THE PRACTICE OF PATIENT BLOOD MANAGEMENT AMONG SOUTH AFRICAN ANAESTHETIC PROVIDERS

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A research report submitted to the Faculty of Health Sciences,

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Declaration

I, Creaghan Eddey, herewith declare that this research report is my own, unaided work. It is being submitted for the degree of Master of Medicine at the University of the Witwatersrand, Johannesburg. It has not been submitted before for any degree or examination at any other University.

_____Signed

On this 15th day of May 2024

Dedication

To all those who have died from bleeding.

Acknowledgements

To Cara Redelinghuys, who’s guidance was invaluable.

To David Baron, whose preceding work inspired ours.

To Clarence Yah, for his statistical knowledge.

To my family, and, especially to Marlé Marais, whose support sustained me.

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Abbreviations

CLT: Conventional Laboratory-based testing

FDP: Freeze-Dried Plasma

FFP: Fresh Frozen Plasma

Hb: Haemoglobin

HICs: High Income Countries

ISBT: International Society of Blood Transfusion

LMICs: Low- and Middle-Income Countries

PBM: Patient Blood Management

PGY: Post-Graduate Year

POC: Point Of Care

RCC: Red Cell Concentrate

REDCap: Research Electronic Data Capture

SANBS: South African National Blood Service

SASA: South African Society of Anaesthesiologists

TXA: Tranexamic Acid

WHO: World Health Organization

Draft article

This article is prepared according to the author guidelines for *Anaesthesia and Analgesia* and may differ from the rest of the document (Appendix 7).

The practice of patient blood management among South African anaesthetic providers

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C. Redelinghuys: Conceptualisation, Methodology, Validation, Formal analysis, Investigation, Data Curation, Writing- original draft, Writing- review and editing, Visualisation, Project administration, Supervision.

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Declaration of Interests

C.R. Eddey would like to declare that this project was submitted in partial fulfilment of requirements for the Master of Medicine (Anaesthesia) at the University of the Witwatersrand. The other authors have no declarations.

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Abstract

Background

Patient Blood Management (PBM) is a multidisciplinary and evidence-based approach aimed at optimising patient outcomes by effectively managing and preserving a patient's own blood, minimising unnecessary transfusions, and promoting overall blood conservation strategies. Thus far, perioperative PBM practices of South African anaesthetic providers have not been described.

Methods

This study prospectively evaluated perioperative PBM practices in South Africa utilising an online survey. In addition, we described the extent to which practices align to the national guidelines, the 2020 South African Society of Anaesthesiologists (SASA) guidelines, and 2014 South African National Blood Service (SANBS) guidelines.

Results

The information letter was opened 573 times. We received 403 surveys that were more than 50% complete and were included in this study. Most respondents were specialists (54.6%) or specialist trainees (25.1%) within their first five years of practice (54.6%). Most providers (89.3%) often or always record a preoperative haemoglobin. Only 1% of providers would defer elective surgery, other than caesarean section, if the haemoglobin (Hb) was <13 g/dL. Appropriate treatment of preoperative anaemia was rarely or never seen by 65.5% of respondents. Access to point of care (POC) coagulation testing was good with only 25.6% having no access to any POC test. Freeze-dried plasma (FDP) is commonly (89.3%) accepted as a substitute for fresh frozen plasma (FFP). A majority (63.9%) of respondents use a transfusion threshold of

7 g/dL for red cell concentrates (RCC) in non-cardiac patients. Few respondents often or always use cell salvage in non-obstetric surgery where >500 ml of blood loss is anticipated (21.2%), or in obstetric major haemorrhage (21.2%). In major haemorrhage, most respondents often or always monitor for, treat, and prevent hypothermia (97.5%), acidosis (96.0%), hypocalcaemia (90.0%), and hyperkalaemia (91.6%). Tranexamic acid is often or always used commonly in severe trauma (70.7%) and major obstetric haemorrhage (72.1%).

Conclusions

Overall, PBM practices were poor, and not in keeping with South African guidelines. The management of preoperative anaemia stands out as the most notable deficiency.

Key points:

Research question: What are the perioperative patient blood management (PBM) practices among South African anaesthetic providers? How do these practices align with the SASA and SANBS guidelines?

Findings: Overall, PBM practices were poor, and not in keeping with South African guidelines.

Meaning: Important context is provided for PBM in low- and middle-income countries.

Introduction

Patient blood management (PBM) is a comprehensive healthcare strategy designed to improve patient outcomes by focusing on the optimal use and conservation of blood resources. Emphasising a multidisciplinary approach, PBM seeks to minimise unnecessary blood transfusions, promote judicious use of blood products, and address preoperative anaemia, ultimately improving patient safety and well-being. Through evidence-based practices and collaboration among healthcare professionals, PBM aims to improve the quality of care while ensuring the responsible and efficient use of blood resources.[1] The World Health Organization (WHO) has acknowledged the urgent need to implement PBM globally: “PBM has the potential to significantly improve global population health and the clinical outcomes of patients and the population at large, while reducing health care costs by billions of US dollars.[2]”

South Africa is an upper-middle-income economy, where anaemia is common.[3–5] This applies to the perioperative population where half of adult (47.8%) and paediatric (46.2%) South African surgical patients are anaemic preoperatively. In adults with preoperative anaemia, the 30-day in hospital mortality rate was 4.9%, more than double that seen in those without anaemia (1.9%).[3,4] South Africa and other low- and middle income countries (LMICs) are encouraged to implement PBM and establish systems to conserve blood,[6] important in the context of national blood product shortages.[6,7] Despite these challenges; modelling shows South Africa to be the only country in Sub-Saharan Africa with enough blood collection to meet need.[8]

Perioperative PBM in South Africa is governed by two sets of guidelines: the South African Society of Anaesthesiologists (SASA) Perioperative Patient Blood Management Guidelines of 2020 and the South African National Blood Service (SANBS) Clinical

Guidelines for the Use of Blood Products in South Africa of 2014.[9,10] The impact of these guidelines on practice among South African anaesthetic providers has not been investigated. The primary objective was to describe the practices surrounding perioperative PBM among South African anaesthetic providers. The secondary objectives were to describe how these practices compared to the 2020 SASA perioperative PBM guidelines and the 2014 SANBS Clinical guidelines for the Use of Blood Products in the South Africa.[9,10]

Methods

The study followed a prospective, cross sectional research design. Approval to conduct the study was granted by the University of the Witwatersrand Human Research Ethics Committee (Medical; May 5, 2023 M230407), and the University of Pretoria Faculty of Health Sciences Research Ethics and the Survey Committee (May 31, 2023 216/2023).

The study population included all anaesthetic providers in South Africa. These providers were provided with a link to the information leaflet and survey shared via university departments, private hospitals, and national medical and anaesthetic organisations. Surveys that were less than 50% complete were excluded. Study data were collected and managed using REDCap (Research Electronic Data Capture) tools hosted at the University of the Witwatersrand.[11,12] The data capture period ran from June 5, 2023 until October 13, 2023.

The sample population is the 8814 anaesthetic providers in South Africa.[13] The Raosoft® sample size calculator was used to determine that, if a 5% margin of error is expected, with a 95% confidence interval and the response distribution is expected to be 50%, 369 responses would be needed.

The survey, available in appendix A, was based on the work of Baron et al. and adapted for content to the 2020 SASA and 2014 SANBS guidelines.[9,10,14] A survey of 30 questions was produced. The questions were characterised into four groups: demographics, background of practice, preoperative practice, and intraoperative practice. A panel of national experts reviewed the questions for face and content validity. Participants were instructed to complete the questions with reference to their clinical practice.

Data was analysed, using Stata®, with assistance from a biostatistician and expressed as frequencies and analysed according to the number of responses given for each question. The survey consisted of single and multiple answer questions. A five-point Likert scale (never, rarely, sometimes, often, and always) was used to quantify the frequency of practice. In the reporting of this data we adhered to the EQUATOR guidelines and the STROBE checklist.

Results

The information leaflet was opened 573 times. The survey was started 484 times. A total of 81 surveys, representing 16.7% of responses, were less than 50% complete and were excluded as per protocol. The remaining 403 (83.3%) survey responses were analysed, giving a margin of error of 4.8%.

Table 1 shows the characteristic data of the population surveyed. The sample consisted mostly of specialists (47.6%) and specialist trainees (25.1%). A large majority were in the first 10 years of time at their current training status (75.7%) with a majority being within the first five years (54.6%). Nearly a third (31.3%) of respondents had work in

private hospitals, and 42.2% of respondents had work in a university affiliated hospital. Only 8.7% of respondents worked in smaller district hospitals.

Table 2, included in appendix B, displays data regarding the presence of institutional protocols and engagement with guidelines. Awareness of both the SASA (75.2%) and SANBS (74.9%) guidelines was high. However, only 15.1% had read the SASA guidelines in full. Only 13.4% had read the SANBS guidelines in full. Both guidelines were mainly engaged with in part or as a summary. A large majority of anaesthetic providers (93.8%) believe their management of severe perioperative bleeding could be improved. Only 30.5% of participants were certain that their institution had a written protocol, guideline or algorithm concerning the management of severe perioperative bleeding. Another 41.9% were certain that they did not and 27.5% were uncertain

. This deviates from the SASA guidelines which recommend that policies should be defined in an institutional major haemorrhage protocol.[9] The SANBS guidelines do not make a recommendation.

Figure 1 displays data about the perioperative assessment and treatment of anaemia. Recording of a preoperative haemoglobin (Hb) was common, in keeping with SASA guidelines.[9] The SANBS guidelines do not make a recommendation.

The SASA guidelines recommend that those with untreated anaemia (Hb <13 g/dL) should be investigated before elective surgery and treated.[9] They further recommend that elective surgery, other than caesarean section should be delayed if required. SANBS does not make a recommendation on delaying elective surgery, but do recommend that anaemia is investigated and a definitive diagnosis made.[10] Despite this only 1% of anaesthetic providers would delay elective surgery other than caesarean

section if the Hb was <13 g/dL. The most common practice was to only delay surgery if Hb was <7 g/dL (55.1%).

The treatment of preoperative anaemia was poor with 65.5% of respondents rarely or never seeing patients with a Hb <13 g/dL receiving appropriate treatment, such as iron supplementation, in the perioperative period. This is despite the SASA and SANBS recommendations.[9,10]

Figure 2 displays data with regards to the perioperative assessment and treatment of coagulopathy. A quarter (25.6%) of respondents had no access to any validated POC modalities used in PBM. The most commonly available POC device is the TEG® (58.1%).

Conventional laboratory-based testing of clotting, including activated partial thromboplastin time, prothrombin time and international normalised ratio, was used sometimes (30.3%,) and often or always (27.8%) in the management of acute, ongoing bleeding. There appears to be weak acceptance of the SASA recommendation that these laboratory tests have little relevance to acute bleeding.[9] In addition, there is conflict with the SANBS recommendation that POC or laboratory testing should guide management.[10] A plurality (42.0%) of respondents never or rarely used POC testing in acute, ongoing bleeding, however 36.9% often or always used POC testing. The use of POC testing in acute, ongoing bleeding is recommended by both SASA and SANBS.[9,10]

Freeze-Dried Plasma (FDP) is commonly viewed by respondents (89.3%) as an acceptable substitute for Fresh Frozen Plasma (FFP). This is in keeping with SASA recommendation.[9] SANBS did not make a recommendation. The South African context may have influenced the SASA recommendation.

The SANBS guidelines recommend a dose of 10-15 ml/kg for FFP, and make no recommendation for FDP.[10] The SASA guidelines recommend 15-20 ml/kg for both FDP and FFP.[9] A 10-15 ml/kg dose was used by 54.7% of respondents for FDP and 55.2% for FFP. Only 14.2% answered 15-20 ml/kg for FDP and 14.4% for FFP. The SASA recommendation does not appear to be broadly adopted.

Figure 3 displays data on perioperative transfusion and cell salvage practices. A majority (63.9%) of respondents use a transfusion threshold of 7 g/dL for red cell concentrates (RCC) in non-cardiac patients. This aligns with the recommendations of both the SASA and SANBS guidelines.[9,10] Despite this recommendation, 34.1% of respondents use a value greater than 7 g/dL and 2% a value less than 7 g/dL as transfusion threshold for RCC.

Respondents commonly used a higher transfusion threshold in acute coronary syndrome (79.2%,) ischaemic heart disease (88.3%,) and after cardiac surgery (61.5%.) This is consistent with the SASA recommendation that a clinician may consider a threshold of 8 g/dL, and SANBS recommendation of targeting a post transfusion value of 8-10 g/dL.[9,10] SANBS does not comment on cardiac surgery.

While the SANBS guideline does not make a recommendation on the use of Group O emergency RCC, SASA suggests that it should only be used when haemorrhage is life threatening.[9] Group O emergency RCC is used by 94.8% of respondents in this situation. However, Group O emergency blood is being given by 23.3% of respondents while waiting for blood from the blood bank when turnaround time is normal, and 39.0% if turnaround time is prolonged. These are not guideline-approved practices. Group O emergency RCC transfusion is safe, however they represents a limited resource in South Africa.[7,16]

The use of cell salvage varies, both in major obstetric haemorrhage and non-obstetric surgery, where blood loss greater than 500 ml is anticipated. Despite a SASA recommendation, only 21.2% often or always use cell salvage in non-obstetric surgery, and 26.6% answered the same for obstetric surgery.[9] Though SANBS describes cell salvage as a technique, no recommendation was made on its use.[10]

Figure 4 details resuscitative practices surrounding perioperative major haemorrhage. The practices surrounding resuscitation of major haemorrhage appear to be in line with the guidelines. Both the SASA and SANBS guidelines suggest that one should monitor for, prevent and treat hypothermia, acidosis, hypocalcaemia and hyperkalaemia.[9,10]

Figure 5 shows data on the perioperative use of tranexamic acid (TXA). Despite frequent usage of TXA in both severe trauma and obstetric major haemorrhage, most of the dosing strategies employed were not those recommended by the guidelines. Both SANBS and SASA recommend that TXA be given to critically ill patients with severe trauma as a bolus followed by an infusion.[9,10] The SASA guidelines recommended 1 g stat then 1 g over 8 hours. The SANBS guidelines recommend a loading dose of 10 mg/kg followed by the same dose over 6 hours. In trauma the most frequent dosing strategy was bolus only (35.2%), followed by bolus infusion (35.0%). A significant portion of the study population (22.1%) used a bolus repeat strategy. In major obstetric haemorrhage, SASA suggests a bolus repeat strategy.[9] SANBS does not suggest a dosing strategy for TXA in obstetric major haemorrhage. In obstetric major haemorrhage, only 22.4% used the guideline suggested bolus repeat strategy, 51.2% gave a bolus only and 17.2% followed a bolus-infusion strategy.

Discussion

In 2015, Baron et al. performed a survey study to investigate how PBM practices in Europe compared to recommendation of the European Society of Anaesthesia guidelines.[14,17] Data from LMICs surrounding PBM practices is poor, however a 2017 International Society of Blood Transfusion (ISBT) survey describes global presence of PBM interventions on the institutional level, and compares high income countries (HICs) to LMICs.[18] According to the ISBT, providers had access to transfusion guidelines more often in HICs (90.3%) than LMICs (72.8%).

The 30.5% rate of institutional protocol presence for the management of severe perioperative bleeding in South Africa compares unfavourably with Europe in 2015 at 52%.[14] The ISBT survey showed major haemorrhage protocols to be more common in HICs (73.4%) than LMICs (41.4%).[18]

In Europe, 24% of respondents were assessed for anaemia four to eight weeks prior to surgery.[14] If anaemia was detected only 38% routinely investigated for a cause. In South Africa, despite 89.3% often or always recording a Hb preoperatively, only 1% deferred elective surgery to allow for work-up and treatment of anaemia. Only 10.9% often or always saw patients receive appropriate preoperative treatment for anaemia.[9,10] According to the ISBT survey, preoperative outpatient screening was as commonly available in LMICs (62.9%) and HICs (63.7%).[18] Anaesthetists were the most common group responsible for this screening in both HICs (58.2%) and LMICs (45.5%). The SASA recommendation that pre-assessment clinics be established may improve South African performance. The issue remains important, as preoperative anaemia is associated with poor outcome and death, both in South Africa and internationally.[4,19]

A quarter (25.6%) of physicians in our survey reported having no access to POC testing, a rate lower than that in Europe in 2015 (41%). In Europe, ROTEM® was most commonly available (36.1%),[14] whereas ROTEM® was only available to 19.9% of participants in South Africa. TEG® was available to 58.1% of South Africans, but only 19.5% of Europeans.[14] Despite this, usage of POC testing is poor in South Africa. Europeans with access to POC testing used it 75% of the time. While not directly comparable, South Africans only used POC testing often or always 34.9% of the time.

A systematic review was unable to recommend or discourage the use of FDP in major haemorrhage.[15] The shelf- stable nature of FDP may have driven the SASA recommendation of equivalence with FFP.

In Europe, 56% of physicians used a transfusion threshold of 7- 9 g/dL.[14] The South African sample used a threshold of >7 g/dL in 63.9%.

Europe reported a 28% rate of cell salvage use. This compares with a South African rate of 21.8% often or always using non-obstetric cell salvage, when 500 ml of blood loss are anticipated, and 26.6% for cell salvage in major obstetric haemorrhage. The ISBT data shows intra- and postoperative cell salvage were more commonly available in HICs (55.6%) than LMICs (38.6%).[18] Cell salvage is an important part of a blood conservation strategy.[20]

In Europe, 89% of respondents aimed to avoid hypothermia and acidosis.[14] In South Africa 97.5% often or always monitor, prevent, and treat hypothermia, and 96.0% do the same for acidosis. Europe did not report rates for hypocalcaemia or hyperkalaemia, however South Africans performed well in these areas. The importance of treating acidosis, hypothermia, hypocalcaemia and associated coagulopathy in bleeding is

established.[21] Transfusion of RCC is associated with hyperkalaemia.[22] This represents a strength in South African perioperative PBM.

In Europe, 54% of respondents routinely utilised TXA.[14] South Africa compares favourably with 70.7% often or always using TXA in severe trauma, and 72.1% doing the same in obstetric major haemorrhage. The ISBT survey showed intraoperative TXA availability to be higher in HICs (56.5%) than LMICS (38.6%). Poor adherence to SASA guideline dosing needs to be put into context. The use of TXA in postpartum haemorrhage and bleeding trauma patients has been established.[23,24] However, a single 1 g or 2 g TXA bolus was found to be equivalent to a bolus-infusion technique in traumatic major haemorrhage.[25] It may be practical for future guidelines to recognise this.

Strengths

This is the first study describing the perioperative PBM practices of anaesthetic providers in South Africa. It was broadly distributed throughout the country, and offers important context to the implementation of perioperative PBM, both in South Africa and other LMICs.

Limitations

This study is at risk of response bias. The population surveyed may not represent anaesthetic providers in South Africa as a whole, as convenience sampling was used. The data which was used to estimate population size is from 2017, no newer data was found.[13] The ways in which the population of anaesthetic providers in South Africa have changed since is unknown. The sample included only anaesthetic providers and is not generalisable to other groups. The work patterns or mix of anaesthetic providers was

not investigated, which may influence the degree to which certain subpopulations and situations covered in the survey are encountered. The availability of cell salvage was not investigated and may have affected practices surrounding its use. We were unable to describe the reasons for practice variation. Further work is required in this direction.

Conclusions

A large majority of anaesthetic providers in South Africa believe their management of severe perioperative bleeding could be improved. This may be achievable through the implementation of PBM.

South Africa remains at the stage of individual PBM initiatives.[26] Currently, there are no large scale or state mandated programmes. However, the *Saving Blood, Saving Lives* project, which aims to encourage rational blood product utilisation without increasing cost or requiring additional staff has shown the effectiveness of PBM interventions in South Africa.[27] The strategy consisted of a paper-based blood transfusion accountability form, a 12-minute educational presentation, and the revitalisation of the hospital transfusion committee. The programme reduced RCC, platelet and FDP use by 40% and saved R46 million ($2 458 000) over 5 years..

