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Association for Peri-operative Practitioners in South Africa

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- APPSA is a non-profit organisation which exists for the benefit of its members. This is accomplished by way of congresses, local meetings and travel grants, with the express goal of raising the standard of peri-operative practice in South Africa

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REGULAR FEATURES

From The PRESIDENT

What a successful year 2023 has turned out to be! So many of us believed that it was going to be a very hard year - as the end of 2022 was not an easy one. COVID-19 had not really abated to the extent that we all had hoped it would, especially from an economic point of view, and this has had a dramatic effect on budgets, especially in the healthcare arena. But 2023 dawned with the vision of our *New Beginnings* Congress that took place in *eGoli*, the welcoming City of Gold, Johannesburg - and as the spirit of congress grew ever closer, so did the enthusiasm that 2023 would be a great year start to become our reality. Our *APPSA 2023 New Beginnings Congress* certainly delivered on its hope of a wonderful event. To those of you who were not fortunate enough to join us, we are aiming to have another successful congress towards the end of 2024, so begin saving and putting in plans to make attendance of the congress your goal for the coming year.

The point I am making, dear colleagues, is that in a goal is a wonderful thing to work towards. It lends purpose to our daily being - and gives us something to strive towards. Many of our APPSA Chapters have held successful APPSA Study Days during the year, offering further opportunities were colleagues could come together to share knowledge, engage in robust debate - and to learn from each other. There is nothing more stimulating for both the mind and the soul than being exposed to the latest in innovation and technology, while sharing experiences will old and new friends.

As the year winds down to a close, may I take this opportunity of thanking each of our dedicated APPSA Chapter Presidents; our Treasurer and Congress Organiser, Marianne Oosthuizen; the dedicated team of Carma Design - Editor and Business Manager, Madeleine Hicklin, and Graphic Design Director, Carole Hicklin - for always giving the best they can to ensuring that we are looked after as an organisation; and to our partners in the healthcare industry without whose support we would surely not survive. Your commitment to our APPSA Journal and our APPSA Study Days is invaluable and greatly appreciated.

But the greatest thanks goes to you, our dedicated members, for your continued hard work and commitment. Commitment not only to APPSA, but more importantly, to our patients and their families. We still live in an insecure and uncertain world, where international conflict, illness and hardships rob many of a chance to lead a normal life. To those of us who are fortunate enough to be able to take time off this December, please spare a thought for those who are working. To us all, please be safe, be responsible - and be loving and caring to those around you. Speak kindness from your mouth, and hold kindness in your heart, for you never know the impact your words can have on another's day.

Be blessed, and have a wonderful Festive season. Until we see each other again in 2024!
Marilyn de Meyer
APPSA President

From The EDITOR'S DESK

2023 is coming to an end and for many the thought of a holiday where one can do absolutely nothing looms large - and welcoming. Not all of us will be able to 'down tools' and put our feet up and chill, and for many APPSA members December can prove to be one of the busiest times of the year.

As members of this caring profession, it is often one of the most pressurised times of the year. There never seems to be a 'dull day' where theatre lists are less busy and where doctors go on holiday. Sure many do, but then we have the 'Festive Madness' where for many, the faster you can drive on our badly maintained roads becomes a challenge, rather than a thing to be avoided.

Burnout at this time of year is real. Know it's signs and appreciate how damaging it can be. And take time out if you have to. It's been a long and hard year - but we need to celebrate the wonders that we have achieved as well.

OUR BOKKE WON THE RUGBY WORLD CUP - FOR THE FOURTH TIME! This is something that no other country has ever been able to achieve. I also do not believe there is a sport than has been more unifying than this World Cup has been. South Africa NEEDED this World Cup WIN. We needed something to unite us again, after the devastation that COVID-19 did to unity in our country.

And while we were still celebrating that win, the performance of our Proteas Cricketing Heroes deserves a mention - and a little known fact: a South African won the Individual World Sheep Shearing Championship against stiff competition from Wales and Scotland.

There were 30 countries who took part in the competition, and Bonile Rabela from South Africa was crowned the Individual World Blade Shearing Champion. Bonile, together with his team mate Zwelamakhosi Mbuweni went on to take the Blade Team Championship trophy as well!

Sport has a way of uniting us and making us stronger as a country. Let's take that as our mission for 2024: remember the word IMPOSSIBLE really stands for I'M POSSIBLE and anything we set our minds and hearts to accomplish IS POSSIBLE.

As we head into the Festive season, allow me to wish each and every one of you blessings, God's eternal grace, and peace on earth. 2024 is going to be a challenging year - with much to fight for as we strive to regain economic momentum to propel South Africa forward.

Let your December be filled with love, light, peace and charity. And kindness to everyone.

Madeleine Hicklin

A MULTICENTRE, CROSS-SECTIONAL STUDY INVESTIGATING THE PREVALENCE OF HYPERTENSIVE DISEASE IN PATIENTS For Elective Surgery In The Western Cape Province, South Africa

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INTRODUCTION

Hypertension is common, affecting over one-billion people worldwide, and is responsible for over seven-million deaths annually[1]. The presence of hypertension increases the risk of myocardial infarction, heart failure, renal failure and cerebrovascular disease[2]. Importantly, in sub-Saharan Africa hypertensive disease not only affects the older population but is becoming increasingly prevalent in younger patient groups[3]. In South Africa (SA), >30% of the adult population have hypertension[4], and it remains the single most common cardiovascular risk factor and the predominant contributor to cardiovascular disease and mortality[5, 6].

Elevated blood pressure is the most common peri-operative co-morbidity encountered in non-cardiac surgical patients, with an overall prevalence of 20% to 25%[7], and it remains poorly controlled in low-income and middle-income countries[8, 9]. Furthermore, hypertension in the peri-operative setting may adversely affect patient outcome[10]. Hypertension therefore poses peri-operative challenges to anaesthesiologists, while simultaneously identifying patients at risk of long-term morbidity and mortality[11, 12]. Hypertension is most frequently diagnosed and treatment initiated in the primary healthcare setting. However, in a resource-limited environment, the peri-operative period gives clinicians a unique opportunity to identify patients with hypertensive disease, educate patients about the disease, and initiate appropriate therapy.

Furthermore, this period provides the opportunity to refer patients for further investigation or follow-up at peripheral healthcare centres for on-going management, thus aiding the decentralisation of chronic, long-term care. The efficient identification and diagnosis of hypertension in the peri-operative period could therefore be seen as an effective utilisation of planned surgical admission by simultaneously addressing a primary healthcare need, and this may serve as an efficient healthcare strategy in reducing long-term cardiovascular morbidity and mortality[13, 14]. Identification and/or optimisation of hypertensive management in the peri-operative period is an attractive healthcare intervention in a resource-limited environment such as SA, particularly when considering difficulties with primary healthcare access and treatment compliance.

OBJECTIVES

The primary objective of this study was to describe the prevalence and severity of hypertension in adult patients presenting for non-cardiac, non-obstetric elective surgery in all surgical disciplines at seven hospitals in the Western Cape Province, SA, in order to determine whether peri-operative screening can be used to supplement primary healthcare management of hypertension through developing effective strategies for the diagnosis and management of hypertension in patients presenting for elective surgery. The secondary objectives were to identify hypertension-associated target organ damage and risk factors associated with hypertension, and to assess compliance with prescribed hypertensive therapy.

METHODS

This was a multi-centre, prospective, observational study conducted at seven hospitals in the Western Cape: one tertiary institution, Groote Schuur Hospital; and six secondary institutions, George, Mitchell's Plain, New Somerset, Paarl, Victoria and Worcester hospitals. Ethics approval was obtained for all institutions (Ref. Nos HREC 661/2016 and 708/2016 and NHRD WC_2016RP55_876), and written informed consent was obtained prior to patient enrolment in the study. The trial was registered on the South African National Clinical Trial Register (NCT03157661). All adult, non-cardiac, non-obstetric patients admitted the day before elective surgery during the study period were eligible for inclusion. Exclusion criteria were patient refusal, day-case surgery (as no preceding day pre-operative assessment was possible) and patients not requiring an anaesthetic. Recruitment was from 07h00 on Monday to 19h00 on Friday of the week chosen for the study.

Data were collected by anaesthesia medical officers, registrars and consultants assigned to each of the surgical lists at the various institutions. Routine preoperative information was recorded on a specifically designed paper case report form and then captured onto the Research Electronic Data Capture (REDCap) web-based application. Compliance with medical therapy was assessed using the Morisky Medication Adherence Questionnaire[15, 16]. A positive response to two or more of the four questions was considered to indicate non-compliance with anti-hypertensive treatment.

Assessment of pre-operative hypertension was evaluated using the South African Hypertension Practice Guideline[2]. All blood pressure measurements were performed with an appropriately-sized non-invasive blood pressure cuff, using an automated oscillometric method of blood pressure measurement. If the patient was found to have a systolic blood pressure of ≥140mmHg or a diastolic blood pressure of ≥90mmHg, two further measurements were performed at least five minutes apart. The lowest of the three readings was taken as the pre-operative blood pressure. Patients who still had a systolic blood pressure of ≥140mmHg or a diastolic blood pressure of ≥90mmHg after these three blood pressure readings were considered to be hypertensive [4].

Categorical variables were described as proportions and compared using χ^2 tests and Fisher's exact tests, as appropriate. Continuous variables were described as means and standard deviations (SDs) or medians and interquartile ranges (IQRs) and compared using t-tests or one-way analysis of variance, as appropriate. Data were analysed using the Statistical Package for the Social Sciences (SPSS) version 24 (SPSS, USA).

RESULTS

The seven participating hospitals and numbers of patients screened and recruited with complete data are shown in **Table 1**. Patient recruitment and the prevalence and control of hypertension are shown in **Figure. 1**. Of the 397 patients who were screened, five refused to participate and four did not meet the inclusion criteria. Six patients were excluded from the analysis owing to incomplete datasets. Analysis was possible on full datasets of 382/388 consenting patients (98.5%). Of the patients, 160 (41.9%) had previously diagnosed hypertension, while newly-diagnosed hypertension was present in a further 38 (9.9%). The prevalence of hypertension, defined as having a previous diagnosis of hypertension or meeting the blood pressure criteria of >140mmHg/90mmHg, was therefore 198/382 (51.8%, 95% confidence interval (CI) 46.8 to 56.8) in the pre-operative assessment.

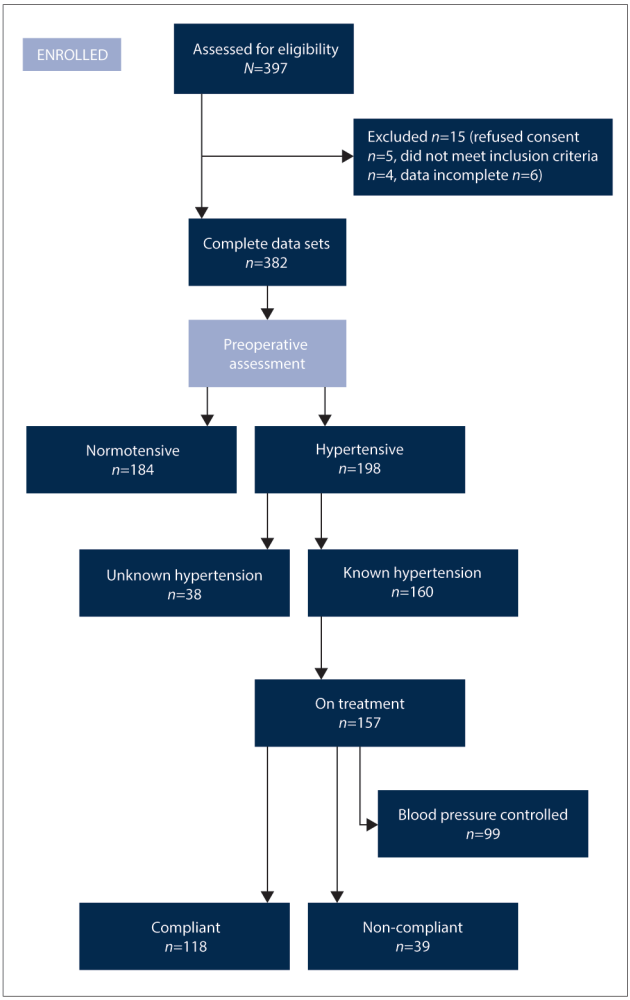

Fig. 1. PRISMA diagram depicting the study recruitment process.

