)
Hypovolemic shock	20 (57.1)	1 (50.0)	2 (18.2)	12 (75.0)	5 (83.3)
Obstructive shock (PE)	5 (14.3)	1 (50.0)	3 (27.3)	1 (6.2)	0 (0.0)
Septic shock	7 (20.0)	0 (0.0)	4 (36.4)	3 (18.8)	0 (0.0)

ASOS= African Surgical Outcome Study; ASA PS= American Society of Anesthesiologists Physical Status; PE= pulmonary embolism

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Cause of death

Hypovolemic shock was the most likely mechanism in 65% of cases, followed by septic shock (19%) and obstructive shock from pulmonary embolism (9%).
In the 15 patients with known time from admission to death, hypovolemia remained the most likely cause, particularly in those who died within 6 hours from admission (64%) and 6–12 hours from admission (83%). 75% of patients with moderate shock (SI 1.1–1.4) died from hypovolaemia. 83% of patients with severe shock (SI >1.4) died from hypovolaemia (Table 4).

Relationship between ASA score and Shock Index

Among the 35 patients with available Shock Index data:

- 51% were ASA 5, and 89% of these (16/18) had a Shock Index >1
- 31% were ASA 4, and 55% (6/11) had a Shock Index >1

Operative risk stratified by procedure type

In patients who underwent major abdominal surgery (n=30) 60% were ASA 4 and 30% were ASA 5. Among thoracic surgery cases (n=17), ASA 4 and 5 accounted for 41% and 59% respectively.

Discussion

This retrospective case series found that that intraoperative death occurred in 0.09% of surgeries performed over a 10-year study period at VMH confirming that it is a rare occurrence, with the majority of deaths associated with hypovolaemic shock (63%), highlighting acute blood loss being as being the primary contributor, followed by septic shock (19.6%), or obstructive shock due to pulmonary embolism (8.9%). Most deaths (94%) occurred during emergency surgery, and most patients were assessed as ASA 4 (89%), reinforcing the association between emergency procedures and elevated perioperative risk. High perioperative risk was reflected in the SI and ASOS risk calculator scores, with 45% classified as moderately shocked and 17% as severely shocked. Frequent findings were also severe anaemia (Hb <7g/dL) and markedly elevated lactate (>10mmol/L), confirming that these patients arrive at theatre with extremely deranged physiology. Inotropic support was initiated preoperatively in 37% of cases, and most patients were transferred directly from the casualty or high care indicating that more than a third of the patients were shocked, requiring inotropic support and fast-tracked to theatre.

The SI and ASOS risk calculators proved to be simple and practical tools for identifying high-risk patients. The findings support the use of these tools for early triage, escalation of care, and mobilisation of resources. An elevated SI was common in patients who died of hypovolaemic shock (17 of 20 cases), suggesting it may be useful in activating transfusion protocols or guiding early haemodynamic support. The ASOS risk calculator was equally effective: 86% of patients had a score of 19 or greater, indicating a >80% predicted risk of severe complications. These tools can empower junior and senior staff to make informed decisions early in the care pathway.

Demographically, young males were highly represented (73.7%) in the cohort (Table 2). Penetrating thoracic trauma accounted for a substantial number of deaths (31.5%) of emergency cases, consistent with VMH's high trauma burden. These cases require time-critical interventions and access to immediate transfusion, highlighting the importance of rapid response systems.
COVID-19 lockdowns temporarily reduced trauma-related surgical deaths. Likely due to reduced alcohol-related violence and road traffic (10).
Staff seniority was not a clear contributing factor, evidenced by all daytime surgeries having consultant anaesthetic cover, and most senior medical officers had completed fellowship exams. Thus, poor outcomes were more likely due to the severity of illness and delays in presentation or intervention, rather than inexperience. However, delays in theatre access due to staffing, infrastructure, or equipment constraints likely contributed to worse outcomes, though it could not be precisely quantified due to incomplete records.
A 2017 study at Charlotte Maxeke Academic Hospital reported a 29% mortality in patients undergoing damage control laparotomy. Delayed surgery was a key contributor, with an average time of 332 minutes from incident to operation (11). Similar delays likely occurred at VMH due to challenges in transport, theatre availability, and triage logistics. Many patients present late and are in extremis, skewing survival outcomes.
Infrastructure limitations, such as the absence of a dedicated trauma theatre at VMH, are likely to have worsened these delays. Further contributors are postulated to be the delay in receiving definitive or appropriate care whilst awaiting theatre, leading to under-resuscitation or simply deteriorating due to their underlying pathology. In some cases, a decision is made intraoperatively to palliate or cap treatment due to perceived futility or high likelihood of death. These ethical and logistical constraints are important

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contributors to intraoperative mortality and must be addressed in future system planning.

Generalizability

The observed correlation between elevated SI and ASOS Risk Calculator scores with intraoperative mortality supports the utility of these tools in identifying high-risk patients. While this study reflects the experience of a single tertiary centre, the findings may apply to similar resource-constrained, high-burden settings in sub-Saharan Africa. Patients presenting with elevated SI and ASOS scores should be prioritised for expedited surgical intervention and critical care resources.