Overall, PBM practices were not in keeping with local guidelines. The most glaring deficiency is in the observed management of preoperative anaemia. A particular weakness is in the rate of treating preoperative anaemia appropriately.

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Tables and Figures

Table 1: Demographic data.

		Frequency (n)	(%)
Training Status			
Community Service Medical Officer	**Nonspecialist-PGY 3**	5	(1.2)
Medical Officer	**Nonspecialist-PGY ≥4**	105	(26.1)
Registrar	**Specialist trainee**	101	(25.1)
Specialist	**Registered specialist**	192	(47.6)
PGY: post-graduate year			
Years of Experience at current training status			
<5 Years		220	(54.6)
≥5-<10 years		85	(21.1)
≥10-<15 years		38	(9.4)
≥15-<20 years		20	(5.0)
≥20 years		40	(9.9)
Place of work (Multiple answer question)			
Public Hospital – District	**Generalist service**	35	(8.7)
Public Hospital – Secondary	**Specialist service**	67	(16.6)
Public Hospital – Tertiary	**Subspecialist service**	118	(29.3)
Public Hospital – University affiliated	**Academic**	170	(42.2)
Private Hospital	**Independent sector**	126	(31.3)

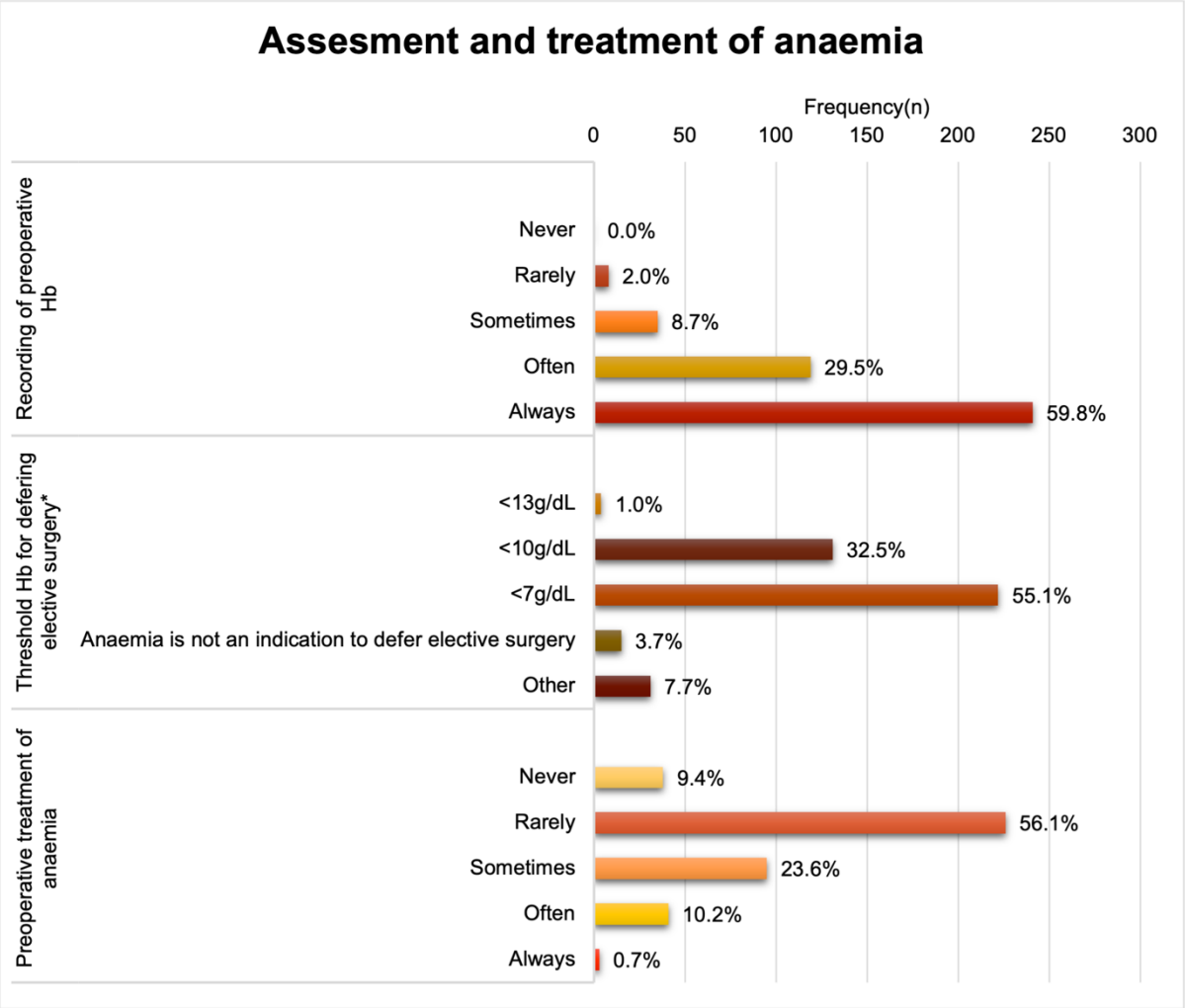

Figure 1: The preoperative assessment and treatment of anaemia among South African anaesthetic providers

(*Other than caesarean section)

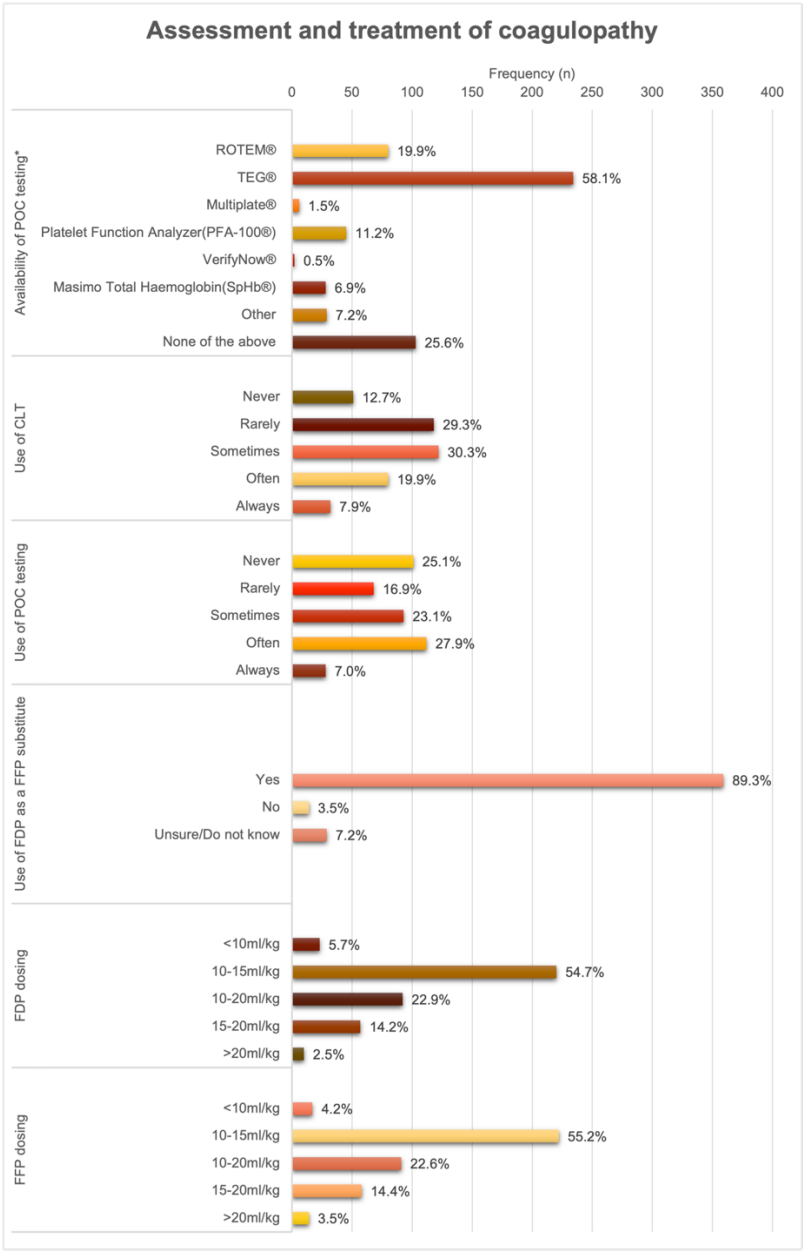

Figure 2: The perioperative assessment and treatment of coagulopathy in ongoing bleeding among South African anaesthetic providers

(*Multiple answers permissible)

(POC: point of care, CLT: conventional laboratory-based testing, FDP: freeze-dried plasma, FFP: fresh frozen plasma)

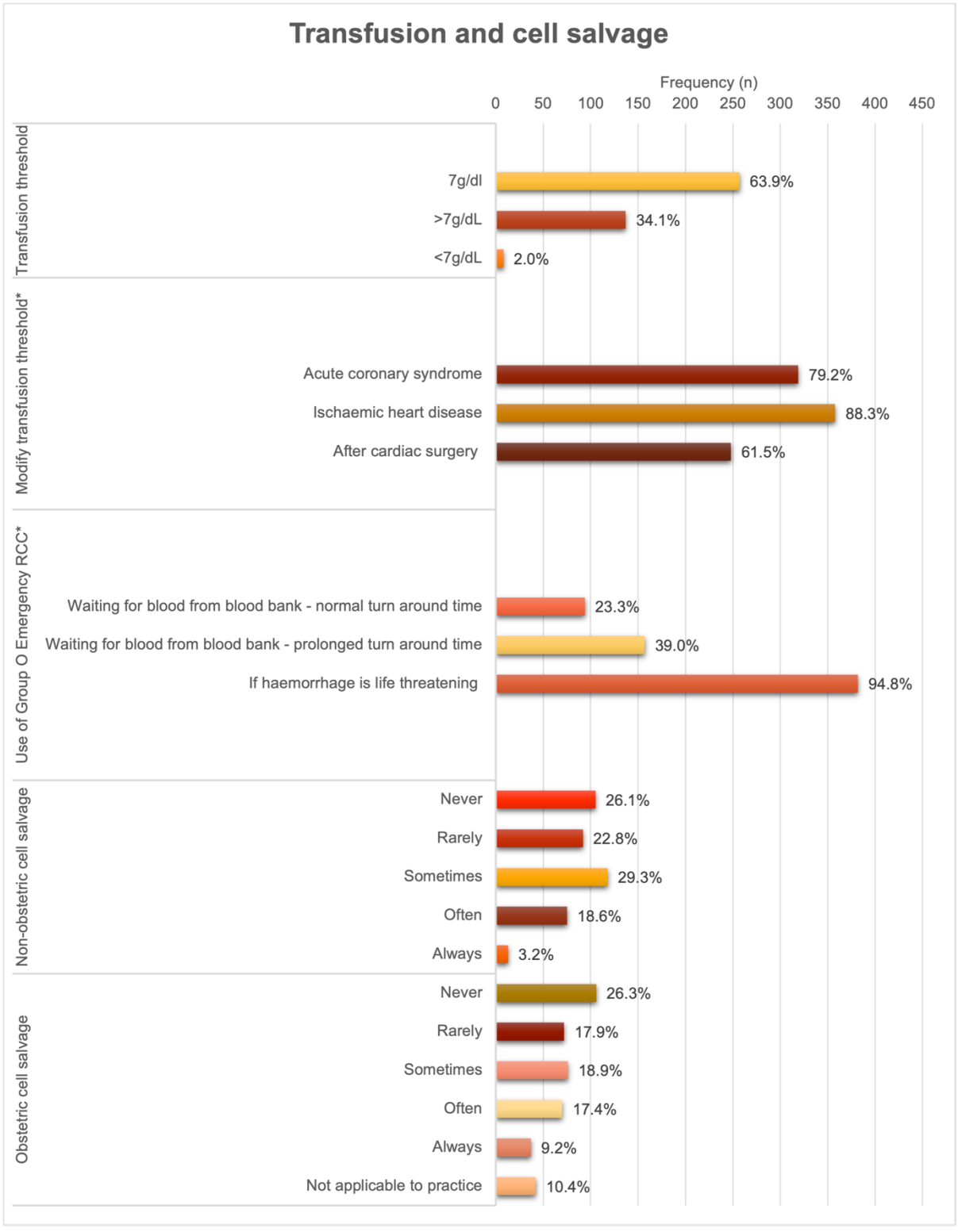

Figure 3: The perioperative transfusion and cell salvage practices among South African anaesthetic providers

(*Multiple answers permissible)

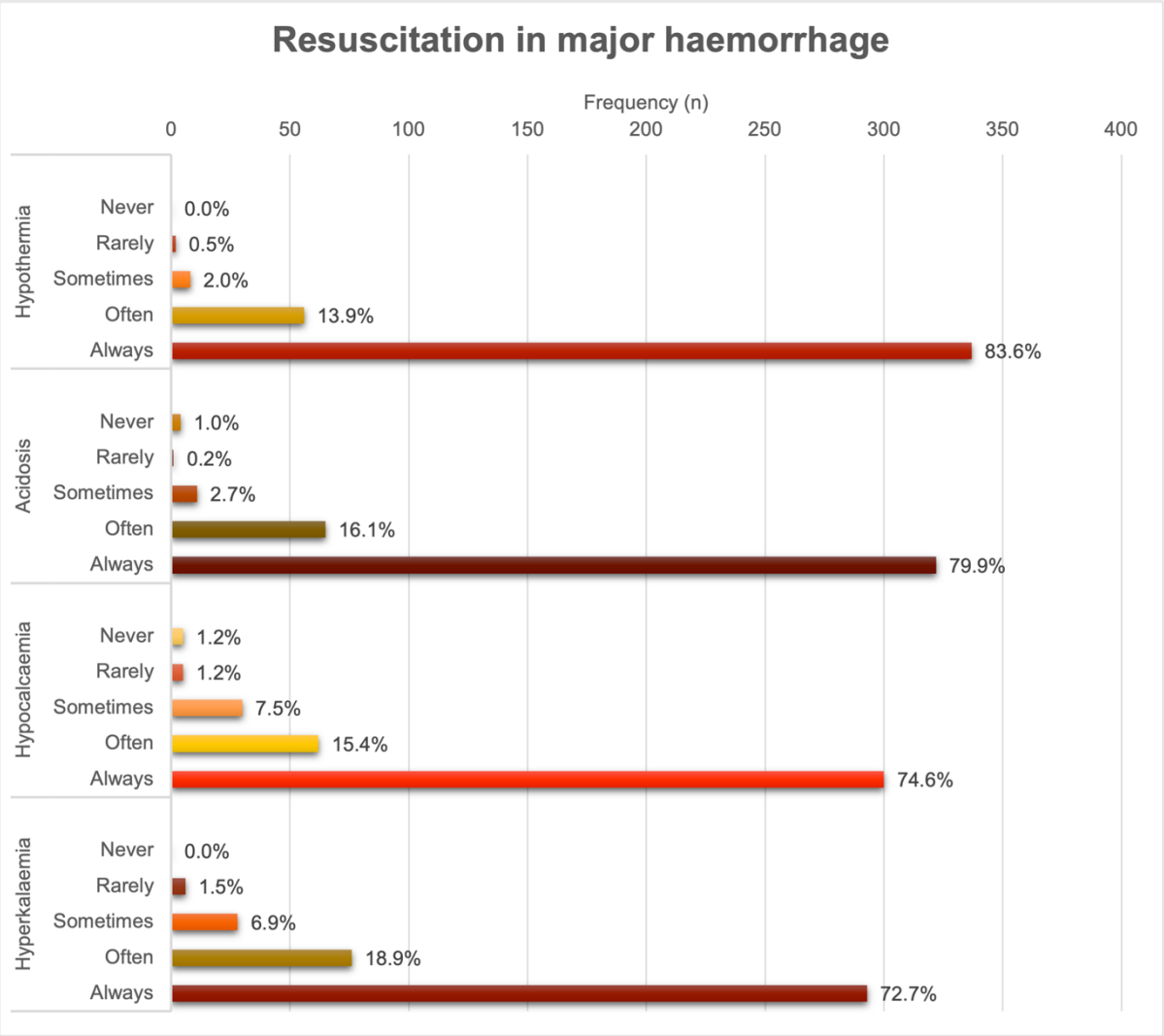

Figure 4: The monitoring, treatment, and prevention of hypothermia, acidosis, hypocalcaemia, and hyperkalaemia in major haemorrhage among South African anaesthetic providers

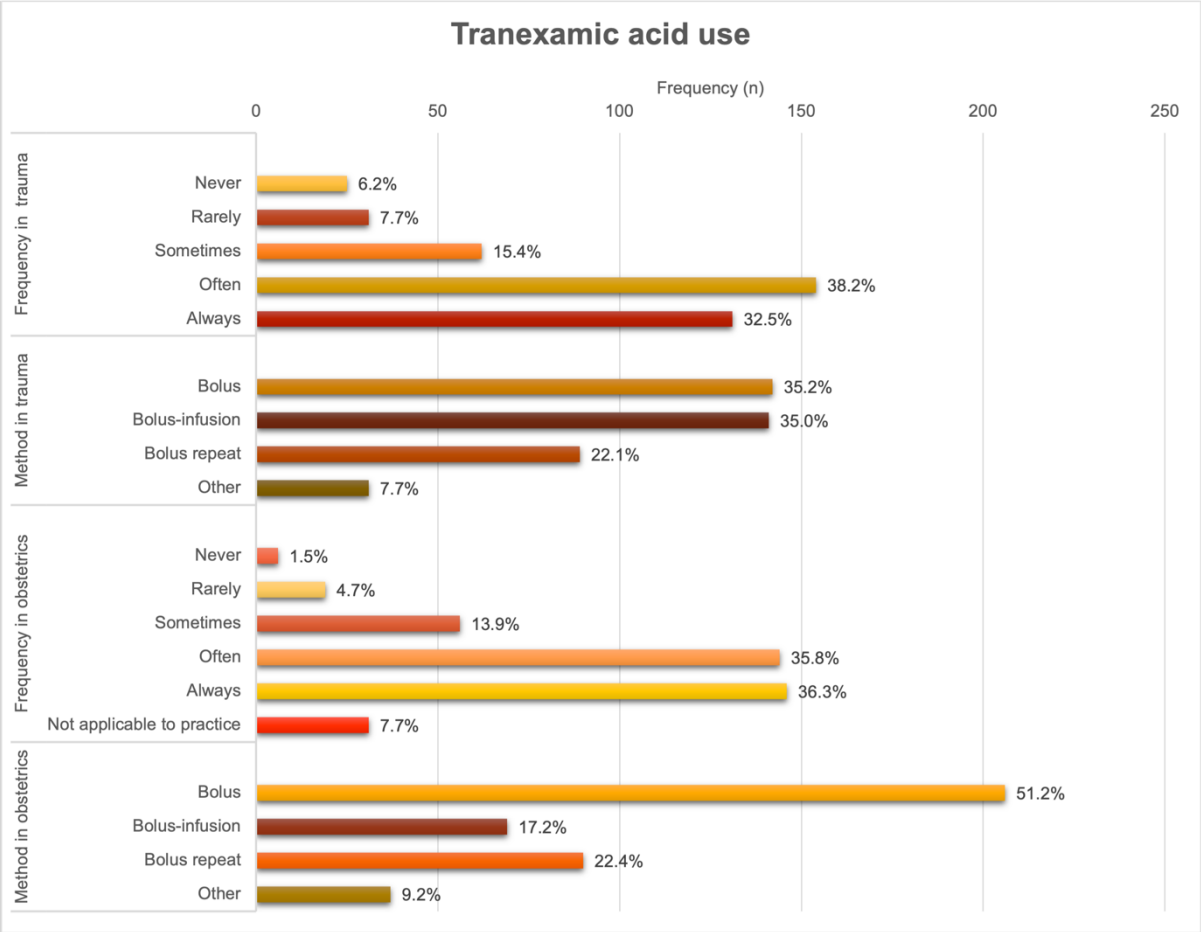

Figure 5: The use of tranexamic acid among South African anaesthetic providers in severe trauma (within 3 hours of injury) and in obstetric major haemorrhage.