Table 1. Participating hospitals

Institution	Level of care	Patients screened (*N*=397), *n*	Patients recruited with complete data (*N*=382), *n*
George Provincial Hospital	Secondary	49	49
Groote Schuur Hospital	Tertiary	187	179
Mitchell's Plain Hospital	Secondary	28	27
New Somerset Hospital	Secondary	45	42
Paarl Hospital	Secondary	46	46
Victoria Hospital	Secondary	12	10
Worcester Hospital	Secondary	30	29

Table 2. Characteristics of the study population

	Patients (*N*=382)	Normotensive (*N*=184)	Hypertensive (*N*=198)	*p*-value
Age (years), mean (SD)	50 (16.1)	41.2 (14.3)	58.5 (12.9)	<0.001
Gender male, *n* (%)	146 (38.2)	76 (41.3)	70 (35.4)	0.248
ASA status (*N*=379), *n* (%)				<0.001
I	127 (33.5)	107 (59.1)	20 (10.1)	
II	187 (49.3)	62 (34.3)	125 (63.1)	
III	59 (15.6)	11 (6.1)	48 (24.2)	
IV	6 (1.6)	1 (0.6)	5 (2.5)	
Risk factors for hypertension, *n* (%)				
BMI (*N*=358)	28.2 (7.2)	26.6 (6.8)	29.7 (7.3)	<0.001
Smoking	160 (41.9)	89 (48.4)	71 (35.9)	0.778
Dyslipidaemia	48 (12.6)	7 (3.8)	41 (20.7)	<0.001
NIDDM	19 (5.0)	5 (2.7)	14 (7.1)	0.060
IDDM	42 (11.0)	6 (3.3)	36 (18.2)	<0.001
Men >55 years	55 (14.4)	18 (9.8)	37 (18.7)	0.014
Women >65 years	46 (12.0)	7 (3.8)	39 (19.7)	<0.001
Target organ damage, *n* (%)				
Left ventricular hypertrophy	39 (10.2)	4 (2.2)	35 (17.7)	<0.001
Coronary artery disease	14 (3.7)	2 (1.1)	12 (6.1)	0.012
Heart failure	5 (1.3)	1 (0.5)	4 (2.0)	0.204
Chronic kidney disease	27 (10.4)	2 (2.0)	25 (15.7)	<0.001
CVA/TIA	6 (1.6)	1 (0.5)	5 (2.5)	0.120
Peripheral arterial disease	8 (2.1)	2 (1.1)	6 (3.0)	0.185
Retinopathy	8 (2.1)	0 (0.0)	8 (4.0)	0.008
Other comorbid disease				
COPD/asthma	36 (9.4)	13 (7.1)	23 (11.6)	0.161
HIV/AIDS	24 (6.3)	16 (8.7)	8 (4.0)	0.090

SD = standard deviation; ASA = American Society of Anesthesiologists; BMI = body mass index; NIDDM = non-insulin dependent diabetes mellitus; IDDM = insulin dependent diabetes mellitus; CVA = cerebrovascular accident; TIA = transient ischaemic attack; COPD = chronic obstructive pulmonary disease.

Table 3. Classification of the severity of hypertension* (*N*=198)

	Hypertensive, *n* (%)
Normotensive	99 (50.0)
Grade 1: mild (SBP 140 - 159 or DBP 90 - 99 mmHg)	66 (33.3)
Grade 2: moderate (SBP 160 - 179 mmHg or DBP 100 - 109 mmHg)	21 (10.6)
Grade 3: severe (SBP ≥180 mmHg or DBP ≥110 mmHg)	12 (6.1)

SBP = systolic blood pressure; DBP = diastolic blood pressure.
*Classification of hypertension as per the 2014 South African Hypertension Practice Guideline.[11]

The characteristics of the recruited patients are shown in **Table 2**. Hypertensive patients were older, carried more risk factors for hypertension and had more co-morbidities as reflected by the higher American Society of Anesthesiologists grading. Hypertensive patients had significantly more target organ damage, specifically coronary artery disease, heart failure, advanced retinopathy, cerebrovascular disease, chronic renal disease, peripheral arterial disease, diabetes and dyslipidaemia. The severity of hypertension is shown in **Table 3**. Of all the hypertensive patients, 99/198 (50.0%, 95% CI 43.0 to 57.0) were found to have a blood pressure >140mmHg/90mmHg. Despite the vast majority of known hypertensive patients (157/160, 98.1%) being on anti-hypertensive therapy pre-operatively, blood pressure control was inadequate in 61/160 (38.1%, 95% CI 31.2 - 46.3).

Table 4 lists the most common anti-hypertensive therapies in the study population. Of the patients who presented for surgery with a diagnosis of hypertension, 39/157 reported treatment non-compliance (24.8%, 95% CI 18.2 to 31.8) (**Table 5**). A third of patients (50/156) taking antihypertensive medication admitted to forgetting to take their medication. Patient factors were the most common cause of treatment non-compliance.

Table 4. Most common antihypertensive therapies used

Antihypertensive treatment	*n* (%)
Diuretic	124/160 (77.5)
ACE-I/ARB	97/160 (60.6)
Beta blocker	61/160 (38.1)
Calcium channel blocker	46/160 (28.8)
Alpha blocker	6/160 (3.8)
Other	4/160 (2.5)

ACE-I = angiotensin-converting enzyme inhibitor; ARB = angiotensin receptor blocker.

Table 5. Incidence of and reasons for non-compliance with hypertensive therapy*

	Hypertensive patients on treatment, *n*/total	%; 95% CI
Compliant	117/156	75.0; 68.2 - 81.2
Non-compliant	39/156	25.0; 18.2 - 31.8
Standardised questions to elicit non-compliance		
Do you ever forget to take your medicine?	50/156	32.1; 24.7 - 39.3
Are you careless at times about taking your medicine?	35/154	22.7; 16.1 - 29.3
When you feel better, do you sometimes stop taking your medicine?	20/155	12.9; 7.6 - 18.2
Sometimes if you feel worse when taking your medication, do you stop taking it?	20/155	12.9; 7.6 - 18.2
Reasons for non-compliance (*N*=39)		
Health system	3/39	7.9; 0.0 - 16.5
Condition	8/39	21.1; 8.1 - 34.0
Patient	22/39	57.9; 42.2 - 73.4
Therapy	6/39	15.8; 4.2 - 27.3
Socioeconomic	5/39	13.2; 2.4 - 23.9

*Compliance with medical therapy was assessed using the Morisky Medication Adherence Questionnaire.[15,16]

DISCUSSION

Principal findings

Five out of every ten patients presenting for elective surgery in the Western Cape are hypertensive. Of these, 20% are undiagnosed and 40% are inadequately controlled. This study suggests that the peri-operative period may be an important opportunity to identify undiagnosed hypertension as well as improve the management of known hypertensive patients in SA. Once a patient is diagnosed with hypertension, access to medication in the community is good, but patient compliance with therapy becomes the more important determinant of subsequent hypertensive control. These data suggest that the peri-operative period could supplement primary healthcare services, through peri-operative screening, treatment initiation and referral. This needs to be coupled with an appropriate educational programme to ensure subsequent patient compliance with therapy on discharge. This dual-pronged approach to hypertension in surgical patients has the potential for a large public health benefit in SA.

IMPLICATIONS OF THE STUDY

It is estimated that 3.5-billion adults, or 60% of the world's population, is hypertensive[17]. In the African region, the prevalence of hypertension is estimated at 46% for adults aged ≥25 years.

The number of adults with hypertension is predicted to increase by ~60% by 2025, with a disproportionately high prevalence in developing countries[18]. In sub-Saharan Africa, despite the high burden imposed by communicable diseases, hypertension has emerged as a significant medical and public health problem and is regarded as one of the continent's greatest health challenges after HIV/AIDS[1]. It is estimated that if the 10-million to 20-million people who are believed to have hypertension in sub-Saharan Africa were treated effectively, about 250 000 deaths could be prevented annually[19]. According to the South African Hypertension Practice Guideline[2], 30.4% of the SA adult population has hypertension. This chronic disease is regarded as the single most prevalent cardiovascular risk factor and as a predominant contributor to cardiovascular disease-related morbidity and mortality[1]. In the 2015, SA mortality statistics, cerebrovascular disease ranked third, accounting for 5.0% of national natural causes of death, heart disease ranked fifth, accounting for 4.8%, and hypertension-related diseases ranked seventh, accounting for 4.2%[20].

Although hypertension is not directly linked to poor peri-operative outcomes, it is associated with long-term cardiovascular morbidity and mortality[2]. Treating hypertension improves long-term outcome[13]. This study suggests that peri-operative evaluation of blood pressure has the potential to:

(i) newly diagnose hypertension in 10% of all adult patients presenting for elective surgery;

(ii) provide surveillance for the adequacy of management of hypertension in the community; and

(iii) play an active role in the management of hypertension using pre-defined interventions[21] to improve both understanding and control of hypertension in as many as 50% of patients who present for all elective surgery.

The global volume of surgery, based on population statistics from 2005 to 2013, estimates an average imputed surgical rate of 5 227 per 100 000 population[22]. With a conservative estimate of 20 000 elective, adult non-cardiac, non-obstetric surgical procedures per annum in the Western Cape (B M Biccard, unpublished data, June 2018), as many as 2 000 (10%) new cases of hypertension could be diagnosed peri-operatively. Furthermore, a total of 8 000 (40%) of these patients would require further therapy optimisation in the peri-operative period. The population attributable risk associated with hypertension for stroke in South Africa is ~50%, while that for ischaemic heart disease is 40%[21]. Optimisation of hypertension could therefore prevent 125 strokes and 244 coronary events in this population annually, based on the prevalence of stroke and coronary heart disease in our population (2.5% and 6.1%, respectively).

IMPLICATIONS FOR SOUTH AFRICA

When considering national statistics, with an average imputed surgical rate of 5 227 per 100 000 population[23] and estimating that 50% of all surgeries are for adults aged ≥18 years of age and older (2 614 per 100 000 population), as many as 261 (10%) per 100 000 new cases of hypertension could be diagnosed peri-operatively annually, and the opportunity will exist to optimise hypertensive treatment in up to 1 046 (40%) per 100 000 patients annually. This approach to peri-operative hypertension therefore has the potential to prevent 16 strokes and 32 coronary events per 100 000 of the adult population in SA, annually.

STUDY STRENGTHS AND LIMITATIONS

This was a multi-centre, prospective observational study of hypertension in the Western Cape. The fact that we were able to follow the SA hypertension guidelines in confirming the diagnosis of hypertension on the day prior to surgery in this study increases our confidence that our results reflect the true burden of hypertensive disease in pre-operative surgical patients. We expect the data to be broadly generalisable across the Western Cape, and possibly across SA for patients from similar social circumstances. It is possible that the prevalence of hypertension may be overestimated in this cohort. Although the evaluation of hypertension was made in elective surgical patients on the day preceding surgery, it is possible that some of the patients may have been anxious, and hence spuriously fulfilled the diagnostic criteria. Furthermore, this study excluded all emergency cases, so it was not possible to obtain a true prevalence of hypertension in patients presenting for all surgery. However, we would expect the prevalence of hypertension to be higher in patients presenting for emergency surgery, as they are more likely than the elective population to have co-morbid disease. Finally, the information related to compliance with medical therapy should be viewed with some caution, as it is based on a relatively small sample size.

CONCLUSIONS

We believe that in South Africa there is a significant potential for public health interventions in the peri-operative period. In particular, we have demonstrated a unique diagnostic and therapeutic opportunity in patients with hypertension. Further research is needed into other co-morbidities such as anaemia and diabetes, where similar potential benefits may apply.

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Author contributions:

This submission has 14 authors from a multi-centre, prospective, observational study of seven hospitals in the Western Cape, South Africa. We have itemised their contributions according to the International Committee of Medical Journal Editors criteria. KvdS: overall conception and design of the Hypertension and Surgery (HaS) study, acquisition of data at Groote Schuur Hospital, interpretation, drafting and critical revising of the work, final approval of the version to be published, agree to be accountable for all aspects, accuracy and integrity of the work; MC: overall conception and design of the HaS study, acquisition of data at Groote Schuur Hospital, interpretation, critical revising of the work, final approval of the version to be published, agree to be accountable for all aspects, accuracy and integrity of the work; MN: overall conception and design of the HaS study, analysis and interpretation, drafting and critical revising of the work, final approval of the version to be published, agree to be accountable for all aspects, accuracy and integrity of the work; FR: overall conception and design of the HaS study, acquisition of data at Mitchell's Plain Hospital, analysis and interpretation, critical revising of the work, agree to be accountable for all aspects, accuracy and integrity of the work; JD: acquisition of data at George Hospital, critical revising of the work, final approval of the version to be published, agree to be accountable for all aspects, accuracy and integrity of the work: JR: acquisition of data at Mitchell's Plain Hospital, critical revising of the work, final approval of the version to be published, agree to be accountable for all aspects, accuracy and integrity of the work; EC: acquisition of data at New Somerset Hospital, critical revising of the work, final approval of the vebe published, agree to be accountable for all aspects, accuracy and integrity of the work; TP: acquisition of data at Paarl Provincial Hospital, critical revising of the work, final approval of the version to be published, agree to be accountable for all aspects, accuracy and integrity of the work; GD: acquisition of data at Paarl Provincial Hospital, critical revising of the work, final approval of the version to be published, agree to be accountable for all aspects, accuracy and integrity of the work; JvdW: acquisition of data at Victoria Hospital, critical revising of the work, final approval of the version to be published, agree to be accountable for all aspects, accuracy and integrity of the work; CvdW: acquisition of data at Worcester Hospital, critical revising of the work, final approval of the version to be published, agree to be accountable for all aspects, accuracy and integrity of the work; MF: acquisition of data at Groote Schuur Hospital, critical revising of the work, final approval of the version to be published, agree to be accountable for all aspects, accuracy and integrity of the work; JS: overall conception and design of the HaS study, critical revising of the work, final approval of the version to be published, agree to be accountable for all aspects, accuracy and integrity of the work; BB: overall conception and design of the Has study, analysis of results, drafting and critical revising of the work, final approval of the version to be published, agree to be accountable for all aspects, accuracy and integrity of the work.

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RITUALS AND BEHAVIOURS IN THE OPERATING THEATRE - A Report

By Kate Woodhead, RGN, DMS

INTRODUCTION

Surgical Site Infection (SSI) reduction remains an area of priority in surgical practice, for surgical team members and peri-operative staff as part of the wider surgical team, as well as for infection control practitioners and microbiology teams in hospital. Considerable harm can be caused to patients, additional pain and suffering - often for months and longer stays in hospitals or re-admission - incurring additional costs for the trust. From every perspective, it is incumbent on the professionals to practice best evidence-based care to reduce as many SSIs to patients, as possible.