Conclusion

There is a high proportion of urgent and emergent surgeries burdening the healthcare system, contributing significantly to intraoperative mortality. In this context, the use of the ASOS Risk Calculator and Shock Index provides an accessible and effective method to identify high-risk patients, enabling more timely interventions and appropriate resource allocation.
To improve outcomes, there is a need for greater investment in both primary healthcare and tertiary level services, particularly a high-volume centre like Victoria Mxenge Hospital (VMH), which faces a high burden of trauma and sepsis. Resource limitations, delays in access to theatre, and staffing constraints continue to impair early resuscitation and definitive care. The ASOS Risk calculator and the Shock Index are simple, validated tools that offer valuable guidance for enhanced surveillance and management of patients at high risk of intraoperative deterioration. Their consistent use may help decrease preventable deaths on the operating table.

Strengths and limitations

Limitations of this study include its small sample size, the rarity of the event being studied, and incomplete or poor documentation. These limitations hindered a deeper exploration of the timing and sequence of events leading to the intraoperative death. Nonetheless, the findings highlight key opportunities for improvement.

Strength is a robust mechanism present at VMH recording on-table or intraoperative deaths; thus, the true incidence of on-table deaths has likely been identified in this study for VMH.

Recommendations

The authors recommend broader implementation of the Shock Index and ASOS Risk Calculator throughout African surgical services, particularly given that the ASOS tool was developed and validated in African populations. These scoring systems offer accessible and reliable means of identifying high-risk surgical patients and should be integrated into routine perioperative assessment, especially in emergency settings.

Improved documentation practices are also strongly encouraged, including the systematic recording of physiological parameters and time intervals, which are critical for both clinical care and retrospective analysis.

The development of a secure, open-access hospital database should be prioritised. Reliance on physical records, which are often destroyed after a fixed retention period or lost due to mismanagement, and digital records controlled by third-party contractors, poses a significant barrier to research continuity and quality improvement.

List of abbreviations

SI: Shock Index
ASOS: African Surgical Outcomes Study
ASA: American Society of Anaesthesiology
VMH: Victoria Mxenge Hospital

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Author contributions

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Conflicts of interest

No conflicts of interest

Data availability

The data supporting this research can be provided by the authors upon request.

References

1. Arbous MS, Grobbee D, Van Kleef J, De Lange J, Spoormans H, Touw P, et al. Mortality associated with anaesthesia: a qualitative analysis to identify risk factors. Anaesthesia. 2001;56(12):1141-53. https://doi.org/10.1111/j.1365-2044.2001.02051.x PMid:11736769
2. Allgöwer M, Burri C. Shock-index. German medical monthly. 1968;13(1):14-9.
3. Kluyts H-L, Le Manach Y, Munlemvo D, Madzimbamuto F, Basenero A, Coulibaly Y, et al. The ASOS Surgical Risk Calculator: development and validation of a tool for identifying African surgical patients at risk of severe postoperative complications. British journal of anaesthesia. 2018;121(6):1357-63. https://doi.org/10.1016/j.bja.2018.08.005 PMid:30442264
4. Cannon CM, Braxton CC, Kling-Smith M, Mahnken JD, Carlton E, Moncure M. Utility of the shock index in predicting mortality in traumatically injured patients. Journal of Trauma and Acute Care Surgery. 2009;67(6):1426-30. https://doi.org/10.1097/TA.0b013e3181bbf728 PMid:20009697
5. Carsetti A, Antolini R, Casarotta E, Damiani E, Gasparri F, Marini B, et al. Shock index as predictor of massive transfusion and mortality in patients with trauma: a systematic review and meta-analysis. Critical Care. 2023;27(1):85. https://doi.org/10.1186/s13054-023-04386-w PMid:36872322 PMCid:PMC9985849
6. Biccard BM, Madiba TE, South African Surgical Outcomes Study I. The South African Surgical Outcomes Study: A 7-day prospective observational cohort study. S Afr Med J. 2015;105(6):465-75. https://doi.org/10.7196/SAMJ.9435 PMid:26716164
7. Biccard BM, Madiba TE, Kluyts HL, Munlemvo DM, Madzimbamuto FD, Basenero A, et al. Perioperative patient outcomes in the African Surgical Outcomes Study: a 7-day prospective observational cohort study. Lancet. 2018;391(10130):1589-98. https://doi.org/10.1016/S0140-6736(18)30001-1 PMid:29306587
8. Harrison GG. Death due to anaesthesia at Groote Schuur Hospital, Cape Town--1956-1987. Part I. Incidence. S Afr Med J. 1990;77(8):412-5.
9. <Harrison Death attributable to anaesthesia 1967-77 BJA.pdf>.
10. Tefera A, Lutge EE, Moodley N, Xaba XW, Hardcastle TC, Brysiewicz P, et al. Tracking the Trauma Epidemic in KwaZulu-Natal, South Africa. World J Surg. 2023;47(8):1940-5. https://doi.org/10.1007/s00268-023-07032-2 PMid:37160653 PMCid:PMC10310579
11. Kruger A, McPherson D, Nicol A, Edu S, Navsaria P. Damage control laparotomy outcomes in a major urban trauma centre. South African Journal of Surgery. 2022;60(2):84-90. https://doi.org/10.17159/2078-5151/SAJS3568 PMid:35851360

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