(TXA: Tranexamic acid, Bolus: 1 g TXA intravenously stat, Bolus-infusion: 1 g TXA intravenously stat followed by 1 g infused over 8 hours, Bolus repeat: 1 g TXA intravenously stat followed by 1 g after 30 minutes if bleeding persists or recurs within 24 hours)

Appendix A: Research tool

Demographics:

1. What is your training status?
    - Community Service Medical Officer
    - Medical Officer
    - Registrar
    - Specialist

2. Please state the number of years you have at your current training status?

3. Where do you work? (Select all that apply)
    - Public Hospital
        i. District
        ii. Secondary
        iii. Tertiary
        iv. University affiliated
    - Private Hospital

Background:

4. Does your institution have a written protocol, guideline, or algorithm concerning the management of severe perioperative bleeding?
    - Yes
    - No
    - Unsure/Do not know

5. Which of the following point-of -care testing modalities are available at your institution? (Multiple answers may apply)
    - ROTEM®
    - TEG®
    - Multiplate®
    - Platelet Function Analyzer(PFA-100®)
    - VerifyNow®
    - Masimo Total Haemoglobin(SpHb®)
    - Other (Please specify)
    - None of the above

6. Are you aware of SASA guidelines on perioperative patient blood management?
    - Yes
    - No

7. Are you aware of SANBS guidelines on the use of blood products?
    - Yes
    - No

8. Have you read the SASA guidelines on perioperative patient blood management?
    - Fully
    - In part
    - As a summary
    - No

9. Have you read the SANBS guidelines on the use of blood products?
    - Fully
    - In part
    - As a summary

10. Do you believe that your current management of severe perioperative bleeding could be improved?
    - Yes
    - No

Preoperative:

For answers in this section please refer to your current personal practice

11. Do you record a preoperative haemoglobin (Hb)?
    - Never
    - Rarely
    - Sometimes
    - Often
    - Always

12. At what haemoglobin would you defer elective surgery, other than caesarean section, to allow for work up and treatment of anaemia?
    - <13g/dL
    - <10g/dL
    - <7g/dL
    - I would not defer elective surgery for this reason

13. How commonly do you see patients with haemoglobin values <13g/dL receiving appropriate treatment (e.g., iron supplementation or erythropoietin based on cause) in the preoperative period?
    - Never
    - Rarely
    - Sometimes
    - Often
    - Always

Intraoperative:

For answers in this section please refer to your current personal practice

14. In high and medium risk non-obstetric surgery, where a blood loss greater than 500ml is anticipated, how often do you use cell salvage?
    - Never
    - Rarely
    - Sometimes
    - Often
    - Always

15. How often do you use cell salvage in obstetric major haemorrhage?

    - Never
    - Rarely
    - Sometimes
    - Often
    - Always
    - This question is not applicable to my practice

16. How often do you administer tranexamic acid to critically ill patients with severe trauma within 3 hours of injury?

    - Never
    - Rarely
    - Sometimes
    - Often
    - Always

17. How do you administer tranexamic acid to a critically ill patient with severe trauma?
    - 1g intravenously stat
    - 1g intravenously and then 1g infused over 8 hours
    - 1g intravenously stat and then 1g after 30 minutes if bleeding persists or recurs within 24 hours

18. How often do you administer tranexamic acid in bleeding obstetric patients?
    - Never
    - Rarely
    - Sometimes
    - Often
    - Always
    - This question is not applicable to my practice

19. How do you administer tranexamic acid to a bleeding obstetric patient?
    - 1g intravenously stat
    - 1g intravenously and then 1g infused over 8 hours
    - 1g intravenously stat and then 1g after 30 minutes if bleeding persists or recurs within 24 hours

20. In non-cardiac patients do you target a transfusion threshold of 7g/dL for red cell concentrate (RCC?)
    - Yes
    - No, I target a value greater than 7g/dL
    - No, I target a value less than 7g/dL

21. When would you consider a higher transfusion threshold?
    - Acute coronary syndrome
    - Ischemic heart disease
    - After cardiac surgery

22. How often do you use activated partial thromboplastin time (aPPT,) prothrombin time (PTT,) and international normalized ratio (INR) in your management of acute, ongoing bleeding?

    - Never
    - Rarely
    - Sometimes
    - Often
    - Always

23. How often do you use validated point-of-care testing, such as TEG® or ROTEM® in your management of acute, ongoing bleeding?

    - Never
    - Rarely
    - Sometimes
    - Often
    - Always

24. In major haemorrhage would you use freeze dried plasma (FDP) as an acceptable substitute for fresh frozen plasma (FFP?)
    - Yes
    - No
    - Unsure/Do not know

25. What initial dose of freeze-dried plasma (FDP) would you use in major haemorrhage?
    - <10ml/kg
    - 10-20ml/kg
    - 10-15ml/kg
    - 15-20ml/kg
    - >20ml/kg

26. What initial dose of fresh frozen plasma (FFP) would you use in major haemorrhage?

    - <10ml/kg
    - 10-20ml/kg
    - 10-15ml/kg
    - 15-20ml/kg
    - >20ml/kg

27. When would you give Group O emergency red cell concentrate (RCC) to a patient with major haemorrhage?

    - While waiting for blood from the blood bank
    - If blood from the blood bank is delayed
    - If haemorrhage is life threatening

28. In major haemorrhage, do you monitor, prevent, and treat hypothermia?

    - Never
    - Rarely
    - Sometimes
    - Often
    - Always

29. In major haemorrhage, do you monitor, prevent, and treat acidosis?

    - Never
    - Rarely
    - Sometimes
    - Often
    - Always

30. In major haemorrhage, do you monitor, prevent, and treat hypocalcaemia?

    - Never
    - Rarely
    - Sometimes
    - Often
    - Always

31. In major haemorrhage, do you monitor, prevent, and treat hyperkalaemia?

    - Never
    - Rarely
    - Sometimes
    - Often
    - Always

Thank you for taking the time to answer these questions.

Appendix B: Supplemental Data

Table 2: Institutional guidelines and engagement with protocols

	Frequency (n)	(%)
Presence of institutional protocol for management of severe perioperative bleeding		
Yes	123	(30.5)
No	169	(41.9)
Unsure/Do not know	111	(27.5)
Awareness of SASA guidelines		
Yes	303	(75.2)
No	100	(24.8)
Awareness of SANBS guidelines		
Yes	302	(74.9)
No	101	(25.1)
Degree to which SASA guidelines have been read		
Fully	61	(15.1)
In part	143	(35.5)
As A summary	89	(22.1)
No	110	(27.3)

Degree to which SANBS guidelines have been read		
Fully	54	(13.4)
In part	138	(34.2)
As A summary	78	(19.4)
No	133	(33.0)
Belief that management of severe perioperative bleeding could be improved		
Yes	378	(93.8)
No	25	(6.2)

Appendices

Appendix 1: Protocol and appendices

The practice of patient blood management among South African anaesthetic providers

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The World Health Organization (WHO) has acknowledged the urgent need to implement patient blood management (PBM) within healthcare globally: “PBM has the potential to significantly improve global population health and the clinical outcomes of patients and the population at large, while reducing health care costs by billions of US dollars (1).”

Shander *et al* provided a global definition of patient blood management: “Patient blood management is a patient-centred, systematic, evidence-based approach to improve patient outcomes by managing and preserving a patient’s own blood, while promoting patient safety and empowerment (2).”

PBM may be understood through a three-pillar matrix. These pillars are diagnosing and treating anaemia, minimising blood loss, and harnessing a patient’s physiological reserve, with the goal of improving patient outcomes. Risk factors for adverse clinical outcomes in surgical patients include anaemia, haemorrhage, and transfusion. These risks can be minimised by managing preoperative anaemia, maximising red cell mass, minimising blood loss, and tolerating anaemia (3).

Estimates of global blood needs show that 305 million units of blood are needed, while only 272 million are supplied (4). It is estimated that nearly 60% of transfusions are avoidable, if the causes of anaemia, blood loss and coagulopathy were treated timeously and clinically non-indicated transfusions were avoided (5,6).

A study of global PBM practices showed that low and middle income countries (LMICs) were less likely to have access to transfusion guidelines and less likely to use tranexamic acid (TXA) (7). Shortfalls in blood availability compared to demand are common (8). Hospital based blood services rely on self-collection and replacement blood donation commonly. The pretransfusion testing of donated blood varies widely. These shortfalls were further exacerbated by the COVID-19 pandemic, resulting in a 10-

50% reduction in blood availability (9). However, LMICs were as likely as their high income counterparts to perform outpatient perioperative evaluation for anaemia (7).

South Africa was the only country in sub-Saharan Africa with enough blood donations to meet its transfusion needs in modelling of global blood supply and need (4). South Africa is at the initiation stage of PBM, and continues to implement PBM based on individual initiatives without a national program (10). Thomson *et al* described in 2019 the potential benefits of introducing PBM in South Africa; including improvements in public health, surgical outcomes, use of a scarce resource and economic benefit (11). The South African Society of Anaesthesiologists (SASA) Perioperative Patient Blood Management Guidelines of 2020 and the South African National Blood Service (SANBS) Clinical Guidelines for the Use of Blood Products in South Africa of 2014 provide the framework for perioperative PBM in South Africa (12,13).

Yudelowitz explored the knowledge surrounding the ordering and administration of blood products in the perioperative period at a tertiary hospital in South Africa. The results from this study indicate that the knowledge of risks, resources, costs, ordering and return of blood products is poor (14). This study preceded the publication of the SASA guidelines and referenced the 2008 SANBS guidelines, and not those of 2014. Laher and Patel found similar deficits in knowledge surrounding transfusion within the department of medicine at the same institution. Knowledge surrounding plasma products was found to be particularly poor (15).

These results are similar in Europe. In 2016, Baron *et al* conducted a survey surrounding perioperative PBM practices and compared these to European Society of Anaesthesia (ESA) guidelines of 2013. Major deficits were found in the assessment of preoperative bleeding risk, the preoperative treatment and assessment of anaemia,

intra-operative transfusion practices, the pharmacological treatment of significant bleeding, and the use of transfusion and coagulation algorithms (16,17).

Anaemia in the South African surgical population is common. The South African Surgical Outcomes Study (SASOS) showed the rate of preoperative anaemia in noncardiac, non-obstetric surgical patients in government hospitals to be 47,8%. Preoperative anaemia was associated with mortality and critical care admission, as well as prolonged hospital stay (18). The South African Paediatric Surgical Outcomes Study (SAPSOS) showed the rate of preoperative anaemia to be 46,2% in noncardiac surgical patients. There was an association between anaemia and any poor postoperative outcome, as well as the need for intraoperative red cell concentrate (RCC) transfusion (19).

The first pillar of PBM includes the diagnosing and treatment of anaemia .The SASA guidelines suggest that a preoperative haemoglobin should be performed for all patients, that all patients with haemoglobin levels less than 13g/dL should be investigated before elective surgery and treated appropriately and that elective surgery, except for caesarean section, should be deferred in patients with untreated anaemia (12).The SANBS guidelines suggest that all patients with a potential need for blood should have a type and screen. If antibodies are found a completed type and cross-match should be required (13).

The second pillar of the PBM matrix includes minimising blood loss. Surgical strategies to reduce intraoperative blood loss include tourniquets, the use of optimal surgical technique, diathermy, intraoperative and drain cell salvage, antifibrinolytics and topical haemostatic agents. Anaesthetic strategies to reduce intraoperative blood loss may include permissive hypotension, central neuraxial anaesthesia, patient positioning,

avoidance of hypothermia and appropriate choice of ventilation strategy to minimise venous bleeding. Permissive hypotension has been shown to reduce transfusion, but patient selection and monitoring of organ perfusion are important. Haemostatic strategies include desmopressin, procoagulant factors and viscoelastic haemostatic assays (20).

The SASA guidelines suggest that activated partial thromboplastin time (aPTT) prothrombin time (PTT) and international normalised ratio (INR) have little relevance in acute and ongoing bleeding. Validated point of care testing is more relevant and preferred for guiding management (12). Viscoelastic testing reduces the need for blood products and improves morbidity (21,22).

The SASA guidelines suggest that freeze dried plasma (FDP) is an acceptable substitute for fresh frozen plasma (FFP) in the South African setting. They suggest that 15-20ml/kg is the appropriate initial dose for both FDP and FFP (12). The SANBS guidelines suggest a dose of 10-15ml/kg for FFPs but does not discuss equivalence with FDPs. FDP may be used when coagulation factors are required (13).

Tranexamic acid (TXA), an anti-fibrinolytic agent, is of proven benefit in trauma, post-partum haemorrhage and mild and moderate head injury (23–25). The SASA guidelines suggest administering TXA to all critically ill patients with severe trauma within 3 hours of injury. The suggested dose is 1g followed by a 1g infusion over 8 hours (12). The SANBS guidelines suggest that trauma patients with significant haemorrhage should receive TXA 10mg/kg intravenously immediately followed by another dose over 6 hours, provided the initial dose can be administered within 3 hours (13). The SASA guidelines suggest that the bleeding obstetric patient should receive 1g of TXA intravenously

followed by a further dose of 1g after 30 minutes, if bleeding persists or recurs within 24 hours (12).

The SASA guidelines state that, during resuscitation of major haemorrhage; hypothermia, acidosis, hypocalcaemia and hyperkalaemia should be monitored and treated (12). The SANBS guidelines state that in trauma severe tissue destruction, hypoxia, acidosis, shock, dilution and hypothermia may act as contributors to the acute coagulopathy of trauma. The SANBS guidelines suggest that hypocalcaemia should be treated, the levels required to cause coagulopathy, being less than 0,5mmol/L. Hyperkalaemia is suggested to be treated if levels greater than 6mmol/L develop (13).

The third pillar of PBM utilises the patients physiological reserve to tolerate anaemia, often through restrictive transfusion thresholds. The SASA guidelines offer a transfusion haemoglobin threshold of 7g/dL in general for RCC. These guidelines and SANBS guidelines acknowledge uncertainty surrounding transfusion thresholds in ischemic heart disease, acute coronary syndromes and after cardiac surgery and state that a target of 8g/dL of haemoglobin may be appropriate. The SANBS Guidelines further suggest that transfusion to a level of 8-10g/dL is acceptable, but that effect of each unit used must be weighed against the risk of heart failure. In cardiac surgery the SASA guidelines suggest a transfusion threshold of 7,5g/dL (12,13).

Alternatives to allogenic RCC include perioperative autologous blood donation and autologous cell salvage, where surgical blood loss is collected and then reinfused (3,26,27). The SASA guidelines suggest all non-obstetric patients with anticipated blood losses greater than 500ml should receive cell salvage, as well as in obstetric major haemorrhage (12). The SANBS recommendations similarly suggests that, cell salvage

should be used for any surgical procedure associated with significant blood loss from clean wounds (13).

The SASA guidelines suggest that Group O RCC should be readily available and transfused if haemorrhage is life threatening (12). Rhesus incompatibility may result in adverse transfusion reactions due to the immunogenicity of the D antigen (28,29). Despite this all men presenting to some major trauma centres are transfused O+ .unmatched RCCs as needed (28). In other systems O- unmatched RCCs are reserved for woman of child-bearing age in order to avoid the possibility of severe haemolytic disease of the neonate, while still preserving the relatively rare O- RCCs (30). The SANBS guidelines state that it is acceptable to give emergency O- RCC to men and postmenopausal women (13).

PBM is an important global issue. The development of PBM offers an opportunity to improve patient outcomes and reduce health costs, fulfilling the health economic imperative. In South Africa the framework for perioperative PBM is governed by both the SASA and SANBS guidelines. Despite the guidance from these documents the implementation and practice of perioperative PBM in South African anaesthetists is unknown as is the alignment of these practices with the most recent guidelines. Identifying areas of improvement in South Africa could translate into patient and healthcare benefits.

1. Problem statement

The practices of anaesthetic providers surrounding perioperative PBM in South Africa are unknown. The alignment of these practices with recommended guidelines is also unknown.

2. Aim

The aim of this study is to describe the practices surrounding perioperative PBM in South Africa and to describe how these align with current guidelines.

3. Objectives

The primary objective of this study is to:

- Describe practices surrounding perioperative PBM among South African anaesthetic providers.

The secondary objectives of this study are to:

- Describe how the practices align with those recommended in the 2020 SASA Peri-operative PBM guidelines (12).
- Describe how the practices align with those recommended in the 2014 SANBS Clinical Guidelines for the use of Blood Products in South Africa (13).

4. Research assumptions

The following definitions will be used in the study**:**

Anaemia: Low blood concentration of haemoglobin. Defined by the WHO as less than 13g/dL in men, 12g/dL in women, and 11g/dL in pregnant women (31).

Anaesthetic Provider: A health care professional providing anaesthesia. In South Africa this would include consultants, registrars, medical officers, and community service medical officers.

Cell Salvage: The collection, washing and reinfusion of blood loss, surgical or otherwise. Achieves autologous transfusion (27).

Coagulopathy: Occurs when the haemostasis of the normal clotting mechanism is disrupted, impairing the body's ability to clot (22).

Community Service Medical Officer: A doctor completing a government mandated year of community service, following completion of internship.

Consultant: A specialist doctor who has completed the Fellowship of the College of Anaesthetists of South Africa.

Freeze Dried Plasma (FDP): Lyophilised pooled plasma, rich in clotting factors, and stored as a stable powder (32) .

Fresh Frozen Plasma (FFP): The blood component therapy, consisting of clotting factor rich plasma, derived by the rapid freezing of centrifuged whole blood (13).

Medical Officer: A doctor who has completed both community service and internship, but who is not a specialist, or in a specialist training programme.

Patient Blood Management (PBM): Patient blood management is a patient-centred, systematic, evidence-based approach to improve patient outcomes by managing and preserving a patient's own blood, while promoting patient safety and empowerment (2).

Point of Care Testing (POC): A test performed near the patient. In the context of coagulopathy includes viscoelastic assays, and are performed around surgery or trauma (22).

Red Cell Concentrate (RCC): The blood component therapy that consists of red cells (13). Previously termed red blood cells(RBCs) (2).

Registrar: A doctor in a specialist post-graduate training programme.

5. Demarcation of study field

This study will include anaesthetic providers practicing in South Africa.

6. Ethical considerations

Approval to conduct the study will be sought from the Human Research Ethics Committee (Medical) and the Graduate Studies Committee of the University of the Witwatersrand.

The Academic Head of the Department of Anaesthesiology at the University of the Witwatersrand, Prof. Motshabi, will be contacted for approval to perform the study. (Appendix A)

Responsible persons from national organisations with affiliated anaesthetic providers will be contacted for permission to distribute the survey through their relevant contact channels (Appendix B.) These organisations are listed alphabetically: Busamed, the

Colleges of Medicine of South Africa (CMSA,) Life Healthcare, Mediclinic, Nelson Mandela University, Netcare, the South African Medical Association (SAMA,) the South African Medical Association Trade Union (SAMATU,) the South African Society of Anaesthesiologists (SASA,) Sefako Magatho Health Sciences University, Stellenbosch University, the University of the Free State, the University of Cape Town, the University of KwaZulu-Natal, the University of Pretoria, and the University of the Witwatersrand.

Participants in the survey will be directed to both the SASA and SANBS guidelines at the end of the survey via a URL link.