Many surgical teams rely on peri-operative 'practice' as it has been, which may be described as ritualistic, without necessarily reviewing the emerging evidence. This report of work undertaken jointly by a Healthcare Infection Society (HIS) and the European Society of Clinical Microbiology and Infectious Diseases (ESCMID) working party[1] identified that it had been 20 years since the last set of specific guidelines that it had produced, and sought to review and update any guidance for practice. As a peri-operative practitioner, I am privileged to have been involved in both iterations of the guidelines and have learned a great deal.

Since 2002, the methodology for reviewing evidence and reporting has become far more specific and scientific. The purpose therefore of the updated guidance is to make clear to clinical practitioners, which rituals and behaviours in operating theatres should be retained and which can be safely discontinued. Some aspects of routine practice may be regarded as benefitting professionalism and peri-operative discipline. The document also highlights areas for which no evidence was found, in order to promote areas for future research.

Each section comprises an introduction, a summary of evidence with levels and a summary of the working party's discussions together with the graded recommendations according to the available evidence. Good Practice Points have been made in places where there is little or no evidence, but where the combined expertise of the working party felt that statements needed to be made.

Three electronic databases (Medline, Embase, EMCare) were searched for relevant articles, published up until January 2022 and were restricted to articles in English. The guidelines included any controlled trials, cohort studies, interrupted time series studies as well as case-controlled studies, cross sectional studies and controlled before and after studies. Due to the paucity of

evidence, some simulation studies were also included. The strength of the evidence was assessed using the GRADE tables, using the ratings high, moderate, low and very low to construct the statements.

When writing the recommendations, a number of key points were assessed by the working party as relevant which are:

- Who should act on these recommendations?
- What are the potential harms and benefits of the intervention and any unintended consequences?
- What is the efficacy and the effectiveness of each intervention?
- Is it possible to stop another intervention because it has been superseded by the new recommendation?
- What is the potential effect on health inequalities?
- What is the cost-effectiveness of the intervention, including staff resources and other economic concerns?
- Can the recommended interventions be feasibly put into practice?
- Does the intervention have a negative impact on the environment?

The space available in this journal is insufficient to include every topic reviewed, but there is a full copy of the report published in the Journal of Hospital Infection. https://doi.org/10.1016/j.jhin.2023.06.009. Instead, topics have been selected which would be of particular interest to the readership of this Journal. Consideration was given to answering a number of key questions by reviewing the current evidence.

PRE-SURGICAL PREPARATION

Does bringing beds and associated linen from wards and other clinical areas into the Operating Theatre result in increased bacterial counts or increased infection post operatively?

Patients come by a variety of means to the Operating Department, including in wheelchairs and walking. No evidence was found in the existing literature on the effects of patients being transported in this manner, with consequences for the incidence of SSI. Some Operating Departments use a two-trolley system, with external transport and a subsequent patient transfer to a new trolley which stays within the theatre environment. There was weak evidence of no benefit which assessed the effect of a transfer system versus a one ward-theatre trolley[2]. As a result of reviewing small numbers of studies, a good practice point was made which stated that clean beds with clean linen can be brought into the operating department directly from clinical areas.

What is the clinical effectiveness of pre-operative showering/bathing before elective surgical procedures using a) non-disinfectant bath/shower or b) Disinfectant bath/shower?

In order to reduce the number of resident and transient flora found on the skin, elective patients are instructed to bathe or shower on the day prior to or on the day of surgery. No studies were found which assessed the effect of a non-disinfectant shower on the incidence of SSI. Previously published studies and guidelines were referenced to address the question of disinfectant showers prior to surgery. These reviews reported that a chlorhexidine shower or bath had no impact on SSI rates when compared to bar soap, placebo or when patients were not required

to bathe or shower[3, 4, 5]. However, it was reported by WHO guidelines and in a systematic review that use of chlorhexidine wipes pre-operatively (particularly for urgent or emergency patients) reduced SSI.

There were no recommendations, therefore, but a few good practice points:

- Encourage patients to shower or bathe prior to surgery for personal hygiene reasons. Do not delay operations for patients who are not able to shower or bathe pre-operatively, but consider using alternatives such as wipes.
- Include in pre-operative patient guidance not to shave their surgical area in the days before surgery.

Does the order in which patients are operated on, in other words, infected patients at the end of an operating list, reduce post operative infections?

There was only very weak evidence of no effect from a meta-analysis of patients undergoing arthroscopy immediately after an infected case, as compared to patients undergoing arthroscopy after a non-infected case. The analysis found no difference in the incidence of SSI[6, 7]. A further study, a case series study, reviewed acquiring an SSI from an infected patient. The study reported that of 35 patients who had become infected, there was one who was infected with the same micro-organism as the preceding infected case[8]. No studies were found on the effect of recovering an infected post-operative patient in theatre rather than recovery, on the incidence of SSI.

RECOMMENDATIONS*:*

Provided that the theatre is cleaned and disinfected to standard between patients and ventilation is running without interruption there is no need to place patients with suspected or confirmed contact transmissible multi-drug resistant bacterial infection at the end of the operating list.

Good Practice point. Allow patients with isolation/contact precautions to recover in theatre or in a designated area of the recovery room.

- Should surgical instruments be unpacked and exposed as close as possible to use?
- Should surgical instruments used in ultra-clean theatres be laid up under the canopy or in the prep room?
- Does setting up the instruments too early, increase the chance of opportunities for deposition of air contaminants?
- Is there any evidence for covering a laid-up trolley before it is used?

There was no specific link to SSI in the literature regarding covering instruments. The was one, low-quality study which reported weak evidence for procedures where instruments were covered and settle plates used to assess the contamination versus the control group where there was no covering. The study found lower mean numbers of bacteria on the covered instruments than the uncovered[9].

The next question asked whether instrument trolleys should be laid up inside the footprint of the UCV ventilation, which has a poor impact on theatre utilisation but may be safer for the patient. There was only weak evidence found in three, low-quality prospective cohort studies[10, 11, 12], and one, low-quality non-randomised controlled trial[13] which identified the effectiveness of placing

the instrument trolley under the UCV to reduce the instrument contamination. Each study reported that bacterial sedimentation onto the instruments was lower inside the canopy than outside it. The working party concluded that the instruments should be set up as close to surgery as possible and if relevant, underneath the UCV canopy. The same principles apply also to opening of prosthetics which should be undertaken immediately before they are needed.

THEATRE ATTIRE

Always a controversial topic and behaviour which is rarely policed is theatre attire. Most local guidelines describe not wearing false nails or nail varnish and few peri-operative staff break this rule.

Should theatre staff remove jewellery, false nails and nail polish before entering the operating theatre facilities?

Effect of jewellery, nail polish and artificial nails. Despite many studies reviewing the evidence for wearing or not wearing rings by the scrub staff and surgeons, the quality of the evidence overall was low and turned out to have little or no effect. However, outbreak studies did show that SSIs from jewellery, although rare, can sometimes occur. There were no studies which assessed nail polish or false nails on the incidence of SSI. There was weak evidence from one RCT, one cross over RCT and one prospective cohort which identified the bacterial counts on staff wearing nail polish.

One study[13] reviewed the bacterial counts on freshly applied nail varnish, chipped varnish or natural nails. It was reported that there was no significant difference in cfu counts before scrubbing. Chipped nails yielded higher counts (median 35cfu) than new nail varnish and natural nails (10 cfu each). The prospective cohort study[14] showed that those staff who regularly wore false nails versus those who did not had significantly higher bacterial counts even before scrubbing (mean 12.2 cfu) with a mean of 8.7cfu in the natural nails group. After scrubbing this became 11.4 cfu in the false nails group with a mean of 7.3 in the natural nails staff.

The working party had several long discussions about the research and what the outcomes should be for clinical practice. They concluded that the policy for all the scrubbed team should be to ban jewellery worn on fingers and anywhere below the elbow when they are in the operating rooms. If it is not possible to remove wedding bands for example, then appropriate rigorous hand hygiene should take place to ensure that area under and around the item is adequately cleaned. This indicates moving the ring upwards and forwards so that the skin is properly exposed to the scrub solution.

Should staff a) cover their hair and b) wear a facemask?

There were no studies identified to compare staff wearing or not wearing head gear on the incidence of SSI. None of the three simulations studies found, reported any significant outcomes.

A number of facemask wearing studies showed moderate evidence of the effectiveness of wearing a facemask during surgery which suggested there is no effect on SSIs. Two of the nine studies reported benefits of wearing masks. One study[15] identified three patients who had an MSSA strain which was traced back to the surgeon who wore a face mask over his mouth but under his nose. Additional evidence from one study[16] showed that the potential benefit from

wearing a mask in protecting surgeons from blood splashes. In the 93/384 operations studied (24.2%), blood was found on the surgeon's mask and in vascular surgery the value was 47% of masks which were contaminated and could have led to a blood borne viral disease.

The suggestion from the working party, therefore, is that masks have no effect on the incidence of SSI so staff can make a personal decision if they wish to protect themselves from blood splashes by wearing a mask. Local policy may suggest that theatre discipline needs all staff to comply with one practice or another. Headwear equally is likely to be a local policy issue, or to maintain discipline, it is not likely to have any effect on SSI incidence.

CONCLUSION

There are a great many other interesting elements of this Healthcare Infection Society and European Society of Clinical Microbiology and Infectious Diseases Report which cannot be related here due to lack of space. However, it is recommended that managers, peri-operative and surgical staff, surgeons and IPC practitioners read the whole report as it contains a fundamental update to the knowledge we have of evidence for some perioperative practices. It also points the way for areas of further research to enlighten us more.

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Talley
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Clinical evaluation of an active therapy support surface within a critical care unit

NHS
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Introduction

Pressure ulcers are recognised as an avoidable patient harm and represent a key quality indicator for all healthcare providers. The elimination of avoidable pressure ulcers remains a priority within the NHS. [1]

Preventing pressure related tissue injury is all about effectively offloading pressure from patients' tissues. In normal circumstances this is done by combining a suitable support surface with a patient specific repositioning schedule.

Critical care which includes high dependency units (HDU) and intensive care units (ICU) can be a particularly challenging environment in the prevention of avoidable pressure ulcers due to a combination of caring for very ill patients who are often too sick to be regularly re-positioned.

As part of a comprehensive care package, the use of an active therapy support surface is often essential to assist with the prevention of pressure related skin damage. International pressure ulcer prevention and treatment guidelines recommend the use of active therapy support surfaces *'for individuals at higher risk of pressure ulcer development when frequent manual repositioning is not possible'*. [2]

Therefore for critical care patients who cannot be regularly repositioned, the use of an active therapy support surface is an accepted intervention. The key issue for healthcare providers is to determine which active therapy mattress offers suitable levels of tissue offloading and meets the clinical requirements of their most dependent patients.

FIGURE 1.
The QUATTRO Acute active therapy support surface from Talley

Aims

The primary aim of this evaluation was to capture the clinical progress/skin status of patients nursed on the QUATTRO® Acute in the critical care setting, to ensure they all remained free from pressure related tissue injury. Secondary aims include reporting on the user acceptance of the QUATTRO Acute and to document wound progress for any patients with existing pressure ulcers.

Distributed in South Africa by PrionTex

Pressure Relieving Systems

Method

The evaluation took place on a 14-bedded critical care unit catering for level 2 (high dependency) and level 3 (intensive care) patients.

The Talley QUATTRO Acute active therapy support surface (see Figure 1) was evaluated on the unit and used in line with local Trust guidelines.

Patient demographics recorded included age, sex, relevant co-morbidities, pressure ulcer risk level, history of previous and existing pressure damage and nutritional status.

Patient progress was reported weekly and user acceptance of the support surface was determined by structured questionnaires using Likert scales upon completion of the evaluation.

Results

Five patients completed the evaluation on the QUATTRO Acute, 4 males and 1 female (one level 3 and four level 2 patients). Mean age was 78 years and length of stay on the mattress was up to 6 days. None of the patients had pre-existing pressure ulcers on admission to the evaluation.

Pressure ulcer risk was determined using the Purpose T pressure ulcer risk assessment tool. [3] All patients were assessed as being 'at risk' and placed onto the primary prevention pathway. Four hourly re-positioning regimes were undertaken for four out of the five patients, with one patient sitting out for 2 to 4 hours per day and able to reposition independently whilst on the mattress.

None of the patients developed any pressure related tissue damage during the evaluation.

Six staff provided feedback and reported that the QUATTRO Acute was reliable, easy to use, and effective in pressure redistribution and maintaining patients skin integrity.

Discussion

The QUATTRO Acute has been effective in the prevention of pressure related tissue damage for patients nursed within the critical care unit.

When dealing with such a vulnerable, high risk patient cohort their pressure ulcer risk is further compounded by their inability to reposition themselves independently and/or the fact that they have a limited number of positions they can be nursed in.

In this situation it is imperative that the support surfaces chosen by clinicians offer optimal pressure relief and redistribution and that the tissue offloading offered by these products is sufficient to safeguard patients by reducing the risk of pressure ulceration.

Not all alternating pressure air mattresses are the same, therefore evaluating products in the correct clinical setting allows clinicians to make an informed choice when prescribing support surfaces to their patients.

Conclusion

Critical care typically looks after the most clinically dependent patients in the acute care setting and providing safe, harm free care for this patient cohort can be a real challenge for clinical staff.