Consent will be implied by agreement to participate in the survey. An information letter will be included in the survey (Appendix C). Anonymity will be ensured by not collecting identifying information and by the allocation of study identification numbers to each respondent. Only the researcher and supervisor will have access to the raw data. Data will be stored securely on a password protected database for 6 years after completion of the study.

The study will be conducted according to the principles of the Declaration of Helsinki and the South African Good Clinical Practice Guidelines (33,34).

7. Research Methodology

7.1 Research design

This study is a contextual descriptive study.

A contextual study evaluates participants within their own environment, or in context (35). This study is contextual as it examines the practice of South African anaesthetic providers within their practice context.

A descriptive study is a study that describes a phenomenon, or phenomena, without determining the relationship between variables (35). This study will describe the practice of South African anaesthetic providers surrounding PBM.

7.2 Study population

The study population will include anaesthetic providers practicing within South Africa.

7.3 Study sample

Sample size

As per the 2017 World Federation of Societies of Anaesthesiologists (WFSA) workforce survey, there are 8814 anaesthetic providers in South Africa (36). This number includes specialists, trainees, and non-specialist providers.

The Raosoft® sample size calculator was used to determine that, if a 5% margin of error is expected, with a 95% confidence interval and the response distribution is expected to be 50% then 369 responses will be needed.

Sampling method

A consecutive and convenience sampling method will be used. Consecutive sampling is when all subjects that meet inclusion criteria are sampled (35). Convenience sampling includes readily available participants in the study (35).

Inclusion criteria

- All anaesthetic providers in South Africa, including specialists, trainees, and non-specialists, including medical officers.

Exclusion criteria

- Survey with > 50 % incomplete sections will be excluded.

Survey

A survey will be adapted from the tool used by Baron *et al* (16). The adapted survey will be reviewed by a panel of experienced specialist anaesthetists for content and face validity. The survey consists of four sections: Demographics, Background, Preoperative and Intraoperative Management (Appendix D). The survey will assess the current practice and will be developed with reference to the SASA and SANBS guidelines (12,13).

7.4 Data collection

Ethical clearance and permission to distribute the online survey will be sought prior to data collection.

Data will be collected using the adapted survey. Participants will be instructed to answer the survey with reference to their own PBM practice. The survey will be administered online and distributed via various South African medical organisations. Data collection will take place over a three month period.

Raw data will be captured into the REDCap® database and exported to a Microsoft® Excel® spreadsheet. Only the researcher and supervisor will have access to the raw data captured.

7.5 Data analysis

Data will be analysed with assistance from a biostatistician. Descriptive statistics will be used. Categorical data will be summarised in tables using frequencies and percentages. Continuous variables with normal distribution will be described using means and standard deviations. In those where data distribution is not normally distributed, medians and interquartile ranges will be utilised.

The comparison of categorical variables between the two groups will be done with either a Fisher's exact or Chi-square test. Comparison of continuous variables between groups will be done using the student t-test with normally distributed variables and the Mann-Whitney U test for variables where variables are not normally distributed. A p-value of less than 0.05 will be considered statistically significant.

7.6 Significance of the study

PBM is an important global issue. The development of PBM offers an opportunity to improve patient outcome and reduce health costs, fulfilling the health economic imperative. South Africa has two national documents providing the framework for perioperative PBM, the SASA and SANBS guidelines. The impact of these guidance documents on South African anaesthetists' practice is unknown, as is the general state of perioperative PBM practice in South Africa. Given the opportunity for effective intervention in this area, it is important that an understanding of this issue is developed. This study will provide information on how anaesthetic providers in South Africa practice PBM.

8. Validity and reliability of the study

Validity refers to the accuracy of results, whereas reliability refers to the consistency, or reproducibility, of results (35).

Validity and reliability will be ensured through the following steps:

- An appropriate study design will be adopted.
- The survey will be adapted from that used and validated by Baron *et al* (16).
- Face and content validity of the adapted survey will be sought from a panel of specialist anaesthetists with a special interest in PBM.
- Data will be stored and captured electronically by a single researcher.
- No identifying information will be captured.
- A biostatistician will be consulted for analysis and interpretation of the data.

9. Potential limitations of the study

This study is at risk for response bias, as it relies on self-reporting of practice by subjects. Therefore, the data gathered may not accurately represent the true state of practice, as subjects may fail to report their true practice (37).

A convenience sampling method will be used. As such, data may not represent the entire population and may not be generalisable to the population of anaesthetic providers in South Africa (38).

This study will include only anaesthetic providers and will not be generalisable to other groups (critical care and medicine), practicing PBM.

10. Project outline

10.1 Time frame

Year											
Month	Oct	Nov	Jan	Feb	March	April	May	Jun	July	Aug	Sep
Proposal											
Post graduate approval											
Ethics approval											
Data collection											
Data analysis											
Submission											

10.2 Financial plan

The University of the Witwatersrand, Department of Anaesthesiology will bear the costs for printing and paper for the proposal and research report, as well as for binding the research report.

Description	Price per item	Number of items	Total
Printing proposal	R1	300	R300
Printing research report	R1	600	R600
Binding final research report	R20	1	R20
Total			R920

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12. Appendices

Appendix A

Request for permission from the Head of the Department of Anaesthesiology at the University of the Witwatersrand

Dear Prof. Motshabi,

My name is Dr Creaghan Eddey, and I am a registrar in the Department of Anaesthesiology at the University of the Witwatersrand. I am writing to ask for permission to conduct research within your department.

It is my intention to perform a survey of the Patient Blood Management practices of anaesthetic providers in South Africa. I intend to title this work:

"The practice of patient blood management among South African anaesthetic providers."

The study will be in the form of an anonymous online survey, using REDCap®, distributed via the weekly newsletter of the South African Society of Anaesthesiologists. The survey will be voluntary, and completion of the survey will imply consent. The questionnaire will also provide the participants with a link to the guidelines for perioperative blood management in South Africa.

The finalised research report will be submitted to the Faculty of Health Sciences, as required for the Master of Medicine degree. If you should wish, a copy will be made available to you.

Yours Sincerely,

Creaghan Eddey

076 638 6258

Creaghan.eddey@gmail.com

Appendix B

Request for permission to use and adapt research tool

From: **David Baron** david.baron@meduniwien.ac.at
Subject: Re: Permission to use and adapt research tool
Date: 13 March 2023 at 14:48
To: Creaghan Ross Eddey creaghan.eddey@icloud.com

Dear Creaghan,

Thank you for your interest in our reseach. Attached please find a Word-version of the questionnaire, which you can adapt according to your requirements. If I had to repeat the study I would use 1-5 scales instead of "rarely of never", "in about half of the patients", and "mostly or always".

I do have one request myself - since it was a lot of work to design the questionnaire, can you please list me as one of the co-authors should you publish the results in a peer-reviewed journal. I will gladly review the manuscript prior to publication.

All my best!

David

David Baron, MD, PhD, EDIC
Associate Professor
Head of Anesthesia Out-Patient Clinic

Medical University of Vienna
Department of Anaesthesia, Intensive Care Medicine and Pain Medicine

Waehringer Guertel 18-20, A-1090 Vienna
T: +43 1 40400 41000
david.baron@meduniwien.ac.at

Am 2023-03-13 13:07, schrieb Creaghan Ross Eddey:

> Dear Dr Baron,
>
> My name is Dr Creaghan Eddey, and I am a registrar in the Department of Anaesthesiology at the University of the Witwatersrand in Johannesburg, South Africa. I am writing to ask for permission to use and adapt the tool you used in 'Evaluation of clinical practice in perioperative patient blood management.'
>
> It is my intention to perform a survey of the Patient Blood Management practices of anaesthetic providers in South Africa. I intend to title this work: "**The practice of patient blood management among South African anaesthetic providers."**
>
> The finalised research report will be submitted to the Faculty of Health Sciences of the University of the Witwatersrand, as required for the Master of Medicine degree. If you should wish, a copy will be made available to you.
>
> Yours Sincerely,
> Creaghan Eddey
> 076 638 6258
> Creaghan.eddey@gmail.com

Appendix C

Request for permission to use contact channels

Group Clinical Manager of Busamed

Dear Dr De Jager

My name is Dr Creaghan Eddey, and I am a registrar in the Department of Anaesthesiology at the University of the Witwatersrand. I am writing to ask for permission to use Busamed's contact channels to distribute my research.

It is my intention to perform a survey of the Patient Blood Management practices of anaesthetic providers in South Africa. I intend to title this work:

"The practice of patient blood management among South African anaesthetic providers."

The study will be in the form of an anonymous online survey, using REDCap®, distributed via contact channels of various South African medical organisations. The survey will be voluntary, and completion of the survey will imply consent. The questionnaire will also provide the participants with a link to the guidelines for perioperative blood management in South Africa.

The finalised research report will be submitted to the Faculty of Health Sciences of the University of the Witwatersrand, as required for the Master of Medicine degree. If you should wish, a copy will be made available to you.

Yours Sincerely,

Creaghan Eddey

076 638 6258

Creaghan.eddey@gmail.com

Academic Registrar of the Colleges of Medicine of South Africa

Dear Ms Kanzi,

My name is Dr Creaghan Eddey, and I am a registrar in the Department of Anaesthesiology at the University of the Witwatersrand. I am writing to ask for permission to use the CMSA's contact channels to distribute my research.

It is my intention to perform a survey of the Patient Blood Management practices of anaesthetic providers in South Africa. I intend to title this work:

"The practice of patient blood management among South African anaesthetic providers."

The study will be in the form of an anonymous online survey, using REDCap®, distributed via contact channels of various South African medical organisations. The survey will be voluntary, and completion of the survey will imply consent. The questionnaire will also provide the participants with a link to the guidelines for perioperative blood management in South Africa.

The finalised research report will be submitted to the Faculty of Health Sciences of the University of the Witwatersrand, as required for the Master of Medicine degree. If you should wish, a copy will be made available to you.

Yours Sincerely,

Creaghan Eddey

076 638 6258

Creaghan.eddey@gmail.com

Research Specialist Life Healthcare

Dear Prof Ricks

My name is Dr Creaghan Eddey, and I am a registrar in the Department of Anaesthesiology at the University of the Witwatersrand. I am writing to ask for permission to use Life Healthcare's contact channels to distribute my research.

It is my intention to perform a survey of the Patient Blood Management practices of anaesthetic providers in South Africa. I intend to title this work:

"The practice of patient blood management among South African anaesthetic providers."

The study will be in the form of an anonymous online survey, using REDCap®, distributed via contact channels of various South African medical organisations. The survey will be voluntary, and completion of the survey will imply consent. The questionnaire will also provide the participants with a link to the guidelines for perioperative blood management in South Africa.

The finalised research report will be submitted to the Faculty of Health Sciences of the University of the Witwatersrand, as required for the Master of Medicine degree. If you should wish, a copy will be made available to you.

Yours Sincerely,

Creaghan Eddey

076 638 6258

Creaghan.eddey@gmail.com

Doctor Relationship Manager Mediclinic

Dear Ms Lategan,

My name is Dr Creaghan Eddey, and I am a registrar in the Department of Anaesthesiology at the University of the Witwatersrand. I am writing to ask for permission to use Mediclinic's contact channels to distribute my research.

It is my intention to perform a survey of the Patient Blood Management practices of anaesthetic providers in South Africa. I intend to title this work:

"The practice of patient blood management among South African anaesthetic providers."

The study will be in the form of an anonymous online survey, using REDCap®, distributed via contact channels of various South African medical organisations. The survey will be voluntary, and completion of the survey will imply consent. The questionnaire will also provide the participants with a link to the guidelines for perioperative blood management in South Africa.

The finalised research report will be submitted to the Faculty of Health Sciences of the University of the Witwatersrand, as required for the Master of Medicine degree. If you should wish, a copy will be made available to you.

Yours Sincerely,

Creaghan Eddey

076 638 6258

Creaghan.eddey@gmail.com

Acting Director of Medicine Nelson Mandela University

Dear Dr Du Toit

My name is Dr Creaghan Eddey, and I am a registrar in the Department of Anaesthesiology at the University of the Witwatersrand. I am writing to ask for permission to use the contact channels of Nelson Mandela University's anaesthetic department to distribute my research.

It is my intention to perform a survey of the Patient Blood Management practices of anaesthetic providers in South Africa. I intend to title this work:

"The practice of patient blood management among South African anaesthetic providers."

The study will be in the form of an anonymous online survey, using REDCap®, distributed via contact channels of various South African medical organisations. The survey will be voluntary, and completion of the survey will imply consent. The questionnaire will also provide the participants with a link to the guidelines for perioperative blood management in South Africa.

The finalised research report will be submitted to the Faculty of Health Sciences of the University of the Witwatersrand, as required for the Master of Medicine degree. If you should wish, a copy will be made available to you.

Yours Sincerely,

Creaghan Eddey

076 638 6258

Creaghan.eddey@gmail.com

Netcare Research Office

Dear Netcare Research Office,

My name is Dr Creaghan Eddey, and I am a registrar in the Department of Anaesthesiology at the University of the Witwatersrand. I am writing to ask for permission to use your Netcare's contact channels to distribute my research.

It is my intention to perform a survey of the Patient Blood Management practices of anaesthetic providers in South Africa. I intend to title this work:

"The practice of patient blood management among South African anaesthetic providers."

The study will be in the form of an anonymous online survey, using REDCap®, distributed via contact channels of various South African medical organisations. The survey will be voluntary, and completion of the survey will imply consent. The questionnaire will also provide the participants with a link to the guidelines for perioperative blood management in South Africa.

The finalised research report will be submitted to the Faculty of Health Sciences of the University of the Witwatersrand, as required for the Master of Medicine degree. If you should wish, a copy will be made available to you.

Yours Sincerely,

Creaghan Eddey

076 638 6258

Creaghan.eddey@gmail.com

South African Medical Association Members Office

Dear SAMA Members Office

My name is Dr Creaghan Eddey, and I am a registrar in the Department of Anaesthesiology at the University of the Witwatersrand. I am writing to ask for permission to use SAMA's contact channels to distribute my research.

It is my intention to perform a survey of the Patient Blood Management practices of anaesthetic providers in South Africa. I intend to title this work:

"The practice of patient blood management among South African anaesthetic providers."

The study will be in the form of an anonymous online survey, using REDCap®, distributed via contact channels of various South African medical organisations. The survey will be voluntary, and completion of the survey will imply consent. The questionnaire will also provide the participants with a link to the guidelines for perioperative blood management in South Africa.

The finalised research report will be submitted to the Faculty of Health Sciences of the University of the Witwatersrand, as required for the Master of Medicine degree. If you should wish, a copy will be made available to you.

Yours Sincerely,

Creaghan Eddey

076 638 6258

Creaghan.eddey@gmail.com

South African Medical Association Trade Union Media Office

Dear SAMATU Media Office,

My name is Dr Creaghan Eddey, and I am a registrar in the Department of Anaesthesiology at the University of the Witwatersrand. I am writing to ask for permission to use SAMATU's contact channels to distribute my research.

It is my intention to perform a survey of the Patient Blood Management practices of anaesthetic providers in South Africa. I intend to title this work:

"The practice of patient blood management among South African anaesthetic providers."

The study will be in the form of an anonymous online survey, using REDCap®, distributed via contact channels of various South African medical organisations. The survey will be voluntary, and completion of the survey will imply consent. The questionnaire will also provide the participants with a link to the guidelines for perioperative blood management in South Africa.

The finalised research report will be submitted to the Faculty of Health Sciences of the University of the Witwatersrand, as required for the Master of Medicine degree. If you should wish, a copy will be made available to you.

Yours Sincerely,

Creaghan Eddey

076 638 6258

Creaghan.eddey@gmail.com

Chief Executive Officer and Membership and Administration Manager of SASA

Dear Ms Britz and Ms Roets,

My name is Dr Creaghan Eddey, and I am a registrar in the Department of Anaesthesiology at the University of the Witwatersrand. I am writing to ask for permission to use your organisation's weekly newsletter to conduct my research.

It is my intention to perform a survey of the Patient Blood Management practices of anaesthetic providers in South Africa. I intend to title this work:

"The practice of patient blood management among South African anaesthetic providers."

The study will be in the form of an anonymous online survey, using REDCap®, distributed via the weekly newsletter of the South African Society of Anaesthesiologists. The survey will be voluntary, and completion of the survey will imply consent. The questionnaire will also provide the participants with a link to the guidelines for perioperative blood management in South Africa.

The finalised research report will be submitted to the Faculty of Health Sciences of the University of the Witwatersrand, as required for the Master of Medicine degree. If you should wish, a copy will be made available to you.

Yours Sincerely,

Creaghan Eddey

076 638 6258

Creaghan.eddey@gmail.com

Head of Department of Anaesthesiology Sefako Makgatho Health University

Dear Prof Merche Roux,

My name is Dr Creaghan Eddey, and I am a registrar in the Department of Anaesthesiology at the University of the Witwatersrand I am writing to ask for permission to use the contact channels of Sefako Makgatho Health University's anaesthetic department to distribute my research.

It is my intention to perform a survey of the Patient Blood Management practices of anaesthetic providers in South Africa. I intend to title this work:

"The practice of patient blood management among South African anaesthetic providers."

The study will be in the form of an anonymous online survey, using REDCap®, distributed via contact channels of various South African medical organisations. The survey will be voluntary, and completion of the survey will imply consent. The questionnaire will also provide the participants with a link to the guidelines for perioperative blood management in South Africa.

The finalised research report will be submitted to the Faculty of Health Sciences of the University of the Witwatersrand, as required for the Master of Medicine degree. If you should wish, a copy will be made available to you.

Yours Sincerely,

Creaghan Eddey

076 638 6258

Creaghan.eddey@gmail.com

Head of Department of Anaesthesiology and Critical Care Stellenbosch University

Dear Prof Chetty,

My name is Dr Creaghan Eddey, and I am a registrar in the Department of Anaesthesiology at the University of the Witwatersrand I am writing to ask for permission to use the contact channels of Stellenbosch University's anaesthetic department to distribute my research.

It is my intention to perform a survey of the Patient Blood Management practices of anaesthetic providers in South Africa. I intend to title this work:

"The practice of patient blood management among South African anaesthetic providers."

The study will be in the form of an anonymous online survey, using REDCap®, distributed via contact channels of various South African medical organisations. The survey will be voluntary, and completion of the survey will imply consent. The questionnaire will also provide the participants with a link to the guidelines for perioperative blood management in South Africa.

The finalised research report will be submitted to the Faculty of Health Sciences of the University of the Witwatersrand, as required for the Master of Medicine degree. If you should wish, a copy will be made available to you.

Yours Sincerely,

Creaghan Eddey

076 638 6258

Creaghan.eddey@gmail.com

Head of Department of Anaesthesiology University of the Free State

Dear Prof Turton,

My name is Dr Creaghan Eddey, and I am a registrar in the Department of Anaesthesiology at the University of the Witwatersrand I am writing to ask for permission to use the contact channels of the University of the Free State's anaesthetic department to distribute my research.

It is my intention to perform a survey of the Patient Blood Management practices of anaesthetic providers in South Africa. I intend to title this work:

"The practice of patient blood management among South African anaesthetic providers."

The study will be in the form of an anonymous online survey, using REDCap®, distributed via contact channels of various South African medical organisations. The survey will be voluntary, and completion of the survey will imply consent. The questionnaire will also provide the participants with a link to the guidelines for perioperative blood management in South Africa.

The finalised research report will be submitted to the Faculty of Health Sciences of the University of the Witwatersrand, as required for the Master of Medicine degree. If you should wish, a copy will be made available to you.

Yours Sincerely,

Creaghan Eddey

076 638 6258

Creaghan.eddey@gmail.com

Head of Department of Anaesthesia and Perioperative Medicine University of Cape Town

Dear Prof Swanevelder,

My name is Dr Creaghan Eddey, and I am a registrar in the Department of Anaesthesiology at the University of the Witwatersrand I am writing to ask for permission to use the contact channels of the University of Cape Town's anaesthetic department to distribute my research.

It is my intention to perform a survey of the Patient Blood Management practices of anaesthetic providers in South Africa. I intend to title this work:

"The practice of patient blood management among South African anaesthetic providers."

The study will be in the form of an anonymous online survey, using REDCap®, distributed via contact channels of various South African medical organisations. The survey will be voluntary, and completion of the survey will imply consent. The questionnaire will also provide the participants with a link to the guidelines for perioperative blood management in South Africa.

The finalised research report will be submitted to the Faculty of Health Sciences of the University of the Witwatersrand, as required for the Master of Medicine degree. If you should wish, a copy will be made available to you.

Yours Sincerely,

Creaghan Eddey

076 638 6258

Creaghan.eddey@gmail.com

Head of Department of Anaesthetics University of KwaZulu-Natal

Dear Prof Gopalan,

My name is Dr Creaghan Eddey, and I am a registrar in the Department of Anaesthesiology at the University of the Witwatersrand I am writing to ask for permission to use the contact channels of the University of KwaZulu-Natal's anaesthetic department to distribute my research.

It is my intention to perform a survey of the Patient Blood Management practices of anaesthetic providers in South Africa. I intend to title this work:

"The practice of patient blood management among South African anaesthetic providers."

The study will be in the form of an anonymous online survey, using REDCap®, distributed via contact channels of various South African medical organisations. The survey will be voluntary, and completion of the survey will imply consent. The questionnaire will also provide the participants with a link to the guidelines for perioperative blood management in South Africa.

The finalised research report will be submitted to the Faculty of Health Sciences of the University of the Witwatersrand, as required for the Master of Medicine degree. If you should wish, a copy will be made available to you.

Yours Sincerely,

Creaghan Eddey

076 638 6258

Creaghan.eddey@gmail.com

Head of Department of Anaesthesiology University of Pretoria

Dear Prof Spijkerman,

My name is Dr Creaghan Eddey, and I am a registrar in the Department of Anaesthesiology at the University of the Witwatersrand I am writing to ask for permission to use the contact channels of the University of Pretoria's anaesthetic department to distribute my research.

It is my intention to perform a survey of the Patient Blood Management practices of anaesthetic providers in South Africa. I intend to title this work:

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Yours Sincerely,

Creaghan Eddey

076 638 6258

Creaghan.eddey@gmail.com

Head of Department of Anaesthesiology University of the Witwatersrand

Dear Prof Motshabi Chakane,

My name is Dr Creaghan Eddey, and I am a registrar in the Department of Anaesthesiology at the University of the Witwatersrand I am writing to ask for permission to use the contact channels of the University of the Witwatersrand anaesthetic department to distribute my research.

It is my intention to perform a survey of the Patient Blood Management practices of anaesthetic providers in South Africa. I intend to title this work:

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The study will be in the form of an anonymous online survey, using REDCap®, distributed via contact channels of various South African medical organisations. The survey will be voluntary, and completion of the survey will imply consent. The questionnaire will also provide the participants with a link to the guidelines for perioperative blood management in South Africa.

The finalised research report will be submitted to the Faculty of Health Sciences of the University of the Witwatersrand, as required for the Master of Medicine degree. If you should wish, a copy will be made available to you.

Yours Sincerely,

Creaghan Eddey

076 638 6258

Creaghan.eddey@gmail.com

Appendix D

Information Leaflet

The information letter originally appeared here in the protocol. It has been moved to Appendix 2 to aid clarity.

Appendix E

Survey

The survey originally appeared here in the protocol. It has been moved to Appendix 3 to aid clarity.

Appendix 2: Information leaflet

Dear Colleague,

My name is Creaghan Eddey, and I am a registrar in the Department of Anaesthesiology at the University of the Witwatersrand. I would like to invite you to participate in my research entitled: “The practice of patient blood management among South African anaesthetic providers.” I intend to submit this research towards the Master of Medicine degree.

Anaemia is common in South Africa. Among pre-operative non-cardiac, non-obstetric patients 47,8% of adult patients and 46,2 % of paediatric patients are anaemic (1,2). Yet the practices of South African anaesthetic providers surrounding peri-operative patient blood management (PBM) are yet to be described.

The World Health Organization has stated an urgent need to deliver PBM (3). The development of PBM offers an opportunity to improve patient outcome and reduce health costs, fulfilling the health economic imperative. Thomson *et al* described in 2019 the potential benefits of introducing PBM in South Africa; including improvements in public health, surgical outcomes, use of a scarce resource and economic benefit (4).

South Africa has two national documents providing the framework for perioperative PBM, the SASA and SANBS guidelines (5,6).. How these documents have affected your current practice is unknown, as is the general state of perioperative PBM in South Africa. Given the opportunity for effective intervention in this area, it is important that an understanding of this issue is developed. This study will provide information on how anaesthetic providers in South Africa practice PBM.

Participation would entail completion of the survey, which consists of four sections: Demographics, Background, Preoperative and Intraoperative Management. The survey should take no more than 15 minutes to complete. No incentives are offered for completion of the survey.

The survey is anonymous; no identifying information will be captured. All responses will be captured in a secure, password protected, database. Only the researcher and supervisor will have access to the database.

Should you have questions about this study, please contact myself: Creaghan Eddey (076 638 6258) or my supervisor: Cara Redelinghuys (011 933 9413).

The Human Research Ethics Committee (Medical) of the University of the Witwatersrand has approved this study. This committee servers to protect the rights and dignity of all research participants. Should you have any questions about the conduct of this study please contact the chairperson: Professor Clement Penny (011 717 2301/Clement.Penny@wits.ac.za,) or the secretaries of the committee (011 717 2700/1234, Zanele.Ndlovu@wits.ac.za or Rhulani.Mukansi@wits.ac.za)

Should you wish to read more about the guidelines for PBM in South Africa please access the following documents:

1. Wise, R., Bishop, D., Gibbs, M., Govender, K., James, M., Kabambi, F., et al. South African Society of Anaesthesiologists Perioperative Patient Blood Management Guidelines 2020. South Afr J Anaesth Analg. 2020:S1–68.

doi:10.36303/SAJAA.2020.26.6.S1 [Accessed 10/09/2022]

2. South African National Blood Service (SANBS). Clinical guidelines for the use of blood products in South Africa (5th ed.). 2014. Available from https://sanbs.org.za/wp-content/uploads/2016/09/Clinical_Guidelines_5th-Edition_2014.pdf

Thank you for taking the time to complete this survey.

Yours Sincerely,

Creaghan Eddey

076 638 6258

Creaghan.eddey@gmail.com

References

1. Marsicano, D., Hauser, N., Roodt, F., Cloete, E., Conradie, W., Morford, V., et al. Preoperative anaemia and clinical outcomes in the South African Surgical Outcomes Study. S Afr Med J. 2018;108(10):839. doi:10.7196/SAMJ.2018.v108i10.13148 [Accessed 10/09/2022]

2. Meyer, H.M., Torborg, A., Cronje, L., Thomas, J., Bhettay, A., Diedericks, J., et al. The association between preoperative anemia and postoperative morbidity in pediatric surgical patients: A secondary analysis of a prospective observational cohort study. Goobie S, editor. Pediatr Anesth. 2020;30(7):759–65. doi:10.1111/pan.13872 [Accessed 11/06/2022]

3. World Health Organization. The urgent need to implement patient blood management: Policy brief. World Health Organization. 2021. Available from https://apps.who.int/iris/handle/10665/346655 [Accessed 10/09/2022]

4. Thomson, J., Hofmann, A., Barrett, C.A., Beeton, A., Bellairs, G.R.M., Boretti, L., et al. Patient blood management: A solution for South Africa. S Afr Med J. 2019;109(7):471. doi:10.7196/SAMJ.2019.v109i7.13859 [Accessed 10/09/2022]

5. Wise, R., Bishop, D., Gibbs, M., Govender, K., James, M., Kabambi, F., et al. South African Society of Anaesthesiologists perioperative patient blood management guidelines 2020. South Afr J Anaesth Analg. 2020:S1–68. doi:10.36303/SAJAA.2020.26.6.S1 [Accessed 10/09/2022]

6. South African National Blood Service (SANBS). Clinical guidelines for the use of blood products in South Africa (5th ed.). 2014. Available from https://sanbs.org.za/wp-content/uploads/2016/09/Clinical_Guidelines_5th-Edition_2014.pdf [Accessed 10/09/2022]

Appendix 3: Survey

Demographics:

1. What is your training status?
    - Community Service Medical Officer
    - Medical Officer
    - Registrar
    - Specialist

2. Please state the number of years you have at your current training status?

3. Where do you work? (Select all that apply)
    - Public Hospital
        i. District
        ii. Secondary
        iii. Tertiary
        iv. University affiliated
    - Private Hospital

Background:

4. Does your institution have a written protocol, guideline, or algorithm concerning the management of severe perioperative bleeding?
    - Yes
    - No
    - Unsure/Do not know

5. Which of the following point-of -care testing modalities are available at your institution? (Multiple answers may apply)
    - ROTEM®
    - TEG®
    - Multiplate®
    - Platelet Function Analyzer(PFA-100®)
    - VerifyNow®
    - Masimo Total Haemoglobin(SpHb®)
    - Other (Please specify)
    - None of the above

6. Are you aware of SASA guidelines on perioperative patient blood management?
    - Yes
    - No

7. Are you aware of SANBS guidelines on the use of blood products?
    - Yes
    - No

8. Have you read the SASA guidelines on perioperative patient blood management?
    - Fully
    - In part
    - As a summary
    - No

9. Have you read the SANBS guidelines on the use of blood products?
    - Fully
    - In part
    - As a summary

10. Do you believe that your current management of severe perioperative bleeding could be improved?
    - Yes
    - No

Preoperative:

For answers in this section please refer to your current personal practice

11. Do you record a preoperative haemoglobin (Hb)?
    - Never
    - Rarely
    - Sometimes
    - Often
    - Always

12. At what haemoglobin would you defer elective surgery, other than caesarean section, to allow for work up and treatment of anaemia?
    - <13g/dL
    - <10g/dL
    - <7g/dL
    - I would not defer elective surgery for this reason

13. How commonly do you see patients with haemoglobin values <13g/dL receiving appropriate treatment (e.g., iron supplementation or erythropoietin based on cause) in the preoperative period?
    - Never
    - Rarely
    - Sometimes
    - Often
    - Always

Intraoperative:

For answers in this section please refer to your current personal practice

14. In high and medium risk non-obstetric surgery, where a blood loss greater than 500ml is anticipated, how often do you use cell salvage?
    - Never
    - Rarely
    - Sometimes
    - Often
    - Always

15. How often do you use cell salvage in obstetric major haemorrhage?
    - Never
    - Rarely
    - Sometimes
    - Often
    - Always
    - This question is not applicable to my practice

16. How often do you administer tranexamic acid to critically ill patients with severe trauma within 3 hours of injury?
    - Never
    - Rarely
    - Sometimes
    - Often
    - Always

17. How do you administer tranexamic acid to a critically ill patient with severe trauma?
    - 1g intravenously stat
    - 1g intravenously and then 1g infused over 8 hours
    - 1g intravenously stat and then 1g after 30 minutes if bleeding persists or recurs within 24 hours

18. How often do you administer tranexamic acid in bleeding obstetric patients?
    - Never
    - Rarely
    - Sometimes
    - Often
    - Always
    - This question is not applicable to my practice

19. How do you administer tranexamic acid to a bleeding obstetric patient?
    - 1g intravenously stat
    - 1g intravenously and then 1g infused over 8 hours
    - 1g intravenously stat and then 1g after 30 minutes if bleeding persists or recurs within 24 hours

20. In non-cardiac patients do you target a transfusion threshold of 7g/dL for red cell concentrate (RCC?)
    - Yes
    - No, I target a value greater than 7g/dL
    - No, I target a value less than 7g/dL

21. When would you consider a higher transfusion threshold?
    - Acute coronary syndrome
    - Ischemic heart disease
    - After cardiac surgery

22. How often do you use activated partial thromboplastin time (aPPT,) prothrombin time (PTT,) and international normalized ratio (INR) in your management of acute, ongoing bleeding?
    - Never
    - Rarely
    - Sometimes
    - Often
    - Always

23. How often do you use validated point-of-care testing, such as TEG® or ROTEM® in your management of acute, ongoing bleeding?
    - Never
    - Rarely
    - Sometimes
    - Often
    - Always

24. In major haemorrhage would you use freeze dried plasma (FDP) as an acceptable substitute for fresh frozen plasma (FFP?)
    - Yes
    - No
    - Unsure/Do not know

25. What initial dose of freeze-dried plasma (FDP) would you use in major haemorrhage?
    - <10ml/kg
    - 10-20ml/kg
    - 10-15ml/kg
    - 15-20ml/kg
    - >20ml/kg

26. What initial dose of fresh frozen plasma (FFP) would you use in major haemorrhage?
    - <10ml/kg
    - 10-20ml/kg
    - 10-15ml/kg
    - 15-20ml/kg
    - >20ml/kg

27. When would you give Group O emergency red cell concentrate (RCC) to a patient with major haemorrhage?
    - While waiting for blood from the blood bank
    - If blood from the blood bank is delayed
    - If haemorrhage is life threatening

28. In major haemorrhage, do you monitor, prevent, and treat hypothermia?
    - Never
    - Rarely
    - Sometimes
    - Often
    - Always

29. In major haemorrhage, do you monitor, prevent, and treat acidosis?
    - Never
    - Rarely
    - Sometimes
    - Often
    - Always

30. In major haemorrhage, do you monitor, prevent, and treat hypocalcaemia?
    - Never
    - Rarely
    - Sometimes
    - Often
    - Always

31. In major haemorrhage, do you monitor, prevent, and treat hyperkalaemia?
    - Never
    - Rarely
    - Sometimes
    - Often
    - Always

Thank you for taking the time to answer these questions.

Appendix 4: Institutional approvals

Postgraduate committee

UNIVERSITY OF THE WITWATERSRAND JOHANNESBURG

Private Bag 3 Wits, 2050
Fax: 027117172119
Tel: 02711 7172076

Reference: Mrs Sandra Benn
E-mail: sandra.benn@wits.ac.za

15 March 2023
Person No: 458419
PAG

Dr CR Eddey
30 Torquay Road
Parkwood
2193
South Africa

Dear Dr Creaghan Eddey

Master of Medicine in Anaesthesia: Approval of Title

We have pleasure in advising that your proposal entitled *The practice of patient blood management among South African anaesthetic providers* has been approved. Please note that any amendments to this title have to be endorsed by the Faculty's higher degrees committee and formally approved.

Yours sincerely

Mrs Sandra Benn
Faculty Registrar
Faculty of Health Sciences

100 1922 2022

Head of Department

UNIVERSITY OF THE WITWATERSRAND JOHANNESBURG | FACULTY OF HEALTH SCIENCES | WITS SCHOOL OF CLINICAL MEDICINE | DEPARTMENT OF ANAESTHESIOLOGY Tel.(011)488 4344

30 March 2023

Postgrad Office

School of Clinical Medicine

Faculty of Health Sciences

University of the Witwatersrand

To Whom It May Concern

Permission To Conduct Research: Dr Creaghan Eddey- Student Number: 458419

This is to confirm that I have read and given permission for **Dr Creaghan Eddey** to conduct research at in the Department of Anaesthesiology towards his/her Mmed project titled ***"The practice of patient blood management among South African anaesthetic providers"***

Thank you.

Assoc. Prof. P Motshabi Chakane

Ass Prof P. Motshabi Chakane
HOD Wits Anaesthesia
HOU Cardiac Anaesthesia
Tel: +27 (0)11 488 4344
Cell: 083 432 1994
Email: palesa.motshabi@wits.ac.za
Website: www.wits.ac.za
Charlotte Maxeke Johannesburg Academic Hospital, 6th Floor, Area 361/16, Jubilee Road, Parktown, Johannesburg

WITS UNIVERSITY | WITS SCHOOL OF CLINICAL MEDICINE | FACULTY OF HEALTH SCIENCES

Appendix 5: Approval to adapt survey

From: **David Baron** david.baron@meduniwien.ac.at
Subject: Re: Permission to use and adapt research tool
Date: 13 March 2023 at 14:48
To: Creaghan Ross Eddey creaghan.eddey@icloud.com

Dear Creaghan,

Thank you for your interest in our reseach. Attached please find a Word-version of the questionnaire, which you can adapt according to your requirements. If I had to repeat the study I would use 1-5 scales instead of "rarely of never", "in about half of the patients", and "mostly or always".

I do have one request myself - since it was a lot of work to design the questionnaire, can you please list me as one of the co-authors should you publish the results in a peer-reviewed journal. I will gladly review the manuscript prior to publication.

All my best!

David

David Baron, MD, PhD, EDIC
Associate Professor
Head of Anesthesia Out-Patient Clinic

Medical University of Vienna
Department of Anaesthesia, Intensive Care Medicine and Pain Medicine

Waehringer Guertel 18-20, A-1090 Vienna
T: +43 1 40400 41000
david.baron@meduniwien.ac.at

Am 2023-03-13 13:07, schrieb Creaghan Ross Eddey:

> Dear Dr Baron,
>
> My name is Dr Creaghan Eddey, and I am a registrar in the Department of Anaesthesiology at the University of the Witwatersrand in Johannesburg, South Africa. I am writing to ask for permission to use and adapt the tool you used in 'Evaluation of clinical practice in perioperative patient blood management.'
>
> It is my intention to perform a survey of the Patient Blood Management practices of anaesthetic providers in South Africa. I intend to title this work: "**The practice of patient blood management among South African anaesthetic providers."**
>
> The finalised research report will be submitted to the Faculty of Health Sciences of the University of the Witwatersrand, as required for the Master of Medicine degree. If you should wish, a copy will be made available to you.
>
> Yours Sincerely,
> Creaghan Eddey
> 076 638 6258
> Creaghan.eddey@gmail.com

Appendix 6: Ethics Certificates

University of the Witwatersrand Human Research Ethics Committee (Medical)

30 May 2023

M230407 MED23-03-111

UNIVERSITY OF THE WITWATERSRAND, JOHANNESBURG

R14/49 Dr Creaghan Eddey et al

HUMAN RESEARCH ETHICS COMMITTEE (MEDICAL)

CLEARANCE CERTIFICATE NO. M230407 MED23-03-111

NAME: (Principal Investigator)	Dr Creaghan Eddey et al
DEPARTMENT:	Anaesthesiology
PROJECT TITLE:	The practice of patient blood management among South African anaesthetic providers
DATE CONSIDERED:	05/05/2023
DECISION:	Approved unconditionally
CONDITIONS:	
SUPERVISOR:	Dr Cara Redelinghuys
APPROVED BY:	Dr C Penny, Chairperson, HREC (Medical)
DATE OF APPROVAL:	30/05/2023 **EXPIRY DATE:** 30/05/2028

This clearance certificate is valid for 5 years from date of approval. Extension may be applied for.

DECLARATION OF INVESTIGATORS

I/we fully understand the conditions under which I am/we are authorized to carry out the above-mentioned research and I/we undertake to ensure compliance with these conditions. Should any departure be contemplated, from the research protocol as approved, I/we undertake to resubmit the application to the Committee. **I agree to submit a yearly progress report** in April each year until study is closed. Failure to submit annual report will result in ethics clearance certificate suspension. The date for annual re-certification will be one year after the date of convened meeting where the study was initially reviewed. In this case, the study was initially reviewed in April and will therefore be due in the month of April each year. Unreported changes to the application may invalidate the clearance given by the HREC (Medical). Login to upload signed copy of this ethics clearance certificate prior to commencing with the study https://www.witsethics.co.za/login.aspx

Principal Investigator Signature

30 May 2023
Date

PLEASE QUOTE THE PROTOCOL NUMBER IN ALL ENQUIRIES

University of Pretoria Faculty of Health Sciences Research Ethics Committee

UNIVERSITEIT VAN PRETORIA
UNIVERSITY OF PRETORIA
YUNIBESITHI YA PRETORIA

Faculty of Health Sciences

Institution: The Research Ethics Committee, Faculty Health Sciences, University of Pretoria complies with ICH-GCP guidelines and has US Federal wide Assurance.