From a pressure ulcer prevention perspective, ensuring that the support surfaces used in the critical care setting are fit for purpose reduces the risk of pressure ulcer incidence even in the most dependent patients.

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A PRACTICAL APPROACH TO PERI-OPERATIVE RISK OPTIMISATION
For Non-Cardiac Surgery

By I Cassimjee: Department of Vascular Surgery, School of Clinical Medicine, Faculty of Health Sciences, University of the Witwatersrand, South Africa

INTRODUCTION

The combination of careful peri-operative considerations, less invasive surgeries and the liberal use of neuro-axial techniques has decreased peri-operative major adverse cardiac events (MACE) and overall mortality in vascular surgical patients.

Despite this, the recently published ASOS-2 study still demonstrated a 1% mortality even with intensive post-operative monitoring for a range of patients and procedures in lower-middle income countries (LMICs)[1]. As surgeons, our outcome measures are sometimes different to other peri-operative physicians (primarily anaesthesiologists and cardiologists). Our outcomes are not limited to the myocardial function or the safe awakening after anaesthesia, but also incorporates medium-term outcomes such as post-operative infections, wound healing, returns to the operating theatre and restoration of pre-morbid functional capacity.

Several scoring systems and guidelines exist for peri-operative risk assessment, and most are variations of each other with a bias towards the society or organisation that publishes them. We use a combination of the Lee Revised Cardiac Index (LRCI)[2], the American Heart Association (AHA) guideline[3], the Canadian guideline[4] and the most contemporary and relevant to us in South Africa, the South African Peri-operative guideline[5] to formulate our own checklist. These guidelines have shaped the current treatment algorithms for non-cardiac surgery and have made a complex decision-making process much simpler. However, they are cardiac-centric and tend to overlook multiple other systems that can be optimised during the peri-operative period.

Other factors such as chronic obstructive pulmonary disease (COPD), obstructive sleep apnoea (OSA), anaemia and renal insufficiency cumulatively add to the risk peri-operatively, and influence modes of anaesthesia administered as well as post-operative monitoring and care. Interestingly, the LRCI has been demonstrated to provide only a modest predictive value in patients undergoing vascular surgery[6]. There are, however, still deficiencies in these algorithms. For example, the LRCI estimates a risk of a cardiac event for a specified number of pre-existing conditions. This is helpful in making us understand the risk, but very difficult to translate on an individual patient level. How does one meaningfully explain an 11% risk of a cardiac event to a patient, when even phrasing it as an 89% chance of a non-event skews the decision. Biomarker incorporation into the algorithm has further simplified and revolutionised it, but again, how does one interpret a ProBNP of 500ng/ml and explain the risks to patients of a future post-operative MACE. An understanding of probabilistic thinking is difficult enough for physicians, let alone for

patients. Additionally, the guidelines (LRCI) highlight the percentage risk of complications but are opaque on the management strategies when abnormalities are detected. Furthermore, the decision-making for the indications, appropriateness and type of surgery are intertwined with peri-operative 'fitness', and no guideline has been able to incorporate these pivotal decision-making steps. Very often diseases have a best-case operative solution which is more invasive but has a durable result; however, there is sometimes a compromise procedure which is less invasive but has less durable outcomes and may be more appropriate for higher-risk patients with higher-procedural risk.

This circular decision-making strategy is harder to incorporate into linear algorithms. Examples of these are open vs endovascular surgery for complex lower limb occlusions, where an endovascular solution can potentially be performed under local anaesthetic, however the long-term durability is inferior to an open bypass. Or, in breast cancer where low-risk tumours sensitive to oestrogen and progesterone receptors may be treated with tamoxifen alone, and not a mastectomy followed by chemotherapy. This decision may be more appropriate when the cancer-related mortality is less than the systemic disease-related mortality (for example, severe COPD). In cancer surgery, the same peri-operative assessment is incorporated into the ability to withstand chemotherapies (for example, doxorubicin and cardiac toxicity), and influences both the tolerance for chemotherapy and the type of chemotherapy.

Over the past few years (for 2012 to 2021), we have refined our own algorithm for peri-operative assessment, incorporating the common guidelines and contemporary recommendations but also placing emphasis on optimisation of organ function as a goal. Below, I will present our 'systems approach' to peri-operative assessment, as well as our algorithm, then discuss some of the potential pitfalls and developing directions in the field.

Figure 1: A traffic light approach to decision-making for low- and high-risk patients

SYSTEMS APPROACH

The concept of 'fitness for surgery' is a misnomer, as procedures can be performed on even the highest-risk patients if the risks are accepted. More aptly, it should be considered as 'appropriateness of surgery'. For example, an elective incisional hernia repair in a high-risk elderly patient with cardiac failure would be deemed inappropriate, however in the same patient with an 8cm aortic aneurysm, we would reconsider the risks, optimise the cardiac failure, share the decision-making with the patient and plan an anaesthetic accordingly. Thus, the focus on modifying risks throughout the peri-operative period is key.

In general, it is simple to identify the low-risk and high-risk patients; it is the intermediate-risk patients that pose a challenge. They often leave us feeling uneasy as we require balancing over-investigation with its own potential harm and time delays versus continuing without any consideration to the tail risks of an unwanted event. A simple traffic light decision-making algorithm to begin with *(see Figure 1)*, screens out low-risk and high-risk patients, prompting a nudge in the direction of appropriateness of the surgery in high-risk individuals.

One of the limitations of the multiple peri-operative guidelines that exist is that they are organ-specific, and to the best of my knowledge, there is none that incorporates a comprehensive multi-organ assessment. Individually we are aware of the significance and dangers of diseases such as OSA, chronic renal failure (CRF) or hyper-thyroidism, thus a unifying framework made intuitive sense to us *(see Figure 2)*. Furthermore, even subtilties such as pre-operative haemoglobin (Hb) optimisation, nutritional depletion or even the presence of an active auto-immune condition purport additional risks and poorer surgical outcomes. We have been using this framework in our unit now for several years and continue to update it with evolving evidence.

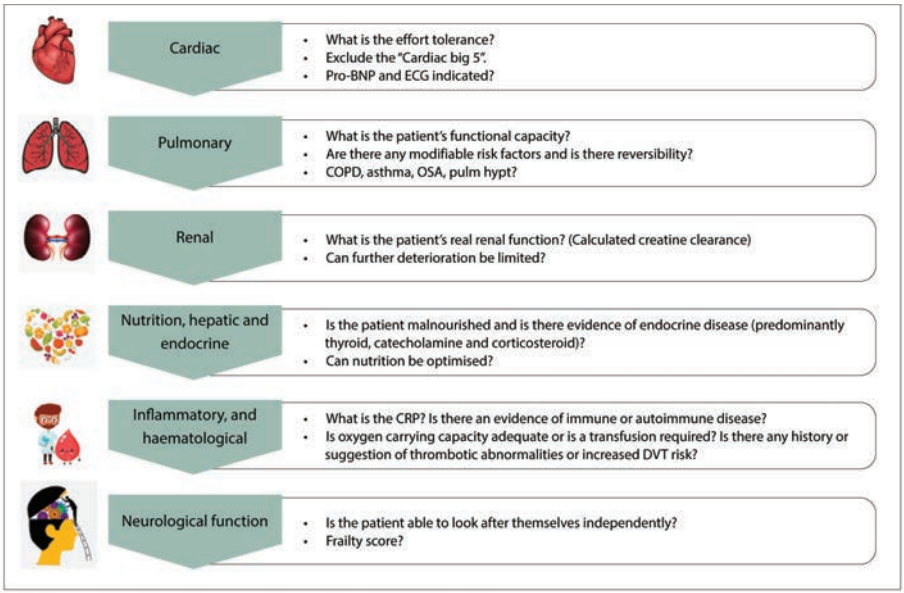

Figure 2: Systems approach to perioperative screening. (WITS vascular surgery algorithm)
Cardiac big 5 – acute coronary syndromes, decompensated heart failure, severe valvular lesions, arrythmias, pericarditis, COPD – chronic obstructive pulmonary disease, OSA – obstructive sleep apnoea, CRP – C-reactive protein, DVT – deep venous thrombosis

CARDIAC SCREENING: OUR APPROACH

1. What is the effort tolerance?
2. Exclude the 'Cardiac big 5'
3. What is the Pro-BNP and ECG?
4. Optimise chronic conditions (blood pressure control, glycaemic control, etc.)

Within a South African context, basing our assessment on the criteria of the LRCI alone would be inadequate to screen HIV-positive patients with vascular disease. In one of the few peri-operative studies of vascular surgical patients in South Africa, the 30-day MACE event rate was 19.4%, whereas the LRCI would have predicted only 4.9% in that cohort[7].

Effort tolerance

A cornerstone of peri-operative screening has been effort tolerance, where a metabolic equivalent of > 4 (MET > 4) has traditionally been thought of as the minimum requirement to withstand anaesthesia safely. The specifics of how one comes to the decision of METS > 4 is not as yet standardised. A provocative and important publication questioned the validity of self-reported effort tolerance[8]. This forces us to question our reliance on self-reported effort tolerance which forms an anchor of most peri-operative algorithms.

In this publication, Wijeysundera *et al.* recruited 1 401 patients with more than one cardiac risk factor and combined the subjective assessment of self-reported functional capacity with objective measures: cardio-pulmonary exercise testing (CPET), the Duke activity score index (DASI) as well as an NTProBNP. Only 2% of their patients had a complication (28 of 1 401), and this was not limited to cardiac events only. One of the most important findings was that self-reported exercise tolerance does not correlate with CPET outputs (peak oxygen consumption and anaerobic threshold), and self-reported METS < 4 had a sensitivity of only 19.4%. Out of the three measures, only the DASI scores were predictive of the primary outcome. DASI and NT-ProBNP correlated reasonably well (AUC 0.7), and our interpretation is that these should be used in combination not as competitors. Since the publication of this study, we have reflected on our practice and included the DASI in our daily algorithm.

The DASI combines 12 questions and provides a score[9], which is then calculated as a metabolic equivalent *(see Figure 3)*. It was first published in 1989, but online calculators make its use and interpretation very simple. Experienced peri-operative clinicians perform this sort of multi-faceted evaluation without having formalised it into a questionnaire and score. The take-home should be that a single self-reported question on functional capacity is not adequate. Although DASI has been validated in the developed world, there are some questions that require adaptation to a South African context. For example, playing golf, dancing or skiing may not be appropriate, nor a direct question on sexual relations be culturally sensitive. Shortening the DASI to just five questions correlated well with CPET outputs and omitting the sensitive sexual relation question also had no impact on the predictive outcomes[10].

Cardiac big 5

Borrowing from the Goldman index and LRCI, we identified five high-risk cardiac conditions that require immediate referral to cardiology for assessment of severity and possible intervention prior

to elective non-cardiac surgery. These are acute coronary syndromes (ACS), decompensated heart failure (NYHCA grades 3 and 4), severe valvular lesions (especially severe aortic stenosis), arrhythmias (especially the tachyarrhythmias or a bradycardia requiring pacing) and pericarditis. These conditions would necessitate an immediate referral to cardiology for either a definitive repair or optimisation prior to elective non-cardiac surgery.

Activity: *Can You…*	Weight
1. take care of yourself, that is, eating dressing, bathing, or using the toilet?	2.75
2. walk indoors, such as around your house?	1.75
3. walk a block or 2 on level ground?	2.75
4. climb a flight of stairs or walk up a hill?	5.50
5. run a short distance?	8.00
6. do light work around the house like dusting or washing dishes?	2.70
7. do moderate work around the house like vacuuming, sweeping floors, or carrying in groceries?	3.50
8. do heavy work around the house like scrubbing floors or lifting or moving heavy furniture?	8.00
9. do yardwork like raking leaves, weeding, or pushing a power mower?	4.50
10. have sexual relations?	5.25
11. participate in moderate recreational activities like golf, bowling, dancing, doubles tennis, or throwing a baseball or football?	6.00
12. participate in strenuous sports like swimming, singles tennis, football, basketball, or skiing?	7.50

Figure 3: The Duke activity score index[9]

NT-ProBNP

We have been using NT-ProBNP in our unit since 2012 and have found it to be the most useful biomarker available. It has both prognosticating value and acts as a screening tool for underlying cardiac disease. The South African Peri-operative guideline recommends its use in all patients over the age of 65 and in patients with at least one risk factor for cardiovascular disease who are over the age of 45. However, the guideline is not clear on how to proceed once an abnormal value is detected. Values of NT-ProBNP vary widely, with a normal value of less than 300pg/ml in most laboratories, thus incorporating its use into a peri-operative algorithm does not produce binary management options.

Rodseth *et al.*, in 2011, reported a patient level meta-analysis of six studies, providing insights into Pro-BNP use and benefits[11]. Measuring NT-ProBNP altered the risk prediction in 58% of patients undergoing vascular surgery when compared to using the LRCI alone. The Canadian guideline reports that NTProBNP levels > 300mg/L have a 21.8% MACE at 30 days[4]. This is somewhat misleading though, because the range is so wide above this level, and seen in the context of vascular surgical patients, the majority have a Pro-BNP > 300ng/L. This makes practical implementation not as clearly-defined or evidence-based. Extrapolating from the Rodseth *et al.*

meta-analysis of 2014 which examined the additive value of a post-operative NTProBNP measurement, they reported on the predictive value of a pre-operative NT-ProBNP from their pooled data. This provided some guidance on cut-offs with which to base decisions on. They found that a pre-operative NT-ProBNP value for mortality or non-fatal myocardial infarction of 0ng/L to 300ng/L, 300ng/L to 900ng/L, 900ng/L to 3 000ng/L and > 3 000ng/L had a 5.2%, 16.1%, 26% and 39.5% rate respectively12 *(see Figure 4)*.

0–300 ng/L	300–900 ng/L	900–3 000 ng/L	> 3 000 ng/L
5.2%	16.1%	26%	39.5%

Figure 4: NT-ProBNP thresholds for 30-day postoperative mortality and non-fatal MI

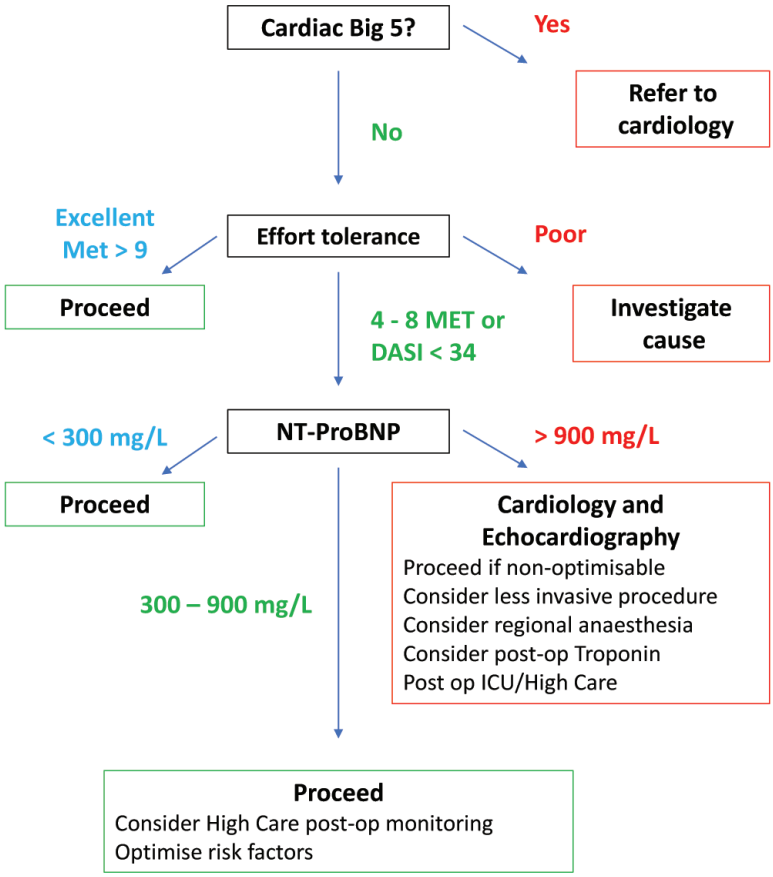

Figure 5: Preoperative cardiac algorithm incorporating NT-ProBNP
DASI – Duke activity score index, MET – Metabolic equivalents

Extrapolating from this information, we incorporated these cutoffs into our algorithm for cardiac risk assessment *(see Figure 5)*. Comparing our algorithm to the South African peri-operative guideline or the Canadian peri-operative guideline, the major difference is the referral for a cardiology consult and presumably non-invasive echocardiography. We find that although the findings may not directly influence the decision to operatively intervene on a patient, it provides information that helps direct therapy peri-operatively. For example, valve lesions may prompt reconsideration for spinal anaesthesia, or subclinical heart failure will allow for evidence-guided remodelling therapy to be instituted timeously, thereby influencing long-term outcomes.

The risk of this strategy is unnecessarily intervening on ischaemic changes found peri-operatively and thus causing harm. Coronary revascularisation prior to non-cardiac surgery has been found to be not beneficial and perhaps even harmful[13]. However, these trials are not without controversy. The DECRASE trails were discredited due to the primary investigator being found to have broken research protocols and subsequently retracted. These were principally around peri-operative B-blockade, which influenced the B-blocker strategy in the main CARP trial but also included the DECREASE V study which showed no benefit for coronary revascularisation prior to vascular surgery[14]. One of the difficulties in interpreting this data is that the CARP trial excluded left main coronary lesions of >50%. In practical terms, how would one exclude a 50% lesion in the left coronary artery in a patient found to have hypokinesia in the distribution of the left coronary segment myocardium without an angiogram. Furthermore, are patients presenting with ischaemic cardiomyopathy truly asymptomatic (in other words, with no chest pain), especially if they have reversibility? Our approach is that if hypokinesia is detected on echocardiography in the face of a patient with ischaemic cardiomyopathy and reduced ejection fraction, we ask our cardiologists to determine the reversibility of the segment. If the segment is reversible, our cardiologists perform an angiogram.

For significant left main lesions, we generally defer to coronary revascularisation first. For other significant lesions, we have a multi-disciplinary team (MDT) meeting. If the vascular surgery requires an open operation (aortic or lower-limb) and can be deferred by six weeks to three months, we generally proceed with coronary revascularisation. As vascular surgeons, we have become accustomed to operating on patients with dual antiplatelets, and this is no longer a deterrent to lower limb bypass or aortic surgery, and we would not interrupt clopidogrel for these. This is a space that requires contemporary investigation. Endovascular procedures are lower risk, but open aortic surgery is still necessary in one-third of patients with aneurysms. Very often in MDT discussions around open aortic surgery, patients are excluded on this basis, as revascularisation prior to surgery is assumed not to be beneficial. It must be noted however, this is not a common scenario, but testing this strategy of pre-screening with a Pro-BNP within the confines of a clinical trial would be beneficial.

The remainder of our systems-based approach attempts to standardise investigations and cover most organ systems that may benefit from optimisation. A detailed presentation of this is beyond the scope of this article. However, the system that is most difficult to assess from a clinical decision-making standpoint is the neurological system. In the clinical spectrum of patients with vascular disease, dementia, strokes and frailty are common. From an ethical standpoint, we are often faced with a patient with a large aneurysm who is cognitively incapable of the awareness of their condition. Although physiologically they may be fit, it is not appropriate to subject patients to major procedures without changing their quality of life. These decisions require involvement

of the primary caregivers and should be a shared decision process. Frailty and frailty scores are gaining popularity in the peri-operative space. Within vascular surgery, markers such as psoas muscle sarcopenia are markers of poorer outcomes[15]. We have found the DASI useful in grading frailty as well[16]. In the future we might use remote monitoring devices to gain a more accurate measure of frailty and activity.

Several other current peri-operative strategies have the potential to influence the framework in the future. In particular, post-operatively the evolving role of myocardial injury after non-cardiac surgery (MINS), and pre-operatively the incorporation of supervised exercise therapy before surgery. MINS is an evolving concept, though its existence is well established, its relevance and therapeutic options are still to be clearly outlined. MINS data also merges post-operative therapeutic options on the background of emerging concepts of long-term post-operative low-dose anticoagulation (rivaroxaban) in patients undergoing vascular surgery to decrease composite vascular events[17].

CONCLUSION

Peri-operative optimisation prior to non-cardiac surgery has iteratively evolved over the last two decades. In South Africa, we are fortunate to have world-leading peri-operative researchers who continue to actively influence this field. The implementation of widely available guidelines requires consolidation of the evidence and a practical implementation strategy. Presented above is one such strategy, incorporating several societal guidelines into a single useable framework.

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PERI-OPERATIVE SAFETY
In Africa

By Kate Woodhead, RGN, DMS

INTRODUCTION

The operating theatre in any country is a high-risk environment and there is a plethora of research which supports this. The hazards of the environment and for all the practitioners who work there are numerous occupational dangers. There are of course many dangers for the patients as well, not least the likelihood of getting an infection during their surgical experience.

Surgery is an essential element of healthcare and the need for it grows constantly with increasing trauma care required due to more vehicles on the roads, obstetric emergencies need surgery and specialised care, as well as cancer and a greater prevalence of orthopaedic diseases in the developing world which require surgical intervention. It is difficult to be exact about the burden of surgical disease, but it is estimated to be 11% of the global disease burden, which may be treated by surgery. Of that 11%, 38% is thought to be injuries, 19% malignancies, 9% congenital abnormalities, 6% pregnancy complications and 5% cataracts[1].

GLOBAL SURGERY

Of an estimated 234.2-million major surgical procedures performed annually, 30% of the world's population undergo 73% of these procedures, with the poorest third undergoing only 3,5%

.

The World Health Organisation (WHO) is increasingly seeing the need for strengthening surgical services around the world as part of comprehensive healthcare and universal health coverage, but there is a vast amount of work to do in order for this to be a reality. There is a huge unmet need for surgical services and many aspects of infrastructure are lacking, including the specialised surgeons, anaesthetists and peri-operative staff.

But, there is hope. Since 2005, the World Health Organisation have changed their emphasis and are calling for additional financial and political support to bolster surgical services. They started with the development of Emergency and Essential Surgical Care Global Initiative (IMEESC) to promote collaboration for all the work which needs to be undertaken.

A recent survey assessed the provision of surgical care in Low-income and Middle-income Countries (LMICs) and found enormous shortfalls in infrastructure, supplies and procedures at district healthcare facilities. An important component of the gap between need and provision is insufficient human capacity at all levels including doctors, nurses, technicians and administrators[2]. A small charity based in the UK is addressing a very small element of this need by training peri-operative nurses in Africa. We believe that we are one of the very few organisations tackling this shortcoming.

Friends of African Nursing has been working in this area since 2002 and has educated more than 3 000 nurses and others face-to-face. Due to COVID-19 a new means of delivery was used and has increased the numbers of nurses being trained using Zoom. We run a regular on-line webinar, reaching a wide variety of theatre nurses hungry for information and rationale for their practice.

PROPOSAL TO THE MINISTRY

A recent visit to Africa has involved us in developing a proposal to train peri-operative nurses who currently work in the district hospitals, to submit to the Ministry to gain their support. We understand that the volume of surgery has recently increased enormously, and that training is what is needed to make the system safer and more efficient.

Currently, if the surgeon, who is probably a general practitioner and not a qualified surgeon, finds an issue he cannot deal with such as a bleeder, the patient is packed with gauze and despatched to the capital, which may be hours away on uncomfortable unpaved roads. The concept note will include the programme of education which we will deliver to the nurses if the proposal is accepted, and will focus on infection prevention, patient safety, peri-operative etiquette and rationale for practice. It will be hard work for the participants, especially if English is not their usual language.

RURAL HOSPITAL OBSTACLES

Obstacles to overcome at district hospitals as described in the literature[3] include, untrained staff, poor basic infrastructure, inadequate supplies of drugs and essential equipment, poor working conditions, low staff morale, lack of communication and referral facilities, costs to patients of treatment and poor management. In addition, Pearson and Shoo identified the need for a functioning blood bank, a clinical laboratory and emergency transport and communication systems to ensure a more effective hospital.

The recent visit was a joy as we were invited to the main teaching hospital to provide induction training to six new theatre recruits. The first day of our training was their first in employment as registered nurses. As induction and training is very often missing and new peri-operative nurses learn bad habits from those who usually teach them, we are confident that our facilitators gave a better than good basis on which to ground their practice. We hope to learn in future visits how they are progressing.

The same operating theatres demonstrate one of the difficulties of upscaling the surgical service as for 10 theatres there are just 40 whole time equivalents (WTE) whereas in this country there would be closer to 200 WTE. Indeed, one of our participants, an experienced member of staff was pulled back to theatre to scrub for a neurosurgical trauma case who needed urgent surgery.

BARRIERS TO ACCESSING CARE

There is a wealth of barriers to overcome for countries who attempt to upscale their rural surgical services, identified by a systematic review[4], include cultural barriers which may be fear of undergoing surgery, fear of having an anaesthetic, and of bad outcomes of the surgery. In

many cultures, family and support networks play an important part in healthcare decisions. Several studies cite members of the family not the patient who may make the decision when and if to transfer the patient to a healthcare facility. This is probably linked to those who will be paying for or raising funds to pay for the care.

There are many other financial barriers which also prevent access to healthcare. These may be direct or indirect costs of surgical fees, drugs, supplies such as bandages and dressings, laboratory tests, transport, stay at hospital and food and drink. There are also many indirect costs - which can be the accumulated costs of being away from work and the concomitant loss of income and the costs of bringing a caregiver to the hospital. Often visits to district and tertiary level hospitals have to be deferred until people have saved sufficient money - or borrowed the money, or even sold precious items and heirlooms to fund their care.

This may also partly explain why local traditional healers are often tried before resorting to more remote 'western medicine'. Solutions to the barriers are complex and difficult to solve in low-resource countries. Additional problems, many of which are seemingly insurmountable, include rural living, cost of treatment and poverty, mountainous terrain and distance to hospitals.

SAFETY DATA

Very few LMIC hospitals are collecting meaningful safety data, which makes it very difficult to ensure that the correct solutions are discovered and implemented. In 2015, the Lancet Commission on Global Surgery outlined five necessary components to ensure the delivery of safe surgery. These are, infrastructure, surgical workforce, service delivery financing and information management.

Capacity building through improved infrastructure and trained surgical workforce expansion has proved to be challenging to sustain on a global scale[5]. One reliable study which is frequently cited is peri-operative patient outcomes in the African Surgical Outcomes Study undertaken in 25 different African countries in 2018. Their findings showed that one in five surgical patients in Africa developed a peri-operative complication, following which, one in ten patients died. The findings also show that despite the profile of the surgical patients being younger with a low-risk value and lower occurrences of complications, patients in Africa were twice as likely to die after surgery when compared with outcomes at a global level.

They also reported that most surgical procedures were done on an urgent or emergency basis and one third were Caesarean sections. Importantly, 95% of the deaths occurred after surgery, indicating the need to improve the safety of peri-operative care[6]. It is critical in the light of this data that surgical care becomes safer and more effective.