- FWA 00002567, Approved dd 18 March 2022 and Expires 18 March 2027.
- IORG #: IORG0001762 OMB No. 0990-0278 Approved for use through August 31, 2023.

Faculty of Health Sciences **Research Ethics Committee**

31 May 2023

Approval Certificate
New Application

Dear Mr CR Eddey

Ethics Reference No.: 216/2023
Title: The practice of patient blood management among South African anaesthetic providers

The **New Application** as supported by documents received between 2023-04-14 and 2023-05-31 for your research, was approved by the Faculty of Health Sciences Research Ethics Committee on 2023-05-31 as resolved by its quorate meeting.

Please note the following about your ethics approval:

- Ethics Approval is valid for 1 year and needs to be renewed annually by 2024-05-31.
- Please remember to use your protocol number (216/2023) on any documents or correspondence with the Research Ethics Committee regarding your research.
- Please note that the Research Ethics Committee may ask further questions, seek additional information, require further modification, monitor the conduct of your research, or suspend or withdraw ethics approval.

Ethics approval is subject to the following:

- The ethics approval is conditional on the research being conducted as stipulated by the details of all documents submitted to the Committee. In the event that a further need arises to change who the investigators are, the methods or any other aspect, such changes must be submitted as an Amendment for approval by the Committee.

We wish you the best with your research.

Yours sincerely

On behalf of the FHS REC, Dr R Sommers
MBChB, MMed (Int), MPharmMed, PhD
Deputy Chairperson *of the Faculty of Health Sciences Research Ethics Committee, University of Pretoria*

The Faculty of Health Sciences Research Ethics Committee complies with the SA National Act 61 of 2003 as it pertains to health research and the United States Code of Federal Regulations Title 45 and 46. This committee abides by the ethical norms and principles for research, established by the Declaration of Helsinki, the South African Medical Research Council Guidelines as well as the Guidelines for Ethical Research: Principles Structures and Processes, Second Edition 2015 (Department of Health)

Research Ethics Committee
Room 4-60, Level 4, Tuwelopele Building
University of Pretoria, Private Bag x323
Gezina 0031, South Africa
Tel +27 (0)12 356 3084
Email: deepeka.behari@up.ac.za
www.up.ac.za

Fakulteit Gesondheidswetenskappe
Lefapha la Disaense tša Maphelo

Appendix 7: Anaesthesia and Analgesia author guidelines

Presented in the style and format provided by Anaesthesia and Analgesia

Anesthesia & Analgesia

INSTRUCTIONS FOR AUTHORS

We greatly appreciate your interest in submitting your manuscript to *Anesthesia & Analgesia* or *A&A Case Reports*. Our goal is to provide authors with a thorough yet timely review of their submissions. All decisions should be completed within 6 weeks, except for Review Articles and Special Articles, which may take up to 8 weeks. Authors will be updated as to the status of their manuscript and notified if delays occur.

Notice: The **Instructions for Authors** for *Anesthesia & Analgesia* and *A&A Case Reports* have been significantly revised. New submissions prepared using the previous Instructions will continue to be accepted for review through **March 8, 2016**. As of **March 9, 2016**, all new submissions should be prepared according to the Instructions that follow. Failure to do so may result in your submission being returned without review.

Mission and Scope

Anesthesia & Analgesia exists for the benefit of patients under the care of health care professionals engaged in the disciplines broadly related to anesthesiology, perioperative medicine, critical care medicine, and pain medicine. The Journal furthers the care of these patients by reporting the fundamental advances in the science of these clinical disciplines and by documenting the clinical, laboratory, and administrative advances that guide therapy. *Anesthesia & Analgesia* seeks a balance between definitive clinical and management investigations and outstanding basic scientific reports. The Journal welcomes original manuscripts containing rigorous design and analysis, even if unusual.

A&A Case Reports publishes short yet informative, peer-reviewed articles that simply ***describe*** (a) the unique perioperative or chronic pain-related clinical care of one to three patients; (b) an important teaching point or novel educational tool; or (c) an innovative solution to a perioperative services, patient safety, or global health management issue. Data collection and analyses are neither expected nor encouraged for an ***A&A Case Report.***

***Anesthesia & Analgesia* and *A&A Case Reports* Instructions for Authors**

Anesthesia & Analgesia and *A&A Case Reports* have specific **Instructions for Authors** for submitting articles, which are found below. We strongly encourage all authors to read these instructions completely and carefully, and to prepare their manuscripts in accordance with these instructions.

Articles that are not submitted in accordance with our instructions and guidelines may be rejected.

Questions?

If you have questions about these submission instructions, please contact the **Editorial Office** via editor@anesthesia-analgesia.org or phone at (**919) 378-1773**.

Manuscripts may only be submitted via the Editorial Manager online submission system. Submit your manuscript here.

If you are new to our journal, our **Visual User Guide for Authors** will help you step-by-step to create an author account and to submit your new manuscript via Editorial Manager.

If you are submitting a revised manuscript, our **User Guide for Revisions** will help you step-by-step to submit your revised manuscript via Editorial Manager.

Download a PDF version of the full Instructions for Authors of *Anesthesia & Analgesia and A&A Case Reports*

INSTRUCTIONS FOR AUTHORS

Except were specifically noted, instructions in the following Sections are the same for both *Anesthesia & Analgesia* and *A&A Case Reports*

Section 1A: *Anesthesia & Analgesia* Article Types (Back to Contents)

Original Clinical Research Report
Original Laboratory Research Report
Brief Report
Narrative Review Article
Systematic Review Articles
Meta-Analysis
Editorial
The Open Mind
Special Article
Echo Rounds
Echo Didactics
Letter to the Editor
Book and Multimedia Reviews
Meeting Report

Section 1B: *A&A Case Report* Article Topics (Back to Contents)

A&A Case Reports publishes short yet informative, peer-reviewed articles that simply ***describe*** (a) the unique perioperative or chronic pain-related clinical care of one to three patients; (b) an important teaching point or novel educational tool; or (c) an innovative solution to a perioperative services, patient safety, or global health management issue. Data collection and analyses are neither expected nor encouraged for an ***A&A Case Reports*** submission.

A&A Case Reports

DESCRIPTIONS

Anesthesia & Analgesia

Original Clinical Research Report (Back to Top)

- An Original Clinical Research Report describes an investigation that focuses on the clinical practice of anesthesiology, perioperative medicine, critical care medicine, or pain medicine.
- Original Clinical Research Reports span the spectrum of patient-reported outcomes, clinical effectiveness, quality and performance improvement, patient safety, health services delivery, dissemination and implementation science, health policy, healthcare economics, and population health.
- Original Clinical Research Reports include a Title Page and structured Abstract of no more than 400 words. These Reports are divided into four sections: Introduction, Methods, Results, and Discussion.
- Original Clinical Research Reports range in length from 1,500 to 4,000 words (not counting the Abstract and references), typically with no more than 30-40 references and 4-6 tables and/or figures. Online supplemental material can be provided when appropriate.
- Study Reporting Requirement (EQUATOR)

- Instructions for manuscript preparation
- Instructions for Figure preparation
- Instructions for Table preparation
- Instructions for Supplemental Material

Original Laboratory Research Report (Back to Top)

- An Original Laboratory Research Report describes an investigation that focuses on an aspect of basic science related to anesthesiology, perioperative medicine, critical care medicine, or pain medicine.
- Original Laboratory Research Reports span the spectrum of cell biology, immunology, neurobiology, biochemistry, pharmacology, microbiology, and genetics.
- Original Laboratory Research Reports include a Title Page and structured Abstract of no more than 400 words. These Reports are divided into four sections: Introduction, Methods, Results, and Discussion.
- Original Laboratory Research Reports range in length from 1,500 to 4,000 words (not counting the Abstract and references), typically with no more than 30-40 references and 4-6 tables and/or figures. Online supplemental material can be provided when appropriate.
- Study Reporting Requirement (EQUATOR)
- Instructions for manuscript preparation
- Instructions for Figure preparation
- Instructions for Table preparation
- Instructions for Supplemental Material

Brief Report (Back to Top)

- A Brief Report describes a clinical or laboratory investigation that does not require the breadth of experimentation or documentation expected of an Original Research Report.
- A Brief Report typically involves the analysis of either retrospective or preliminary data, thus forming the basis for a subsequent more extensive investigation. A Brief Report can also be technical in nature, describing a new instrumentation or analytic technique.
- Brief Reports include a Title Page and an unstructured Abstract with no more than 100 words. Brief Reports contain an Introduction, Methods, Results, and a very brief (no more than 1 paragraph long) Discussion.
- Brief Reports are no more than 1500 words (not counting the Abstract and references), typically with no more than 10 references and 1 table and/or 1 figure.
- Study Reporting Requirement (EQUATOR)
- Instructions for manuscript preparation
- Instructions for Figure preparation
- Instructions for Table preparation
- Instructions for Supplemental Material

Narrative and Systematic Review Articles (Back to Top)

- A Narrative Review Article synthesizes previously published material into an integrated presentation of our current understanding of a topic and can be either focused or comprehensive in scope. A Narrative Review Article should describe aspects of a topic about which scientific and evidence-based consensus exists, as well as aspects that remain controversial and are thus topics for ongoing and future research.
- Another specific option is a Focused Narrative Review of the conventional or novel application of contemporary quantitative sciences (i.e., statistics, epidemiology, or database management) to issues of concern to anesthesia, critical care or pain researchers. Here the inclusion of programing code/illustrative datasets as online supplemental material is encouraged.
- For a Systematic Review, a formal strategy to search and to critically evaluate the medical literature should be applied and described. Such explicit methods are used in a Systematic Review to minimize bias in its content and findings.
- All Review Articles include a Title Page and an unstructured Abstract with no more than 400 words. Review Articles range in length from 1,500 to 5,000 words (not counting the Abstract and references), with up to 150 references and 4-6 tables and/or figures.
- Study Reporting Requirement (EQUATOR)
- Instructions for manuscript preparation
- Instructions for Figure preparation
- Instructions for Table preparation
- Instructions for Supplemental Material

Meta-Analysis (Back to Top)

- A Meta-Analysis uses analytic techniques to combine the quantitative results from existing individual studies, which are initially identified via a Systematic Review, thereby (a) allowing for a more precise estimate of the magnitude of benefit or harm of an intervention and/or (b) increasing the applicability of the results to a broader range of patients
- A Meta-Analysis should not be written and submitted as a Systematic Review Article but as a separate submission type.
- A Meta-Analysis includes a Title Page and structured Abstract of no more than 400 words. These manuscripts are divided into four sections: Introduction, Methods, Results, and Discussion.
- A Meta-Analysis ranges in length from 1,500 to 4,000 words (not counting the Abstract and references), typically with no more than 30-40 references and 4-6 tables and/or figures. Online supplemental material can be provided when appropriate.
- Study Reporting Requirement (EQUATOR)
- Instructions for manuscript preparation

- Instructions for Figure preparation
- Instructions for Table preparation
- Instructions for Supplemental Material

Editorial (Back to Top)

- Editorials are *solicited* by the Editorial Board
- An Editorial either (a) provides an editorial perspective on an article published in the Journal or (b) expresses the general policies or opinions of the Journal Editorial Board. If an Editorial is intended to provide an expert perspective on an article or topic published in the Journal, it is typically solicited from reviewer(s) who provided unusually thoughtful insight during the peer-review process, and which the Editors believe should be shared with the Journal readership.
- An Editorial includes a Title but not an Abstract. It is typically less than 2000 words (not counting the references), with no more than 15 references and occasionally 1 table and/or 1 figure.
- Instructions for manuscript preparation
- Instructions for Figure preparation
- Instructions for Table preparation
- Instructions for Supplemental Material

The Open Mind (Back to Top)

- The Open Mind is a unique forum for thoughtful, scholarly, and preferably well-referenced perspectives. The Open Mind is intended to stimulate lively yet civil discussion. It is a forum for (a) challenging myths or dogma and/or (b) proposing new approaches or solutions to an important issue facing the anesthesiology community.
- Submissions to The Open Mind include a Title Page but not an Abstract.
- Open Mind articles range in length from 1,500 to 3,000 words (not counting the references), with up to 20 references and 2-3 tables and/or figures.
- Instructions for manuscript preparation
- Instructions for Figure preparation
- Instructions for Table preparation
- Instructions for Supplemental Material

Special Article (Back to Top)

- A Special Article is a manuscript that does not fit in any of the other article types. They are typically invited by the Editorial Board to examine a particular topic.
- Occasionally, authors produce a publishable scholarly text that does not fit one of the other article types. After first communicating directly with the Journal's Editor-in-Chief, these may be submitted as a Special Article.
- All Special Articles include a Title Page and an unstructured Abstract with no more than 400 words. Special Articles range in length from 1,000 to 5,000 words (not counting the Abstract and references), with up to 150 references and 4-6 tables and/or figures.
- Instructions for manuscript preparation
- Instructions for Figure preparation
- Instructions for Table preparation
- Instructions for Supplemental Material

Echo Rounds (Back to Top)

- Echo Rounds provide a focused discussion of a unique or interesting perioperative clinical situation in which ultrasound was central to the clinical management. Submissions must provide succinct teaching points on echocardiographic/ultrasound views, techniques or calculations. Their teaching content must be supported by the current literature or standard reference texts of echocardiography, preferably those most accessible to the general reader.
- Authors are advised to examine previously published Echo Rounds (either via the Table of Contents or via the www.anesthesia-analgesia.org) to avoid submission of previously published topics.
- Echo Rounds should not be construed and presented as "mini Case Reports." Therefore, only the most relevant clinical details and specific echo findings should be succinctly presented in the first one-third of the manuscript. The specific echo findings and didactic discussion of the echo topic(s) should comprise the subsequent two-thirds of the manuscript.
- Echo Rounds include a Title Page but not an Abstract.
- Echo Rounds are short reports with no more than 800 words (not counting the Abstract and references) and 6 references.
- Echo Rounds should be accompanied by 1-3 echocardiographic still images and 1-3 video clips with legends. The video clips will be available online. The still images usually, but not always, correspond to the respective video clip(s). Figures and clips should be appropriately labeled (e.g., arrows, abbreviations of anatomic structures, etc.). Authors may elect to consolidate consecutive time segments into a single clip,

although adequate viewing time for each segment must be provided to clearly illustrate the primary findings being discussed in the text. One simple table is also allowed.

- Study Reporting Requirement (EQUATOR)
- Echo Rounds Submission Checklist
- Required HIPAA Waiver
- Instructions for manuscript preparation
- Instructions for Figure preparation
- Instructions for Table preparation
- Instructions for Supplemental Material
- Instructions for Video Preparation

Echo Didactics (Back to Top)

Echo Didactics are *solicited* submissions presenting a practical clinical *review* of a particular ultrasound topic (e.g., important measurements, specific anatomic or physiologic evaluation, and current or emerging technologies) related to transesophageal, surface/transthoracic, epicardial, epiaortic or intravascular echocardiography.

- Echo Didactics include a Title Page but not an Abstract. The author should instead provide 3 or 4 bulleted teaching points summarizing the most important teaching points.
- Echo Didactics submissions start with an index case, which is a 1-2 sentence clinical scenario to preface the content.
- The main focus of Echo Didactics should be a discussion of the most relevant background, the "nuts and bolts" of the assessment, measurement, or imaging, and new concepts.
- Echo Didactics are typically no more than 1500 words (not counting the Abstract and references) and should include no more than 10 references.
- Echo Didactics should include 1 to 3 high-resolution figures and 1 to 3 video clips, which can be composite videos. Figures and clips should be appropriately labeled (e.g., arrows, abbreviations of anatomic structures, etc.). Authors may elect to consolidate consecutive time segments into a single clip, although adequate viewing time for each segment must be provided to clearly illustrate the primary findings being discussed in the text.
- One simple table is also allowed.
- Study Reporting Requirement (EQUATOR)
- Echo Didactics Checklist
- Instructions for manuscript preparation
- Instructions for Figure preparation
- Instructions for Table preparation
- Instructions for Supplemental Material

Letter to the Editor (Back to Top)

- A Letter to the Editor can offer brief, objective, and constructive comments or criticism concerning previously published articles or provide other communication of general interest to the readership. Such correspondence submissions are not a venue for Case Reports, and authors must attest during the submission process, in their cover letter, that a case description is not included in their correspondence.
- A Letter to the Editor should be brief, with no more than 500 words. Three or fewer references, a small table or a pertinent illustration may be provided.
- All Letters to the Editor should be submitted via the *Anesthesia & Analgesia* Online Submission and Review System and not via email or postal service.
- Letters are edited by the Correspondence Editor, sometimes extensively, to sharpen their focus. A Letter to the Editor may be sent for peer review, at the discretion of the Correspondence Editor.
- A Letter to the Editor that is written in response to a published paper must be submitted no later than 3 months after the first of day of the month of the original article's print publication date.
- Instructions for manuscript preparation

Book and Multimedia Reviews (Back to Top)

- A Book and Multimedia Review reports on a current publication about anesthesiology, perioperative medicine, critical care medicine, or pain medicine.
- Publishers interested in having their book or multimedia material reviewed by the Journal should first contact our Media Reviews editor at: bookreviews@iars.org.
- Book Reviews are typically less than 750 words.
- Instructions for manuscript preparation

Meeting Report (Back to Top)

- A Meeting Report is a scholarly outline of the program and content of a scientific meeting.
- A Meeting Report may be organized temporally (day by day) or thematically (topic by topic).

- Authors interested in submitting meeting reports should first contact our Media Reviews editor at bookreviews@iars.org to confirm that the meeting is of general interest to the readership.
- A Meeting reports does not have an Abstract and is typically less than 1500 words.
- Instructions for manuscript preparation

A&A Case Reports (Back to Top)

Please note that when submitting a manuscript to *A&A Case Reports*, go to http://www.editorialmanager.com/aa/default.aspx and select "A&A Case Reports" as the submission type.

- Case Reports include a Title Page and an unstructured Abstract with a maximum of 100 words.
- Case Reports include an Introduction, Description of the case, project, initiative, setting, or scenario, Discussion, and References.
- There are no absolute word limits. However, it is recommended that the Introduction, Description, and Discussion should be no more than 1500 words, with no more than 10 references.
- Including figures, illustrations, tables, and supplementary digital and video and audio material that expands the reader's understanding of the case report is strongly encouraged
- Study Reporting Requirement (EQUATOR)
- Instructions for manuscript preparation
- Instructions for Figure preparation
- Instructions for Table preparation
- Instructions for Supplemental Material

For more information about *A&A Case Reports* and to view examples of its published manuscripts, visit: http://journals.lww.com/aacr.