The findings may be due to scarce workforce resources and poor early warning systems to detect deteriorating patients. The median number of 0.7 specialists (surgeons, anaesthetists and obstetricians) per 100 000 population is well below the point of 20 to 40 specialists thought necessary to decrease peri-operative mortality. In addition, there are fewer hospital and critical care beds in Africa than reported globally, with consequential greater risk of death following peri-operative complications.

PATIENT AND STAFF SAFETY

There is a huge range of different aspects of patient safety by the literature - especially in peri-operative care. Friends of African Nursing (FoAN) focuses its education delivery on the elements of peri-operative care which the nurses manage. This is a long list of specialised actions such as positioning on the operating table, the surgical count - including instruments - as well as decontamination of instruments. *Safe Surgery Saves Lives* is an additional session that is offered, although it is acknowledged that not every patient gets the checklist completed.

Anecdotally, aseptic technique education is required by all members of the team, as is hand anti-sepsis. That being said, a focus on instrument decontamination and sterilising would be a good plan for local education and demonstration to peri-operative staff at different levels, as it is not felt to be part of the picture and generally - according to what has been witnessed - is woefully inadequate for all the blood-borne and other diseases prevalent in Africa.

Part of the infrastructure which is frequently written about is the lack of or under-maintained ventilation systems. One teaching hospital audited by FoAN had not had any functioning ventilated theatre for 12 years before our visit. Added to which the furniture in theatre including the operating table often has ripped mattress covers, a perfect home for multitudes of bacteria which may cause SSIs soon after surgery.

Much of the education is also focused on keeping peri-operative staff safe with training sessions on hand hygiene, eye protection, maintaining asepsis, stress management and dealing with bullying and harassment. We need to ensure that the nurses we are educating can continue to work safely in the area they are assigned to. It is difficult to learn from the problems encountered by the staff and patients in many hospitals as data are not collected. However, in recent times, it has been noticed that more hospitals are now reporting, collecting data and managing risks in a more comprehensive way and it is hoped that they are being collated at national level.

A study undertaken in Uganda was assisted by a team from the WHO[7] to reduce SSIs has lessons for all of us. The study involved evidence-based closing the doors to operating theatres, reducing the number of people in theatre, limiting traffic in and out of the theatre, as well as ensuring patients bathe before surgery. Other measures included improving skin preparation, waiting for the skin to dry before incision and using appropriate surgical antibiotic prophylaxis. These measures reduced the infection rate by half after they were introduced, enabling earlier discharge, saving costs for the patient and the hospital. SSIs cause harm and distress to patients and must be reduced as much as possible.

CONCLUSION

Many of the issues related to surgical services in Africa are intractable and require significant effort and financing in order to help scale up all the issues to ensure more widespread accessibility to a safe and effective surgical service in African areas. One of the efforts to ensure peri-operative staff know what they are doing is delivered by Friends of African Nursing. Those endeavours will never fulfil the ever-growing need on the Continent, but may make a difference in a small measure. Ministries and Governments must, equally, make greater effort to up-scale their surgical services to make them safer for both patients and staff before a meaningful difference will be experienced.

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PERI-OPERATIVE EVALUATION OF PATIENTS

Who Are Due To Undergo Surgery

By Professor Ntobeko Ntusi

INTRODUCTION

Physicians are often requested to evaluate patients before surgery, either in response to a request from a surgeon or a primary care clinician assessing the patient prior to surgical referral. The objectives of this pre-operative evaluation are to determine the risk to the patient of the proposed procedure and to minimise risk by:

(i) Identifying unrecognised co-morbid disease and risk factors for medical complications of surgery;
(ii) Optimising the pre-operative medical condition;
(iii) Recognising and treating potential complications; and
(iv) Working effectively as a member of the pre-operative team (including those from nursing, medical, surgical and anaesthetic backgrounds)

Does pre-operative evaluation of patients improve surgical outcomes? Data from published studies reveal that physicians and anaesthetists are more likely to identify conditions that may affect surgical outcomes. They then recommend interventions for these conditions[1, 2] and occasionally cancel or delay surgery so that medical conditions can be optimally managed[3], ensuring a high level of satisfaction with co-management arrangements[4].

Data on the effect of pre-operative medical consultation on cost measures are conflicting. Three large studies reported a decrease in hospital stay after peri-operative evaluation and care of patients undergoing thoracic[5], hip[6] and various other operations[7]. Some studies, however, showed increased costs and a similar length of stay for patients who had been consulted[4, 8].

Similarly, studies of the impact of peri-operative medical evaluation on peri-operative mortality are contradictory. In an investigation of neurosurgical patients, medical consultation had no effect on mortality[4], while in a different study, it was shown to increase 30-day and one-year mortality rates and length of hospital stay, respectively[9]. Overall, robust evidence demonstrating clear improvements in resource utilisation or patient outcomes is currently lacking. Nevertheless, the practice of peri-operative evaluation is widespread and, assuming doctors make evidence-based recommendations that improve surgical outcomes, it is reasonable to infer that consultation will improve the care of the surgical patient if consultative recommendations are implemented.

Closer to home, peri-operative research remains unco-ordinated in South Africa. A group of investigators and interested individuals collaborated under the auspices of the South African Peri-operative Research Group (SAPORG).

Members of SAPORG believe that:

(i) Collaborative research is necessary to address the clinical challenges encountered in peri-operative care and outcomes, both in South Africa and globally;
(ii) There is capacity to conduct national and international collaborative research in South Africa;
(iii) Collaborative research conserves limited research resources;
(iv) There are urgent public health issues in peri-operative medicine that need to be addressed to improve the health of the South African population; and
(v) A national research priority-setting process is necessary to prioritise research in an environment of limited research resources[10].

To this end, SAPORG has defined 10 research priorities for peri-operative medicine in South Africa:

(i) The establishment of a national database of critical care outcomes and critical care resources;
(ii) A randomised controlled trial of pre-operative B-type natriuretic peptide-guided medical therapy to decrease major adverse cardiac events after non-cardiac surgery;
(iii) A national prospective observational study of the outcomes associated with paediatric surgical cases;
(iv) A national observational study of maternal and foetal outcomes following operative delivery in South Africa;
(v) A stepped-wedge trial of an enhanced recovery-after-surgery programme;
(vi) A stepped-wedge trial of a surgical safety checklist of patient outcomes in South Africa;
(vii) A prospective observational study of peri-operative outcomes after surgery in district general hospitals in South Africa;
(viii) Short-course interventions to improve anaesthetic skills of rural doctors;
(ix) Studies of the efficacy of simulation training to improve patient outcomes, team dynamics and leadership; and
(x) The development and validation of a risk stratification tool for South Africa surgery based on the South African Surgical Outcomes Study (SASOS) data[10].

A recent publication in the Lancet reported on a seven-day, international, prospective, observational cohort study of patients aged ≥18 years undergoing any in-patient surgery in 25 countries in Africa (African Surgical Outcomes Study)[11]. A total of 11 422 patients were included from 247 hospitals serving a median population of 810 000, with a combined number of specialist surgeons, obstetricians and anaesthetists of 0.7/100 000 population. A median of 212 surgical procedures per 100 000 population were performed in hospitals each year. Patients were younger (mean age 38.5 years) and had a lower risk profile than that reported in high-income countries. Patients (11%) were infected with HIV, 57% of procedures were urgent or emergent, and the most common procedure was Caesarean delivery (33%).

Post-operative complications occurred in 18.2%, and 2.1% of patients died the day after surgery. In this important publication, despite a low-risk profile and few post-operative complications, patients in Africa were twice as likely to die after surgery compared with the global average for post-operative deaths. The authors conclude that initiatives to increase access to surgical treatments in Africa, therefore, should be coupled with improved surveillance for deteriorating physiology in patients who develop post-operative complications and the resources necessary to achieve this objective[11].

In this CME issue, Du Toit *et al.*[12] review the peri-operative management of diabetes. In their comprehensive summary, the authors review the guidelines for optimisation and peri-operative management of diabetic patients, and importantly place their discussion within the South African context. Ultimately, peri-operative diabetic care should be driven by a multi-disciplinary team considering the evidence base within a resource and patient context. The second article, by Neethling *et al.*[13], discusses the role of point-of-care ultrasound (POCUS) as an essential modality in the assessment of critically-ill patients and those in the peri-operative period. POCUS can be performed by trained non-cardiologist physicians at the patient's bedside as an adjunct to the physical examination, and aids with the rapid diagnosis of severe and life-threatening pathological conditions, often changes clinical management and may have an impact on patient outcomes.

While no large studies have definitively shown a decrease in peri-operative morbidity associated with peri-operative medical consultation, the practice is nevertheless widespread and, assuming that consultants make evidence-based recommendations that improve surgical outcomes, it is reasonable to infer that consultation will improve the care of the surgical patient. The experienced peri-operative medicine physician should be able to identify the pertinent medical problems, anticipate potential peri-operative problems, avoid addressing issues outside of their area of expertise or issues unrelated to the procedure, assess a patient's risk and need for further interventions, and communicate effectively with the surgeon and anaesthesiologist. There is now emerging evidence of the status of peri-operative medicine and outcomes on the African continent. In the future, it is my hope that further research in this area will improve surgical outcomes of patients in South Africa and beyond.

Conflicts of interest. None.

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PRE-OPERATIVE ANAEMIA AND CLINICAL OUTCOMES
In The South African Outcomes Study

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INTRODUCTION

In high-income countries, preoperative anaemia has been associated with increased post-operative morbidity and mortality.[1] Pre-operative anaemia is a common problem, with three large database studies in Europe and America estimating the prevalence to be between 25% and 30%.[2-4] Anaemia is also associated with increased peri-operative blood transfusions, a practice independently associated with morbidity and mortality.[5] Growing evidence supports increasingly restrictive transfusion strategies in surgical and critical care patients, and as a result allogeneic transfusions can no longer be considered an appropriate isolated management strategy for surgical patients with pre-operative anaemia.[6,7] Furthermore, the demographics of the South African (SA) surgical population differ significantly from those of the populations in which the morbidity associated with preoperative anaemia has been described. SA non-cardiac surgical patients are younger, have fewer non-communicable diseases, and undergo significantly more urgent and emergency procedures than their European counterparts.[8] The prevalence of pre-operative anaemia and the associated post-operative outcomes in SA patients may therefore differ from those described in the published international literature.

In SA's resource-restricted setting, it is imperative to prioritise simple interventions that are likely to be associated with improved patient outcomes. Should pre-operative anaemia be independently associated with post-operative morbidity and mortality, correction of pre-operative anaemia may be a simple intervention to improve surgical outcomes.

OBJECTIVES

The primary objective was to determine the association between pre-operative anaemia and in-hospital mortality in SA adult non-cardiac, non-obstetric surgical patients. Secondary objectives were to describe the prevalence of pre-operative anaemia in adult SA surgical patients, and to determine the association between pre-operative anaemia and:

(i) Length of post-operative hospital stay; and
(ii) Admission to critical care units

METHODS

This study was a secondary analysis of the South African Surgical Outcomes Study (SASOS) (University of Cape Town Human Research Ethics Committee ref. no. HREC R010/2014).

Setting

SASOS was a seven-day national multi-centre prospective observational cohort study. Patients

aged >16 years undergoing in-patient non-cardiac, non-obstetric surgery between 07h00 on 19 May and 06h59 on 26 May 2014 in 50 participating government-funded hospitals across all nine provinces of SA were recruited into the study. Exclusions were planned day-case surgery an radiological procedures not requiring anaesthesia. Patients aged <18 years attending hospitals associated with the University of the Witwatersrand were excluded from the study because they were deemed unable to give consent. In total, 3 927 patients from 45 hospitals were included in the study.

The data collected included patient demographics and co-morbidities, selected pre-operative blood tests (including haemoglobin concentration (Hb)), the urgency of the surgery, the surgical specialty and the anaesthetic technique. Details of the study design and procedures have been described in the primary article.[8] The primary outcome was in-hospital mortality, which was censored at 30 days for patients who were still in hospital. Data on length of stay and critical care admission were also collected. The independent risk predictors for mortality identified in SASOS were age (years), American Society of Anesthesiologists (ASA) classification ≥2, major surgery, urgent or emergency surgery, infection or injury as an indication for surgery, upper gastro-intestinal tract (GIT) surgery, and the co-morbidities of stroke or transient ischaemic attack and metastatic cancer.

The independent risk predictors for critical care admission were ASA classification ≥2, intermediate or major surgery, urgent or emergency surgery, injury as an indication for surgery, upper GIT surgery, head and neck surgery, neurosurgery and thoracic surgery.

DEFINITIONS

The last recorded Hb prior to surgery was recorded as the pre-operative Hb. Anaemia and its subclassifications were defined as Hb <13 g/dL in males (mild 11 to 12.9, moderate 8 to 10.9, severe <8) and <12 g/dL in non-pregnant females (mild 11 to 11.9, moderate 8 to 10.9, severe <8), according to the World Health Organization sex-based criteria.[9]

STATISTICAL ANALYSIS

Categorical variables were described as proportions and compared using $\chi 2$ tests, Pearson's $\chi 2$ tests and Fisher's exact tests. The continuous variables age (years), Hb (g/dL) and length of hospital stay (days) were described as means and standard deviations if normally distributed or as medians and interquartile ranges (IQRs) if not.

A multivariate logistic regression analysis was performed to determine the association between pre-operative anaemia and in-hospital mortality or critical care admission. Two analyses were conducted for each outcome:

(i) Anaemia entered as a binary variable; and
(ii) Anaemia entered as mild, moderate or severe categorical data.

To determine whether pre-operative anaemia was independently associated with mortality or critical care admission, we forced all the independent risk factors of mortality and critical care admission identified in the primary SASOS analysis[8] into the respective anaemia models. A post hoc multi-variate analysis for the independent predictors of anaemia in SASOS was conducted. To determine the optimal Hb cut-point for anaemia associated with mortality, a receiver operating characteristic (ROC) curve was generated.

Univariate and multivariate statistical analyses were performed using the Statistical Package for the Social Sciences (SPSS), version 23 (SPSS Inc., USA).

RESULTS

The study recruitment is shown in **Figure 1.** Pre-operative haemoglobin data were available for 3 610/3 927 (91.9%) of the SASOS patients. The patient characteristics are shown in **Table 1.** The prevalence of pre-operative anaemia was 1 725/3 610 (47.8%), with 711 patients (19.7%) presenting with mild anaemia, 863 (23.9%) with moderate anaemia and 151 (4.2%) with severe anaemia.

In univariate analysis there was a significant association between pre-operative anaemia and female gender, an ASA classification of ≥3, congestive heart failure, insulin-dependent diabetes, metastatic cancer, HIV/AIDS, urgent or emergency surgery, and gynaecological and vascular surgery.

Pre-operative anaemia, in-hospital mortality and critical care admission

The incidence of mortality associated with anaemia is shown in **Table 2.** Anaemic patients were significantly less likely than those who were not anaemic to survive to hospital discharge.

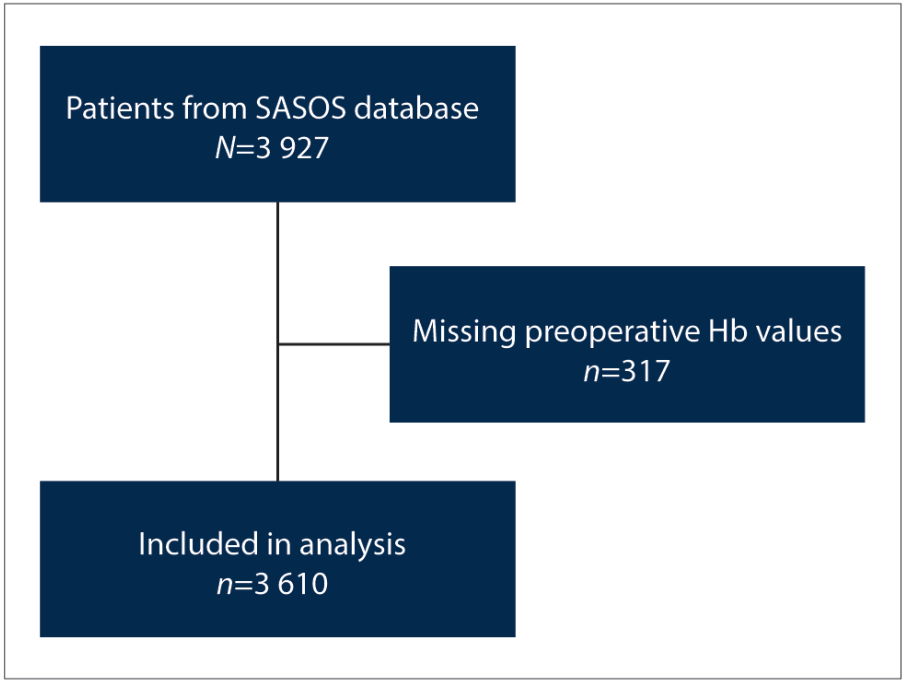

Fig. 1. Flow diagram of patient recruitment for the study. (SASOS = South African Surgical Outcomes Study; Hb = haemoglobin.)

Table 1. Baseline characteristics of patients with and without anaemia

	Total	Anaemic	Not anaemic	*p*-value
Age (years), mean (SD)	43.6 (17.6)	43.7 (18.0)	43.3 (17.0)	0.514
Hb (g/dL), mean (SD)	12.3 (2.5)	10.3 (1.7)	14.2 (1.4)	<0.001
Female, *n* (%)	1 807/3 610 (50.1)	913/1 725(52.9)	894/1 885 (47.4)	0.001
ASA, *n* (%)				<0.001
1	1 549/3 588 (43.2)	647/1 714 (37.7)	902/1 874 (48.1)	
2	1 266/3 588 (35.3)	560/1 714 (32.7)	706/1 874 (37.7)	
3	630/3 588 (17.6)	395/1 714 (23)	235/1 874 (12.5)	
4	129/3 588 (3.6)	101/1 714 (5.9)	28/1 874 (1.5)	
5	14/3 588 (0.4)	11/1 714 (0.6)	3/1 874 (0.2)	
Primary indication for surgery, *n* (%)				<0.001
Non-communicable disease	1 724/3 598 (47.9)	786/1 720 (45.7)	938/1 878 (49.9)	
Infection	686/3 598 (19.1)	378/1 720 (22.0)	308/1 878 (16.4)	
Injury	1 188/3 598 (33.0)	556/1 720 (32.3)	632/1 878 (33.7)	
History of				
Coronary artery disease	150/3 560 (4.2)	68/1 701 (4.0)	82/1 859 (4.4)	0.560
Congestive heart failure	53/3 560 (1.5)	35/1 701 (2.1)	18/1 859 (1.0)	0.008
Insulin-dependent diabetes	159/3 560 (4.5)	105/1 701 (6.2)	54/1 859 (2.9)	<0.001
Non-insulin-dependent diabetes	213/3 560 (6.0)	113/1 701 (6.6)	100/1 859 (5.4)	0.120
Metastatic cancer	94/3 560 (2.6)	63/1 701 (3.7)	31/1 859 (1.7)	<0.001
Cirrhosis	7/3 560 (0.2)	5/1 701 (0.3)	2/1 859 (0.1)	0.210
Stroke/TIA	53/3 560 (1.5)	32/1 701 (1.9)	21/1 859 (1.1)	0.072
COPD/asthma	222/3 560 (6.2)	87/1 701 (5.1)	135/1 859 (7.3)	0.008
HIV/AIDS	493/3 560 (13.8)	294/1 701 (17.3)	199/1 859 (10.7)	<0.001
Grade of surgery, *n* (%)				0.085
Minor	1 213/3 571 (34.0)	582/1 709 (34.1)	631/1 862 (33.9)	
Intermediate	1 561/3 571 (43.7)	706/1 709 (41.3)	855/1 862 (45.9)	
Major	797/3 571 (22.3)	421/1 709 (24.6)	376/1 862 (20.2)	
Urgency of surgery, *n* (%)				<0.001
Elective	1 619/3 598 (45.0)	620/1 718 (36.1)	999/1 880 (53.1)	
Urgent	1 201/3 598 (33.4)	659/1 718 (38.4)	542/1 880 (28.8)	
Emergency	778/3 598 (21.6)	439/1 718 (25.6)	339/1 880 (18.0)	
Type of surgery, *n* (%)				
Orthopaedic	1 017/3 610 (28.2)	445/1 725 (25.8)	572/1 885 (30.3)	0.003
Breast	97/3 610 (2.7)	35/1 725 (2.0)	62/1 885 (3.3)	0.023
Gynaecological	514/3 610 (14.2)	309/1 725 (17.9)	205/1 885 (10.9)	<0.001
Vascular	132/3 610 (3.7)	93/1 725 (5.4)	39/1 885 (2.1)	<0.001
Upper GIT	150/3 610 (4.2)	83/1 725 (4.8)	67/1 885 (3.6)	0.066
Lower GIT	386/3 610 (10.7)	164/1 725 (9.5)	222/1 885 (11.8)	0.031
Hepatobiliary	87/3 610 (2.4)	33/1 725 (1.9)	54/1 885 (2.9)	0.065
Plastics	228/3 610 (6.3)	119/1 725 (6.9)	109/1 885 (5.8)	0.171
Urology	193/3 610 (5.3)	83/1 725 (4.8)	110/1 885 (5.8)	0.183
Kidney	13/3 610 (0.4)	9/1 725 (0.5)	4/1 885 (0.2)	0.165
Head and neck	200/3 610 (5.5)	73/1 725 (4.2)	127/1 885 (6.7)	0.001
Neurosurgery	127/3 610 (3.5)	49/1 725 (2.8)	78/1 885 (4.1)	0.037
Thoracic	65/3 610 (1.8)	38/1 725 (2.2)	27/1 885 (1.4)	0.103
Other	396/3 610 (11.0)	190/1 725 (11.0)	206/1 885 (10.9)	0.958

Hb = haemoglobin; ASA = American Society of Anesthesiologists; TIA = transient ischaemic attack; COPD = chronic obstructive pulmonary disease; GIT = gastrointestinal tract.

The risk factors independently associated with mortality and critical care admission in SASOS are shown in **Tables 3 and 4,** respectively. Anaemia was independently associated with mortality (odds ratio (OR) 1.657, 95% confidence interval (CI) 1.055 to 2.602; p=0.028) and critical care admission (OR 1.487, 95% CI 1.081 to 2.046; p=0.015) in the presence of all the independent predictors of mortality and critical-care admission derived in the original SASOS model.[8] All the original independent predictors for mortality and critical-care admission remained in the models when anaemia was forced into the model, with the exception of a history of stroke in the mortality model. **Figure 2** shows the ROC curve for anaemia and survival to hospital discharge. The optimal Hb cut-point was 10.95 g/dL, with an area under the curve of 0.662 CI (0.608 to 0.716).

Pre-operative anaemia and length of hospital stay

Patients with pre-operative anaemia remained in hospital significantly longer than those with a normal preoperative Hb (median 4 days (IQR 1 - 10) v. 2.5 days (IQR 1 - 5), respectively) (p<0.001).

Table 2. In-hospital mortality of patients with and without anaemia, and by subgroups

	In-hospital mortality, *n* (%) (95% CI)	OR (95% CI)	*p*-value
No anaemia	35/1 885 (1.9) (1.2 - 2.5)	Ref	
Anaemia	84/1 725 (4.9) (3.9 - 5.9)	2.706 (1.814 - 4.036)	<0.001
Anaemia subgroups			
None		Ref	
Mild	13/711 (1.8) (0.8 - 2.8)	0.984 (0.518 - 1.872)	0.962
Moderate	61/863 (7.1) (5.4 - 8.8)	4.020 (2.632 - 6.142)	<0.001
Severe	10/151 (6.6) (2.7 - 10.6)	3.749 (1.819 - 7.727)	<0.001

CI = confidence interval; OR = odds ratio.

Table 3. Independent predictors of mortality

	OR (95% CI)	*p*-value
Age	1.018 (1.005 - 1.030)	0.005
Anaemia	1.657 (1.055 - 2.602)	0.028
ASA		
1	Ref	
2	2.887 (1.342 - 6.209)	0.007
3	5.802 (2.694 - 12.493)	<0.001
4	24.206 (10.640 - 55.065)	<0.001
5	15.069 (3.417 - 66.453)	<0.001
History of		
Stroke/TIA (mortality model)	2.361 (0.965 - 5.778)	0.060
Metastatic cancer (mortality model)	2.973 (1.399 - 6.319)	0.005
Grade of surgery		
Minor	Ref	
Intermediate	1.669 (0.871 - 3.200)	0.123
Major	3.218 (1.666 - 6.216)	0.001
Urgency of surgery		
Elective	Ref	
Urgent	1.878 (1.057 - 3.334)	0.032
Emergency	2.900 (1.607 - 5.235)	<0.001
Type of surgery		
Upper GIT	2.915 (1.570 - 5.411)	0.001
Primary indication for surgery recorded		
Non-communicable disease	Ref	
Infection	1.661 (0.932 - 2.961)	0.085
Injury	2.115 (1.261 - 3.547)	0.005

OR = odds ratio; CI = confidence interval; ASA = American Society of Anesthesiologists; TIA = transient ischaemic attack; GIT = gastrointestinal tract.

Predictors of anaemia

There was an independent association between pre-operative anaemia and ASA classification of 3 and 4, insulin-dependent diabetes, metastatic cancer, HIV, and urgent and emergency surgery **(Table 5).**

DISCUSSION

Statement of principal findings

The study showed a high prevalence of pre-operative anaemia (47.8%) in SA patients presenting for non-cardiac and non-obstetric surgery. Pre-operative anaemia was independently associated with in-hospital mortality, increased admission to critical care units and a longer hospital stay.

Context

Our study findings of an association between pre-operative anaemia and post-operative mortality are in keeping with similar large studies of the American College of Surgeons National Surgical

Quality Improvement Program database (ACS NSQIP) and the European Surgical Outcomes Study (EuSOS) database.[2-4] However, our study presents data from a middle-income country, while the others present data from predominantly high-income countries. Furthermore, it was observed that the burden of co-morbidities in SASOS was significantly lower than that reported in EuSOS.[4,8] A higher prevalence of anaemia, but with fewer co-morbidities, suggests that a nutritional iron deficiency anaemia may be a proportionately larger contributor to the aetiology of anaemia in SA than in the other studies. It is therefore possible that a larger proportion of pre-operative anaemia may be reversible in SA compared with other published cohorts. This is important in view of the fact that pre-operative anaemia is associated with significant peri-operative morbidity and mortality.