Section 2: Articles at a Glance (Back to Contents)

Manuscript Type	Abstract:	Figures/Tables	References	Word Count	Sections	Supplemental Material	Additional Information
Clinical Research Report	Structured 400 word limit	4 to 6 tables and/or figures	30-40	1500-4000 (not including abstract and references)	Introduction, Methods, Results, and Discussion	When appropriate	EQUATOR checklist
Laboratory Research Report	Structured 400 word limit	4 to 6 tables and/or figures	30-40	1500-4000 (not including abstract and references)	Introduction, Methods, Results, and Discussion	When appropriate	EQUATOR checklist
Brief Reports	Unstructured 100 word limit	1 table and/or 1 figure	10	1500 (not including abstract and references)	Introduction, Methods, Results, and a very brief (no more than 1 paragraph long) Discussion	NA	EQUATOR checklist
Narrative Review Articles	Unstructured 400 word limit	4-6 tables and/or figures	150	1,500 to 5,000 words (not including abstract and references)		The inclusion of programing code/illustrative datasets as online supplemental material is encouraged	EQUATOR checklist
Systematic Review Article	Unstructured 400 word limit	4-6 tables and/or figures	150	1,500 to 5,000 words (not including abstract and references)		When appropriate	EQUATOR checklist

Meta Analysis	Structured 400 word limit	4-6 tables and/or figure	30-40	1,500 to 4,000 words (not including abstract and references)		When appropriate	EQUATOR checklist
Editorial ***Solicited by the Editorial Board***	NA	1 table and/or 1 figure	15	Less than 2000 words (not including references)		When appropriate	EQUATOR checklist
The Open Mind	NA	2-3 tables and/or figures	20	1500 to 3000 words (not including references)		When appropriate	EQUATOR checklist
Special Article ***Solicited by the Editorial Board***	Unstructured 400 words	4-6 tables and/or figures	150	1000-5000 (not including abstract and reference)		When appropriate	EQUATOR checklist
Echo Rounds	NA	1 simple table allowed (.doc format only) 1-3 echocardiographic still images and 1-3 video clips with legends	6	800 words (not including abstract and references)		When appropriate	EQUATOR checklist
Echo Didactics ***Solicited***	3 bulleted teaching points summarizing the most importing teaching points	1-3 high-resolution figures 1 simple table allowed 1-3 video clips, which can be composite videos)	10	1500 (not including abstract and references)		When appropriate	• Echo Didactics submissions start with an index case, which is a 1-2 sentence clinical scenario to preface the content EQUATOR checklist
Letter to the Editor and Reply	NA	Small table or a pertinent illustration may be provided.	3 or less	500			EQUATOR checklist
Book and Multimedia Review	NA	NA	Reference the publication	750			EQUATOR checklist
Meeting Report	NA	NA		Less than 1500	•May be organized temporally (day by day) or thematically (topic by topic).		EQUATOR checklist
Case Reports	Unstructured 100 words or less	Figures, illustrations, tables, and supplementary digital and video and audio material that expands the reader's understanding of the case report is strongly encouraged	10	Recommend ed length – 1500 words (Introduction – Discussion)	Introduction, Description of the case, project, initiative, setting, or scenario, Discussion, and References	When appropriate	EQUATOR checklist

Section 3: *Anesthesia & Analgesia* and *A&A Case Reports* Standardized Study Reporting Requirements (Back to Contents)

SPECIFIC STUDY TYPE AND ASSOCIATED GUIDELINE

1. Randomized Controlled Trials. Authors reporting the results of a **randomized controlled trial** must follow the CONSORT statement and provide a completed CONSORT checklist. Authors must also provide a CONSORT flow diagram as Figure 1 of the submitted manuscript.

Please note that there are CONSORT Extensions for several different types of randomized trials, and the most applicable Extension should be followed by authors.

2. Non-Randomized Controlled Trials. Authors reporting the results of a **non-randomized controlled trial** must follow the TREND statement and provide a completed TREND checklist.

3. Observational Studies. Authors reporting the results of **a cohort, case-control, or cross-sectional study (or any other type of observational study of human subjects)**, a case series of ≥ 4 patients, or a retrospective data collection study must follow the STROBE statement and provide a completed STROBE checklist.

For a single case study or small case series of ≤ 3 patients, the STROBE statement is not applicable but instead the CARE statement (see below) should be followed.

4. Systematic Review or Meta-analysis. Authors reporting a **systematic review** or **meta-analysis of randomized trials or cohort studies** must follow the PRISMA (previously named QUOROM) Statement and provide a completed PRISMA checklist. Authors must also submit a PRISMA flow diagram as Figure 1 of the submitted manuscript.

5. Quality Improvement Research. Authors reporting the results of a **quality improvement study** must follow the SQUIRE 2.0 guidelines and provide a completed SQUIRE 2.0 checklist.

6. Qualitative Research. Authors reporting the results of a **qualitative study** (e.g., in-depth interviews and focus groups) must provide a completed SRQR checklist.

Alternatively, authors reporting the results of a **qualitative study** can provide a completed COREG checklist.

7. Health Economic Evaluation Research. Authors reporting the results of a **health economic evaluation research study** must follow the CHEERS guidelines and provide a completed CHEERS checklist.

8. Diagnostic Accuracy. Authors reporting a **study of the accuracy of a diagnostic test** must follow the STARD statement and provide a completed STARD checklist. Authors must also provide a STARD flow diagram as Figure 1 of the submitted manuscript.

Alternatively, authors reporting studies of the accuracy of diagnostic tests can follow the TRIPOD Statement and provide a completed TRIPOD checklist.

9. Genetic Association Studies. Authors reporting a **genetic association study** must follow the STREGA guidelines and must submit a completed STREGA checklist.

10. Animal Studies. Authors reporting an **animal study** must follow the ARRIVE guidelines and must submit the ARRIVE checklist.

11. Echo Rounds and Echo Didactics Submission Checklist

- Authors must submit a completed *Anesthesia & Analgesia* checklist for an Echo Rounds submission Required Echo Rounds Submission Checklist
- or an Echo Didactics submission Required Echo Didactics Submission Checklist
- Echo Rounds or Echo Didactics for publication by *Anesthesia & Analgesia* must be prepared in accordance with the requirements of HIPAA privacy regulations (See Section 7 ***A&A* Echo Rounds and Echo Didactics Compliance with HIPAA Privacy Regulations**).

12. Case Reports. Authors reporting the details of a **case study** of a single patient or a **case series** of ≤ 3 patients must follow the CARE Guidelines and submit a completed CARE checklist.

Case Reports for publication by *Anesthesia & Analgesia* must be prepared in accordance with the requirements of HIPAA privacy regulations (See Section 7 ***A&A Case Reports* Compliance with HIPAA Privacy Regulations**).

In clinical case reports, authors should state whether they have reported serious adverse events to the manufacturer, United States Food and Drug Administration (FDA), or other governmental regulatory agency.

The Enhancing the Quality of and Transparency of Health Research (EQUATOR) Network was created to monitor and to propagate the proper use of guidelines to improve the quality of scientific publications by promoting transparent and accurate reporting of human subjects, health services, and animal research.

As advocated by the EQUATOR Network, *Anesthesia & Analgesia* requires adherence to the applicable statement/guidelines and checklist for all submitted research-related manuscripts (see Table below).

Adhering to the applicable statement/guidelines and checklist promotes consistent study design and manuscript content, which are major advantages for the Journal's authors, reviewers, editors, and readers.

Authors should consult the EQUATOR Network webpage and/or the webpage URL or citation listed in the Table below for the most current version of the specific, applicable **statement or guideline and its checklist**.

- **The applicable study checklist should be completed and uploaded as a Supplemental/Additional File at the time of initial manuscript submission via Editorial Manager.** Instructions for Supplemental Material

Acronym	Full Title of Guideline	Webpage URL or Citation
CONSORT	Consolidated Standards of Reporting Trials (See footnote* below)	http://www.consort-statement.org/
TREND	Transparent Reporting of Evaluations with Nonrandomized Designs	http://www.cdc.gov/trendstatement/
STROBE	Strengthening the Reporting of Observational Studies in Epidemiology	http://www.strobe-statement.org/
PRISMA	Preferred Reporting Items for Systematic Reviews and Meta-Analyses	http://www.prisma-statement.org/
SQUIRE	Standards for Quality Improvement Reporting Excellence	http://www.squire-statement.org/
SRQR or COREG	Standards for Reporting Qualitative Research Consolidated Criteria for Reporting Qualitative Research	PMID: 24979285 PMID: 17872937
CHEERS	Consolidated Health Economic Evaluation Reporting Standards	http://www.ispor.org/Health-Economic-Evaluation-Publication-CHEERS-Guidelines.asp
STARD or TRIPOD	Standards for Accurate Reporting of Diagnostic Tests *Transparent Reporting of a Multivariable Prediction Model for Individual Prognosis Or Diagnosis*	http://www.stard-statement.org/ http://www.tripod-statement.org/
STREGA	Strengthening the Reporting of Genetic Associations	http://www.medicine.uottawa.ca/public-health-genomics/web/eng/strega.html
ARRIVE	Animal Research: Reporting of *In Vivo* Experiments	http://www.nc3rs.org.uk/arrive-guidelines
CARE	Case Reports	http://www.care-statement.org/

* The main CONSORT Statement is based on the "standard" two-group parallel design. However, there are several different types of randomized trials, some of which have different designs (e.g., cluster, non-inferiority and equivalence, or pragmatic trials), interventions (e.g., herbal medicinal, non-pharmacological, or acupuncture) and data (e.g., harms), for which specific CONSORT Extensions exist.

Section 4: Digital Copyright Transfer Agreement (Back to Contents)

All Copyright Transfer Agreements (CTA) must now be signed digitally and uploaded (one completed form per author) upon submission for all new submissions. The corresponding author is responsible for collecting all signed forms and uploading them (as a "Copyright Transfer Form" file) into the "Attach Files" section of Editorial Manager. Please note that you will not have a Manuscript ID if you are submitting a new submission and only need to provide the manuscript title.

If your manuscript is in the revision stage please have the corresponding author collect all signed forms and upload them (as a "Copyright Transfer Form" file) into the "Attach Files" section of Editorial Manager.

If your manuscript has been accepted please have the corresponding author collect all signed copyright forms and email or fax them (in one batch) to the editorial office.

Download the **Copyright Transfer Form**.

Questions About the Copyright Transfer and Disclosure Form?

Please see the **Copyright Form FAQs for Authors**.

If you are unable to view the form: Please be aware that the default setting used by all of the most commonly used browsers is to open PDF files within a new browser tab or window. Because the copyright form is a very large file it may not load within a browser, depending on the speed of your Internet connection. If you are unable to view the form in your browser, please download the file and open it directly within Adobe Reader. You may also

Adhering to the applicable statement/guidelines and checklist promotes consistent study design and manuscript content, which are major advantages for the Journal's authors, reviewers, editors, and readers.

Authors should consult the EQUATOR Network webpage and/or the webpage URL or citation listed in the Table below for the most current version of the specific, applicable **statement or guideline and its checklist**.

- **The applicable study checklist should be completed and uploaded as a Supplemental/Additional File at the time of initial manuscript submission via Editorial Manager.** Instructions for Supplemental Material

Acronym	Full Title of Guideline	Webpage URL or Citation
CONSORT	Consolidated Standards of Reporting Trials (See footnote* below)	http://www.consort-statement.org/
TREND	Transparent Reporting of Evaluations with Nonrandomized Designs	http://www.cdc.gov/trendstatement/
STROBE	Strengthening the Reporting of Observational Studies in Epidemiology	http://www.strobe-statement.org/
PRISMA	Preferred Reporting Items for Systematic Reviews and Meta-Analyses	http://www.prisma-statement.org/
SQUIRE	Standards for Quality Improvement Reporting Excellence	http://www.squire-statement.org/
SRQR or COREG	Standards for Reporting Qualitative Research Consolidated Criteria for Reporting Qualitative Research	PMID: 24979285 PMID: 17872937
CHEERS	Consolidated Health Economic Evaluation Reporting Standards	http://www.ispor.org/Health-Economic-Evaluation-Publication-CHEERS-Guidelines.asp
STARD or TRIPOD	Standards for Accurate Reporting of Diagnostic Tests *Transparent Reporting of a Multivariable Prediction Model for Individual Prognosis Or Diagnosis*	http://www.stard-statement.org/ http://www.tripod-statement.org/
STREGA	Strengthening the Reporting of Genetic Associations	http://www.medicine.uottawa.ca/public-health-genomics/web/eng/strega.html
ARRIVE	Animal Research: Reporting of *In Vivo* Experiments	http://www.nc3rs.org.uk/arrive-guidelines
CARE	Case Reports	http://www.care-statement.org/

* The main CONSORT Statement is based on the "standard" two-group parallel design. However, there are several different types of randomized trials, some of which have different designs (e.g., cluster, non-inferiority and equivalence, or pragmatic trials), interventions (e.g., herbal medicinal, non-pharmacological, or acupuncture) and data (e.g., harms), for which specific CONSORT Extensions exist.

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If your manuscript is in the revision stage please have the corresponding author collect all signed forms and upload them (as a "Copyright Transfer Form" file) into the "Attach Files" section of Editorial Manager.

If your manuscript has been accepted please have the corresponding author collect all signed copyright forms and email or fax them (in one batch) to the editorial office.

Download the **Copyright Transfer Form**.

Questions About the Copyright Transfer and Disclosure Form?

Please see the **Copyright Form FAQs for Authors**.

If you are unable to view the form: Please be aware that the default setting used by all of the most commonly used browsers is to open PDF files within a new browser tab or window. Because the copyright form is a very large file it may not load within a browser, depending on the speed of your Internet connection. If you are unable to view the form in your browser, please download the file and open it directly within Adobe Reader. You may also

change the default PDF-handling settings in your browser. Both options are explained in our online knowledge base: **Opening the Copyright Transfer Form**.

ATTENTION MAC USERS: The form cannot be viewed with Safari. In order to access the form, you will need to:

1) File -> Save As (to save onto your computer)

2) Open Adobe Reader

3) File -> Open File -> copyrightransfer.pdf

A visual step-by-step guide for signing a PDF document electronically is available at: **http://links.lww.com/ZUAT/A106**.

Our publisher's CTA FAQ is available at: **http://lwwonline.custhelp.com/app/answers/list**

The form is accessible via Adobe Reader X. To download the latest version of Adobe Reader, go to: **http://get.adobe.com/reader/**.

If you have problems uploading your form and you need to fax it to us, please email us for instructions.

Section 5: Open Access Option for Publication (Back to Contents)

Authors of accepted peer-reviewed articles have the choice to pay a fee to allow perpetual unrestricted online access to their published article to readers globally, immediately upon publication. **The article processing charge for Anesthesia & Analgesia and A&A Case Reports is $3,000**. Please see the **Open Access page** for more details.

Section 6: *Anesthesia & Analgesia* and *A&A Case Reports* Manuscript Preparation (Back to Contents)

Manuscript Organization

Title Page

Abstract (when required)

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Figure Legends

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Video instruction for Echo Rounds and Echo Didactics

Supplemental Material

Additional Information

- **Units of Measurement**
- **Abbreviations**
- **Drug Names and Equipment**
- **Statistical Analysis**
- **Patient Identification**

Permissions

Language Editing Services

Manuscript Organization (Back to Top)

ALL articles should be arranged in the following order.

1. Manuscript, as a single file, consisting of Title Page, Abstract (not required for all article types - see Articles At A Glance), Body Text, References
2. Tables (each Table should be a separate .doc file)
3. Figure Legends (placed consecutively, in numerical order, all on the same page)
4. Figures (each Figure should be uploaded as a separate file)
5. Appendices (each Appendix should be a separate file)

Title Page (Back to Top)

- Article Title
- First name, middle initial, and last name of each author, with their highest academic degree (M.D., Ph.D., *etc.*), and institutional affiliations.
- Name, mailing address, phone number, and e-mail address of the corresponding author.
- Disclosure of funding received for the work from National Institutes of Health (NIH), Wellcome Trust, Howard Hughes Medical Institute (HHMI), and all other financial support, including departmental or institutional funding. If no funding received, state Financial Disclosures: None
- Please list any conflicts of interest the authors have had within the 36 months of submission. If no conflicts, state Conflicts of interest: None
- Clinical trial number and registry URL, if applicable.
- Number of words in Abstract, in Introduction, and in Discussion.
- Abbreviated Title (running head) that states the essence of the article (< 50 characters). This is not required for all article types--see above.

Abstract (Back to Top)

Manuscript Type	Abstract Type	Number of words
Original Clinical Research Report	Structured	400
Original Laboratory Research Report	Structured	400
Brief Report	Unstructured	100
Narrative Review	Unstructured	400
Systematic Review	Unstructured	400
Meta-Analysis	Structured	400
Editorial	NA	NA
The Open Mind	NA	NA
Special Article	Unstructured	400
Echo Rounds	NA	NA
Echo Didactics	3 bulleted teaching points	NA
Letter to the Editor	NA	NA
Book and Multimedia Review	NA	NA
Meeting Report	NA	NA
Case Report	Unstructured	100

Body (Back to Top)

The body of the manuscript should typically be divided into four parts (does not apply to all article types – See Article Types At A Glance):

- Textual material (body text, tables, figure legends etc.) should be submitted in a .doc word processing program
- 12 point Arial or Times New Roman font
- Introduction (new page, recommended 500 word limit). This should rarely exceed one page in length.
  - Should contain three brief paragraphs: (1) background, (2) rationale/significance, and (3) the study's objectives/aims and if applicable, hypotheses.
  - Avoid the temptation and frequent tendency to provide a literature review
- Methods (new page)
  - A subsection entitled "Statistical Analysis" should appear at the end of the Methods section when appropriate
  - A statement indicating the author has followed the appropriate EQUATOR guidelines should be included in the Methods section
    - Example: This manuscript adheres to the applicable Equator guidelines.
- Results (new page)
- Discussion (new page). Focuses on the findings in the current work

Acknowledgements (Back to Top)

For acknowledgement of individuals or organizations, provide complete name, degrees, academic rank, department, institutional affiliation, city, state, and country. Add description of the contribution to the study.

References (Back to Top)

- *Anesthesia & Analgesia* and *A&A Case Reports* follow the American Medical Associate (AMA) citation style; Consult the American Medical Association Manual of Style, 10th ed., New York, Oxford University Press, 2007, for style.
- Number references (as superscripts) in the sequence they appear in the text.
- In text, tables, and legends, identify references with superscript Arabic numerals.
- Abbreviate names of journals according to the journals list in PubMed
- Manuscripts "In Press" – A "manuscript in press" is defined as an article that has been accepted for publication, but has not yet been published by the accepting journal, in print or online and is being cited as basis for the study being described in the submitted manuscript. Please submit an electronic copy (Word, PDF) of any "In Press" manuscript that is cited in the reference list, labeled as "In Press, Reference # ___."
- List all authors and/or editors up to 6; if more than 6, list the first 3 followed by "et al."

Tables (Back to Top)

- *Anesthesia & Analgesia* and *A&A Case Reports* follow the American Medical Associate (AMA) table format
- Tables should be uploaded as a separate Word file or presented in the main document word file, just after the references
- Use a separate page for each table
- Double-space each table's entry
- Do not submit tables as photographs or pasted images
- Number the tables consecutively, and cite them consecutively (on first instance) in the text. Each table should have a brief title. Each column in a table should have a brief name
- Use footnotes (not table titles or column headings) for explanatory matter and definitions of abbreviations. Abbreviations must be described with footnotes even if they are defined in the text or in other tables.
- For footnotes, use lower-case italicized letters in alphabetical order.
- If you include a block of data, a table, or a figure from another source, whether published or unpublished, acknowledge the original source.

Appendices (Back to Top)

- Uploaded as a separate file
- Each appendix must be cited within the text, in consecutive order.

Figure Legends (Back to Top)

- Supply a legend for each figure.
- Group Figure legends on a single page just after the references
- If a figure has multiple panels (e.g., left, right or A, B, C) please specify each panel in the legend.
- Repeat definitions of any abbreviations used in the legend

Figures (Back to Top)

- Figures should be uploaded as separate .tiff, .jpeg or .eps files. Figures will have to be uploaded at a resolution of 300 dpi or higher at acceptance.
- Figures with multiple panels should be condensed into a single file for each figure (for example, Figure 1A through 1F should be in one file, Figures 2a through 2F should be in a second file, etc.). Each individual panel should be labeled with a capital letter.
- *Anesthesia & Analgesia* and *A&A Case Reports* publish in full color, and encourage authors to use color to increase the clarity of figures.
- Standard colors should be used (black, red, green, blue, cyan, magenta, orange, and gray).
- Avoid colors that are difficult to see on the printed page (e.g., yellow) or are visually distracting (e.g., pink).
- Figure backgrounds and plot areas should be white, not grey.
- Axis lines and ticks should be black and thick enough to clearly frame the image.
- Axis labels should be large enough to be easily readable and printed in black.
- Number figures consecutively. Supply a brief title for each. Cite figures in the text in consecutive, numerical order on first instance.
- If a figure has already been published, acknowledge the original source. You must obtain and submit written permission from the copyright holder to reproduce the material when you submit the manuscript for review. Unpublished figures require permission of the author. Permission is required to reproduce any previously published material except for documents or figures in the public domain. See Permissions
- Define all abbreviations used in each figure. Repeat definitions of any abbreviations used in subsequent legends.