Internationally, increasing awareness of the risks and expenses associated with allogeneic blood transfusions has resulted in a shift of focus from transfusion as a treatment for peri-operative anaemia to a more holistic patient blood management (PBM) strategy.[10] PBM is an evidence-based approach that aims to identify and address the three pillars of haematological risk that face surgical patients through:

(i) Identification and treatment of pre-operative anaemia;
(ii) Minimisation of peri-operative blood loss; and
(iii) Management of post-operative anaemia by optimising the patient's physiological reserve together with the adoption of restrictive haemoglobin transfusion triggers.[11,12]

This approach has been associated with a reduction in:

(i) Peri-operative morbidity and mortality;
(ii Peri-operative blood loss and transfusions;
(iii) Length of hospital stay; and
(iv) Costs.[13]

Indeed, in recognition of these benefits, in 2010 the World Health Assembly urged member states to promote PBM as a transfusion alternative where appropriate.[14] Our study suggests that pre-operative anaemia is common in SA, and it provides impetus to actively adopt a PBM approach in SA. We believe that this has the potential to improve surgical outcomes in this country. Future local research should attempt to determine the types of pre-operative anaemia and appropriate treatment regimens.

Study strengths and weaknesses

A major strength of this study is that it was possible to control for other independent predictors of mortality and critical care admission using the full SASOS data set. The finding that anaemia is associated with mortality and critical care admission in SA is therefore robust. A further strength is that this study included all the government-funded tertiary hospitals and 55.4% of the government-funded regional and tertiary hospitals in SA.[8] These data therefore have generalisability for these surgical populations in SA. A potential weakness of the study is that surgical populations attending private hospitals were not included, and the results may therefore not be generalisable to this population. Similarly, government-funded district hospitals were poorly represented, and these data may therefore not be generalisable to these hospitals. However, the finding that anaemia is independently associated with peri-operative mortality in SA is consistent with other surgical studies,[1] and would suggest that our data are probably generalisable to the entire SA surgical population.

Table 4. Independent predictors of critical care admission

	OR (95% CI)	*p*-value
Anaemia	1.487 (1.081 - 2.046)	0.015
ASA		
1	Ref	
2	1.403 (0.895 - 2.201)	0.140
3	4.895 (3.236 - 7.405)	<0.001
4	12.110 (7.086 - 20.694)	<0.001
5	7.564 (2.240 - 25.538)	0.001
Grade of surgery		
Minor	Ref	
Intermediate	2.230 (1.307 - 3.805)	0.003
Major	8.735 (5.192 - 14.696)	<0.001
Urgency of surgery		
Elective	Ref	
Urgent	2.335 (1.550 - 3.520)	<0.001
Emergency	3.090 (2.049 - 4.660)	<0.001
Indication for surgery		
Non-communicable disease	Ref	
Infection	1.014 (0.652 - 1.575)	0.952
Injury	1.515 (1.059 - 2.169)	0.023
Type of surgery		
Upper GIT	2.910 (1.756 - 4.824)	<0.001
Head and neck	4.550 (2.533 - 8.174)	<0.001
Neurosurgery	7.523 (4.659 - 12.149)	<0.001
Thoracic	4.431 (2.224 - 8.828)	<0.001

OR = odds ratio; CI = confidence interval; ASA = American Society of Anesthesiologists; TIA = transient ischaemic attack; GIT = gastrointestinal tract.

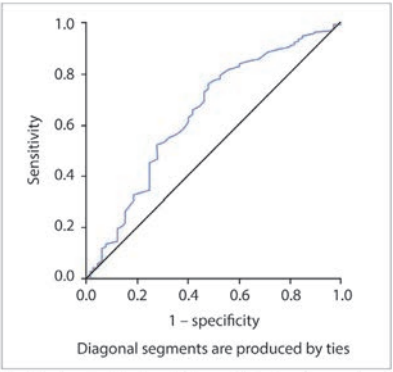

Fig. 2. Receiver operating characteristic curve for preoperative anaemia and survival to hospital discharge.

Owing to the original study design, we could not distinguish acute from chronic anaemia. Acute anaemia is associated with morbidity, and chronic anaemia negatively affects the outcome associated with acute anaemia. While emergency surgery was independently associated with anaemia, injury as an indication for surgery was not. We therefore conclude that it is unlikely that the entire signal of morbidity and mortality associated with anaemia in this study was due to acute anaemia.

We could also not control for peri-operative blood transfusions. It is likely, however, that blood administration and anaemia are both independently associated with post-operative mortality,[15]

and we therefore believe that this weakness should not compromise the interpretation of our findings. Furthermore, it is also possible that the prevalence and severity of pre-operative anaemia may have been underestimated in this study, owing to pre-operative transfusions.

A major limitation of this work is the potential role of multiple testing on the significance of these findings, as this is a secondary analysis of the SASOS dataset. Should one correct for a second analysis for mortality and a second analysis for critical care admission, an adjusted two-sided significance level of 0.05/2 = 0.025 could be considered appropriate. If one applies this approach, anaemia remains independently associated with critical care admission but not mortality. For these reasons, the data presented here should be considered hypothesis generating at best.

Table 5. Independent predictors of anaemia

	OR (95% CI)	*p*-value
Age	1.003 (0.998 - 1.008)	0.244
Gender (female)	1.082 (0.915 - 1.279)	0.358
ASA		
1	Ref	
2	1.131 (0.934 - 1.368)	0.207
3	2.408 (1.873 - 3.096	<0.001
4	5.019 (3.063 - 8.223)	<0.001
5	2.802 (0.724 - 10.855)	0.136
History of		
Coronary artery disease	0.531 (0.360 - 0.783)	0.001
Congestive heart failure	1.357 (0.714 – 2.578)	0.351
Insulin-dependent diabetes	1.749 (1.197 - 2.556)	0.004
Non-insulin-dependent diabetes	1.152 (0.840 - 1.580)	0.380
Metastatic cancer	1.982 (1.226 - 3.205)	0.005
Cirrhosis	2.644 (0.443 - 15.779)	0.286
Stroke/TIA	1.202 (0.647 - 2.230)	0.560
COPD/asthma	0.527 (0.384 - 0.725)	<0.001
HIV/AIDS	1.580 (1.258 - 1.983)	<0.001
Grade of surgery		
Minor	Ref	
Intermediate	0.900 (0.760 - 1.065)	0.220
Major	1.136 (0.922 - 1.399)	0.230
Urgency of surgery		
Elective	Ref	
Urgent	1.835 (1.537 - 2.191)	<0.001
Emergency	1.837 (1.490 - 2.264)	<0.001
Primary indication for surgery recorded		
Non-communicable disease	Ref	
Infection	0.784 (0.629 - 0.976)	0.030
Injury	1.122 (0.885 - 1.423)	0.340

OR = odds ratio; CI = confidence interval; ASA = American Society of Anesthesiologists; TIA = transient ischaemic attack; COPD = chronic obstructive pulmonary disease.

CONCLUSIONS

SA patients have a higher prevalence of pre-operative anaemia than reported in other international cohorts, and this is associated with surgical mortality. Simply transfusing patients peri-operatively can no longer be considered an acceptable solution, owing to the morbidity associated with blood transfusion. Education and institution of PBM programmes in SA are important to reduce the morbidity and mortality associated with pre-operative anaemia.

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Conflicts of interest. None.

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NEWS

CHAPTER PRETORIA, LIMPOPO AND NORTH WEST

African Institute had its very first CSSD full-day Orientation to the CSSD Workshop on the 15th of August 2023. The Central Sterile Services Department (CSSD) is an organised place in hospitals that performs sterilization and other activities on medical devices, equipment and consumables.

The CSSD has a significant part in patient care and in minimising hospital surgical contamination. With the centralisation of the pre-disinfection, cleaning, packing and disinfection of all objects in one section, it is of supreme importance to deliver dependably high quality in the sterilization methods and product quality. Nine modules were presented during the workshop to refresh and upskill employed CSSD technicians. The Workshop introduced the critical pillars underpinning the workforce's roles and responsibilities when assigned to the CSSD, such as introductory Microbiology, Decontamination and Cleaning, Sterile packaging, Steam Sterilization and loading of Autoclaves, Mechanical monitoring and the Bowie-Dick test, Sterile Storage and Distribution and Recordkeeping.

Emphasis was placed on theory-practice correlation and attendees remained engaged by sharing their experiences and challenges, working towards standardized best practices to enhance quality delivery in the CSSD department. Attendees were especially eager to participate in module assessments. Kahoot, a game-based learning platform was used in real time after each Module to assess individual knowledge gained. Congratulations to Ms. Marietjie Fourie from Cintocare, the overall winner of all assessments for the day.

HEALTHCARE SYSTEM BURDENED BY ILL-CONSIDERED MALPRACTICE CASES

MedicalBrief reports on 16 November that there are growing concerns that patient care and doctor well-being are being undermined by the high number of ill-considered and unfounded cases brought against medical practitioners in South Africa.

Statistics from the Health Professions Council of South Africa's 2022/2023 annual report reveal that of the complaints, just 9% were referred by the HPCSA to an inquiry before a professional conduct committee. Of the complaints which were considered by the committees of the Preliminary Inquiry of the Medical and Dental Professions Board, it accepted 39% of the explanations, a further 3% were closed or withdrawn, 12% required further information, 11% resulted in guilty fines, 11% required consultations, 6% could not be decided due to time constraints and the balance related to a various miscellaneous issues. These numbers emphasise that a substantial portion of complaints of

unprofessional conduct brought against healthcare practitioners in the medical and dental profession lack merit. It also tends to suggest that many of these complaints are not closed promptly as they are subjected to time-consuming, costly and extensive committee reviews.

In light of *National Doctors' Day* on 16 November, a leading professional indemnity provider of surgical specialists, EthiQal, highlights the impact that poorly considered allegations have on the healthcare sector. In South Africa, the doctor to patient ratio is about 0.31 doctors per 1 000 patients.

Dr Hlombe Makuluma, clinical risk management specialist at EthiQal, says: "In this context it is patients, who end up paying the price of hasty and sometimes unjustified legal recourse against healthcare professionals. After ill-considered allegations, some doctors stop practising altogether or reduce their scope of practice, given fear of future litigation, further exacerbating South Africa's critical doctor shortage. Others become defensive in their practice and push up healthcare costs unnecessarily by performing tests aimed at mitigating their medico-legal risks. This is costly, especially to the patient, and can be based more on mitigating the doctor's own risk, rather than on what they feel their patient requires."

The threat of aggrieved patients reporting doctors to the HPCSA, or demanding compensation or, in the worst cases, laying criminal charges against them, can take a massive toll on the mental well-being of healthcare professionals.

"A condition known as medical malpractice stress syndrome (MMSS) has been recognised as affecting medical professionals who are subjected to litigation. This disorder, which includes severe anxiety and depression and physiological changes relating to immune and endocrine functions, speaks to the often profoundly negative impact unfounded allegations can have on doctors," said Makuluma.

South Africans are urged to openly discuss their grievances with their treating doctor before reporting the practitioner or taking legal action. Head of claims and legal at EthiQal JP Ellis says: "Legal action should be a last resort, pursued only after all other channels of communication and conflict resolution have been thoroughly explored. It's essential to recognise that litigation is not only costly but also time-consuming, intricate, and emotionally draining for both parties involved. By fostering open dialogue and understanding between patients and healthcare professionals, we can mitigate unnecessary legal proceedings and uphold the integrity of our healthcare system."

Other than the undue stress it causes to both the patient and doctor involved, unwarranted legal action creates unnecessary bottlenecks within the regulatory processes, potentially slowing down the review of deserving cases. While the HPCSA has acknowledged the delays and inefficiencies within their processes, they are actively dedicated to making significant improvements.

Ellis adds: "Medical care cannot guarantee perfect outcomes and it is important to understand that it inherently involves certain risks. It is essential to recognise that less-than-ideal outcomes or unexpected complications do not automatically indicate negligence. Our courts have cautioned against the natural human inclination to attribute blame to someone when an innocent party is injured. This underscores the importance of distinguishing between adverse outcomes and genuine negligence. Doctors' Day is an opportunity to recognise the growing challenges facing South African doctors. It is also an opportunity for each of us, as patients, to foster open and direct communication with our doctors to safeguard a robust healthcare system in our country."

APPSA GUIDELINES

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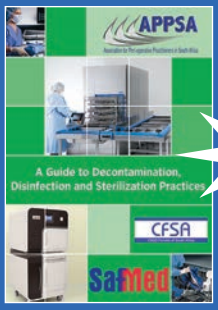

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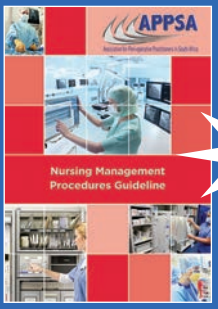

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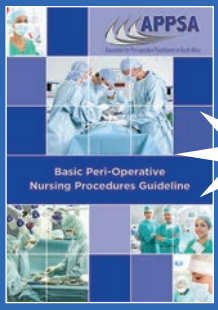

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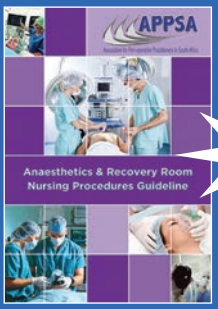

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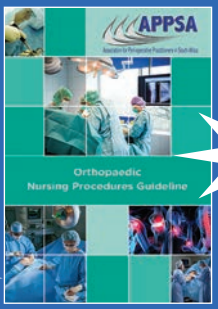

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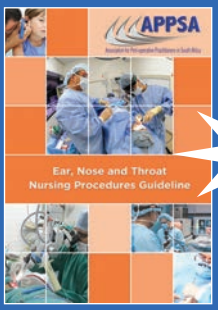

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