Video preparation for Echo Rounds or Echo Didactics (Back to Top)

The video clip(s) accompanying Echo Rounds or Echo Didactics submissions should conform to the following:

- Formatted in MPEG, QuickTime (MOV), Windows Media Video (WMV) or MP4.
- Play on *both* Windows and Macintosh platforms. The review process will be delayed if the Editorial Office cannot play your video clip.
- Individual size should not exceed 15 MB. Use video-compression software to reduce video size if necessary.
- Optimal video frame dimensions of 480 x 360 pixels and 640 x 480 pixels. Videos of 320 x 240 pixels have inadequate resolution for teaching.
- Duration of individual video clip should be less than 15-25 seconds.
- Combinations of clips: If you combine several video clips, for example several TEE echocardiographic loops, please provide adequate time for each segment, and leave a suitable gap between the videos. Use appropriate labeling to ensure that the viewer can understand the timing of the pathology and events. Labeling can be added with video editing programs such as Adobe Premiere or iMovie.

The figure(s) accompanying Echo Rounds or Echo Didactics submissions should conform to the following:

- Formatted in high-resolution JPEG or TIFF formats.
- Individual size should not exceed 500 KB (to permit adequate resolution for printing).

Supplemental Material (Back to Top)

- Authors may submit separate supplemental material to enhance their article's text and to be considered for online-only posting.
- Supplemental material may include the following types of content: text documents, graphs, tables, figures, audio, and video.
- Cite all supplemental digital content consecutively in the text.
- Citations should include the type of material submitted, should be clearly labeled, and should include a sequential number (Example "Supplemental Figure1", "Supplemental Table 1", "Supplemental Video 1").
- Supplemental Legends should be submitted separately and should provide a brief description of the supplemental content. For example: "Supplemental Table 1: Lists all medications used in this study."
- Each supplemental digital content file must be composed to standalone. For example, tables and figures must include titles, legends, and/or footnotes, following journal style, so the viewer can fully understand the supplemental content on its own. Production will not make any edits to the supplemental files; they will be presented as submitted.
- For audio and video files, enter the author name, videographer, participants, length (minutes), and size (MB) of file in Editorial Manager. Authors should mask patients' eyes and remove patients' names from supplemental digital content unless they obtain written consent from the patients and submit written consent with the manuscript. Copyright for video or audio supplemental digital content will be required upon acceptance.
- For a list of acceptable file types and size limits, please review LWW's requirements for submitting supplemental digital content: http://links.lww.com/A142

Additional Information (Back to Top)

1. Units of Measurement
   Use metric units. The units for pressures are mmHg or cmH2O. Diagonal slashes are acceptable for simple units, *e.g.*, mg/kg; when more than two items are present, negative exponents should be used, *i.e.*, ml · kg^{-1} · min^{-1} instead of ml/kg/min.

2. Abbreviations
   Define all abbreviations except those approved by the International System of Units for length, mass, time, temperature, amount of substance, *etc.* Do not create new abbreviations for drugs, procedures, experimental groups, *etc.*

3. Drug Names and Equipment
   Use generic names. If a brand name must be used, insert it in parentheses after the generic name. Provide manufacturer's name, city, state, and country. Be careful about the use of trademarked terms (*e.g.*, Thrombelastography™, TEG™, *etc.*).

4. Statistical Analysis
   Detailed statistical methodology must be reported. Describe randomization procedures and the specific tests used to examine each part of the results; do not simply list a series of tests. Care should be taken with respect to a) parametric vs. nonparametric data, b) corrections for multiple comparisons, and c) rounding errors (summary statistics should not contain more significant digits than the original data). Median range (or percentiles) is preferred for nonparametric data.

5. Patient Identification
   Do not use patients' names, initials, or hospital numbers. An individual (other than an author) must not be recognizable in photographs unless written consent of the subject has been obtained and is provided at the time of submission.

Permissions (Back to Top)

Authors must submit written permission from the copyright owner (usually the publisher) to use direct quotations, tables, or illustrations that have appeared in copyright form elsewhere, along with complete details about the source. Any permission fees that might be required by the copyright owner are the responsibility of the authors requesting use of the borrowed material, not the responsibility of Wolters Kluwer or the editorial office. To request permission and/or rights to use content from *Anesthesia & Analgesia*, access the Copyright Clearance Center) and enter *Anesthesia & Analgesia* in the 'Get Permissions' field in the upper-right corner. Please note: Permission will not be granted to adapt figures that have been previously published in *Anesthesia & Analgesia*. Contact the Editorial Office at editor@anesthesia-analgesia.org for further information.

Language Editing Services (Back to Top)

Articles submitted to the Journal must be written with a solid basis of English language. If you need assistance in preparing a manuscript for submission, our publisher, Wolters Kluwer, in partnership with Editage, offers a range of editorial services for a fee, including:

- Premium Editing: Intensive language and structural editing of academic papers to improve the clarity and impact of your manuscript.
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Section 7: *Anesthesia & Analgesia* and *A&A Case Reports* Editorial, Ethical and Legal Requirements (Back to Contents)

Anesthesia & Analgesia and *A&A Case Reports* follow the International Committee of Medical Journal Editors (ICMJE) "Recommendations for the Conduct, Reporting, Editing, and Publication of Scholarly Work in Medical Journals"**.**

All authors submitting a manuscript to *Anesthesia & Analgesia* and *A&A Case Reports* are required to understand and adhere to the material below.

A. Role of Authors and Contributors

Anesthesia & Analgesia and *A&A Case Reports* adhere to the ICMJE recommendations for defining the role of authors and non-author contributors

Anesthesia & Analgesia therefore defines manuscript authorship as meeting the following 4 criteria:

1. Substantial contributions to the conception or design of the work; or the acquisition, analysis, or interpretation of data for the work; AND

2. Drafting the work or revising it critically for important intellectual content; AND

3. Final approval of the version to be published; AND

4. Agreement to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

Those who do not meet all four criteria should be acknowledged as non-author contributors.

Each manuscript must have a "Corresponding Author." The corresponding author serves as the primary contact during the submission and review process on behalf of all co-authors. Upon submission, the corresponding author is required to attest to the validity and legitimacy of the data and interpretation. The corresponding author is responsible for ensuring that all authors have reviewed the manuscript and have completed the conflict of interest disclosures. If the manuscript is accepted, the corresponding author is responsible for reviewing the proof.

B. Author Conflict of Interest

Anesthesia & Analgesia endorse the ICMJE recommendations for defining the role of authors' conflict of interest.

- *Anesthesia & Analgesia* holds that a conflict of interest exists when professional judgment concerning the primary interest, including patients' welfare or the validity of research, may be influenced by a secondary interest like financial gain. Perceptions of conflict of interest are as important as actual conflicts of interest.
- Authors therefore must define all funding sources supporting their work. This includes departmental, hospital, or institutional funds. The authors must disclose commercial associations that might pose a conflict of interest in connection with the work submitted. Financial relationships such as employment, consultancies, stock ownership or options, honoraria, patents, and paid expert testimony must also be reported.

C. Protection of Human Subjects

Research is a systematic investigation for the creation of generalizable knowledge. Any investigation submitted for publication demonstrates intent to create generalizable knowledge, and thus constitutes research.

The name of the institutional research ethical review and oversight committee varies with country and local custom. In the United States, this committee is called the Institutional Review Board (IRB). Other countries may use other terms (e.g., "Research Ethics Committee") for their research ethical review committee. "Institutional Review Board" is used here generically to refer to the local board that reviews the ethical treatment of human subjects and grants institutional approval for the study.

- Regardless of the country of origin, all clinical investigators undertaking human subjects research must abide by the "Ethical Principles for Medical Research Involving Human Subjects" outlined in the Declaration of Helsinki, and adopted in October 2000 by the World Medical Association.

Clinical studies not meeting the Declaration of Helsinki criteria will not be considered for publication. If published research is subsequently found to be noncompliant, it will be retracted.

- On the basis of the Declaration of Helsinki, *Anesthesia & Analgesia* requires that all manuscripts reporting clinical research state in the first paragraph of the Methods section that:

1. The study was approved by the appropriate Institutional Review Board (IRB), and

2. Written informed consent was obtained from all subjects, a legal surrogate, the parents or legal guardians for minor subjects, or that the requirement for written informed consent was waived by the Institutional Review Board (IRB).

The Editors of *Anesthesia & Analgesia* may question the authors about the details of the IRB review, informed consent forms, or the consent process. On occasion, the Editor-in-Chief may request a copy of the approved IRB application from the author. Lack of appropriate consent or its documentation will be grounds for rejection or subsequent retraction.

- Patients also have a right to privacy regarding their protected health information (PHI). Access to their protected health information (PHI) should not occur without their written authorization of use or disclosure of PHI for the explicit purposes of (a) research or (b) a case report (N = 1) or case series (N ≤ 3). Under certain circumstances, the requirement for patient written authorization may be waived by the Institutional Review Board (IRB).

D. *A&A Case Reports* Compliance with HIPAA Privacy Regulations

A patient's protected health information (PHI) can be viewed and used in a clinical setting by those who are assisting with or learning how to provide health care to patients. For example, a patient's PHI can be used internally for grand rounds or quality improvement and patient safety projects and related presentations.

However, the circumstances are different if the PHI is to be shared outside one's own HIPAA-covered entity's clinical education setting.

When making presentations outside one's HIPAA-covered entity's clinical education setting or ***when preparing a case report or case series (with an N ≤ 3) for publication***, the researcher or educator has two options:

1. The first and most efficient means to use patient information is to remove all PHI data elements from the information before using it. If **all** of the 18 PHI data elements, found at http://www.oshpd.ca.gov/Boards/CPHS/HIPAAIdentifiers.pdf, are removed from the presentation or ***a case report or case series (with an N ≤ 3)*** for publication, then the information is de-identified data and contains no PHI. A signed patient authorization is not required when using such de-identified data.
2. If a clinician, educator, or researcher must include certain PHI data elements as part of the activity, then the second option applies. The patient must authorize the use of their PHI by signing a HIPAA-compliant authorization, which prescribes how their PHI will be used for a specific purpose. Examples of situations for which patient authorization is required include preparation of ***a case report or case series (with an N ≤ 3) for publication***, a lecture to national or international professional meeting, and presentation to a class or seminar outside the covered entity's clinical education setting.

Nota bene that one the 18 PHI data elements includes: "**Any other unique identifying** number, **characteristic**, or code." This scenario includes a case so unique that individuals with personal knowledge of the incident could identify the patient. In this situation, an authorization must be obtained for disclosure of the PHI in a ***case report or case series (with an N ≤ 3) for publication***.

A case report or retrospective chart review with three (3) or fewer patients (N ≤ 3), which is not presented as a systematic investigation that is designed to contribute to generalizable knowledge, is not considered research. Such efforts do not require Institutional Review Board (IRB) approval.

A&A Case Reports therefore (a) does not require IRB approval but (b) does require that authorization (permission) is obtained from the patient or (deceased) patient's relative for submission of a Clinical Case Report or Case Series for potential publication. This must be obtained before submission of the manuscript, and the authors must state this in their submission cover letter. If photographs of the patient, in any form, are used, a specific signed permission from the patient must be obtained, and a copy of this signed permission be submitted with the manuscript. Failure to comply with these requirements will result in rejection of the manuscript.

E. *Anesthesia & Analgesia* Echo Rounds and Echo Didactics Compliance with HIPAA Privacy Regulations

A patient's protected health information (PHI) can be viewed and used in a clinical setting by those who are assisting with or learning how to provide health care to patients. For example, a patient's PHI can be used internally for grand rounds or quality improvement and patient safety projects and related presentations.

The circumstances are different if the PHI is to be shared outside one's own HIPAA-covered entity's clinical education setting.

When making presentations outside one's HIPAA-covered entity's clinical education setting or when preparing a case report (N = 1) (which includes an Anesthesia & Analgesia Echo Rounds) or case series (with an N < 3) for publication, the researcher or educator has two options:

1. The first and most efficient means to use patient information is to remove all PHI data elements from the information before using it. If all of the 18 PHI data elements, found at http://www.oshpd.ca.gov/Boards/CPHS/HIPAAIdentifiers.pdf, are removed from the presentation or a case report (N = 1) or case series (with an N < 3) for publication, then the data are de-identified and contain no PHI. A signed patient authorization is not required when using such de-identified data.

2. If a clinician, educator, or researcher must include certain PHI data elements as part of the activity, then the second option applies. The patient must authorize the use of their PHI by signing a HIPAA-compliant authorization, which prescribes how their PHI will be used for a specific purpose. Examples of situations for which patient authorization is required include preparation of a case report (N = 1) or case series (N < 3) for publication, a lecture to national or international professional meeting, and presentation to a class or seminar outside the covered entity's clinical education setting.

Nota bene that one of the 18 PHI data elements states: "Any other unique identifying number, characteristic, or code." This scenario includes a case so unique that individuals with personal knowledge of the incident could identify the patient. In this situation, an authorization must be obtained for disclosure of the PHI in a case report (N = 1) or case series (N < 3) for publication.

A case report or retrospective chart review with three (3) or fewer patients (N < 3), which is not presented as a systematic investigation that is designed to contribute to generalizable knowledge, is not considered research. Such efforts do not require Institutional Review Board (IRB) approval.

Anesthesia & Analgesia therefore (a) does not require IRB approval but (b) does require that a HIPAA-compliant written authorization of use or disclosure of PHI, for the explicit purposes of the Echo Rounds manuscript, is obtained from the patient or (deceased) patient's relative for submission of an Echo Rounds for potential publication. This written authorization of use or disclosure of PHI must be obtained before submission of the manuscript. The author(s) must state they obtained this written authorization of use or disclosure of PHI in their submission cover letter. Failure to comply with these requirements will result in rejection of the manuscript.

F. Investigational Drugs

The Editorial Board of *Anesthesia & Analgesia* may exercise judgment about the ethics of a clinical trial involving investigational drugs that differs from the view of the investigators' Institutional Review Board. This situation most frequently occurs in studies involving neuraxial or perineural drug administration; drug studies in children; and nonconformity in dose, route, or indication ("off-label" use).

- Studies using drugs injected into the neuraxial (caudal, intrathecal, or epidural) or perineural space must meet at least one of three criteria:

1. The drug is approved for neuraxial or perineural administration by the United States (US) Food and Drug Administration (FDA) or the equivalent regulatory agency for the country in which the study took place.

2. The drug is not approved for neuraxial or perineural use, but it is widely used and accepted for neuraxial (e.g., fentanyl) or perineural administration. The publication of dosing guidelines in multiple textbooks represents a reasonable demonstration that a drug is widely used and accepted for neuraxial or perineural administration.

3. The study is performed under an Investigational New Drug (IND) or Biologics License Application (BLA) application approved by the US FDA or the equivalent agency in the investigator's country.

- *Anesthesia & Analgesia* is committed to expanding knowledge of the clinical pharmacology of drugs in children. However, studying drugs in children when there is no pediatric indication poses ethical concerns. Therefore, studies of drugs in children must meet at least one of three criteria:

1. The drug is approved for pediatric administration by the US FDA or an equivalent regulatory agency.

2. The drug is not approved for use in children but is widely used and accepted for pediatric administration. A reasonable demonstration that the drug is clinically accepted for use in children is when the administration in the study is consistent with the route, dose, and indication reported in multiple textbooks.

3. The study is done under an IND application approved by the US FDA or the equivalent agency in the investigator's country. Investigators in the United States are directed to the FDA website for further information on obtaining an investigator IND.

Anesthesia & Analgesia will not publish a paper describing a retrospective assessment involving pediatric drug administration, if the treatment would be considered inappropriate or unethical in a prospective trial.

- Drugs are commonly used off-label in clinical trials, and the practice is generally acceptable. However, the Editorial Board of *Anesthesia & Analgesia* reserves the right not to review a manuscript describing off-label administration of a drug if the Editorial Board believes the study posed unacceptable risk to subjects. To preclude such a determination, investigators are encouraged to obtain an Investigator IND from the US FDA or an equivalent agency in their country before initiating studies involving off-label drug administration.

G. Registration of Clinical Trials

All clinical trials involving assignment of patients to treatment groups must be registered prior to patient enrollment. The registry, registration number, principal investigator's name, and date of registration must be stated in the first paragraph of the Methods section of the manuscript.

A number of registries have been approved by the International Committee of Medical Journal Editors (http://www.icmje.org/about-icmje/faqs/clinical-trials-registration/), including http://www.clinicaltrials.gov (the most commonly used registry in the United States), http://isrctn.org,

http://www.umin.ac.jp/ctr/index/htm, http://www.anzctr.org.au, and http://www.trialregister.nl. Submissions that have registered with the European Clinical Trials Database, EudraCT (https://eudract.ema.europa.eu/) meet this requirement.

H. Protection of Animal Subjects

Manuscripts describing investigations performed in vertebrate animals must explicitly state that the study was approved by the authors' Institutional Review Board for animal research (e.g., Institutional Animal Care and Use Committee, IACUC). The Journal expects humane and ethical treatment of all experimental animals, and requires that the study has been conducted in a manner that does not inflict unnecessary pain or discomfort upon the animals, as outlined by the United States Public Health Service Policy on Humane Care and Use of Laboratory Animals and the Guide for the Care and Use of Laboratory Animals (1996), prepared by the National Academy of Sciences' Institute for Laboratory Animal Research. A statement to this effect should appear at the beginning of the Methods section of the manuscript.

I. Plagiarism

Plagiarism is the use of previously published material without attribution. **The Editorial Office screens all manuscripts for plagiarism prior to peer review.** The screening process identifies passages of text that have been previously published. Text copied from previously published work is interpreted using the following taxonomy:

- *Intellectual theft* is misrepresentation by an author that words and ideas previously published by another author represent the plagiarist's own scholarship. It is the most serious form of plagiarism. Intellectual theft identified during screening results in immediate rejection of the manuscript and a request for an explanation from the author.

- *Intellectual sloth* is the use of the words of another author to avoid the effort of writing new text. It commonly occurs when descriptions of research methodology are taken from prior publications. It is less serious than intellectual theft, because the text is generic and of no particular value. Submissions containing intellectual sloth are typically returned to the authors with a request that the copied text either correctly cite the original author or be rewritten in the authors' own words.

- *Plagiarism for scientific English* occurs when authors uncomfortable using scientific English compose their manuscripts as a patchwork of previously published sentences and paragraphs. Papers constructed in such a manner are rejected outright, primarily because patchwork plagiarism suggests that the authors may not understand the text they have submitted for publication.

- *Technical plagiarism* is the use of verbatim text not identified as verbatim, but referenced to the original source. The offense is a technical one, and authors are simply asked to correct it prior to peer review.

- *"Self-plagiarism"* occurs when an author uses his or her verbatim words from a previous manuscript in a new submission. Provided the authors are not engaged in duplicate publication, the Journal does not view "self-plagiarism" as misconduct. Authors are permitted to reuse their own words, and are encouraged to do so when describing identical research methods in multiple papers.

J. Duplicate Submission or Duplicate Publication

- *Duplicate submission* is concurrent submission of a nearly identical manuscript to two journals. It is improper for authors to submit a manuscript describing essentially the same research simultaneously to more than one peer-reviewed research journal. Authors should not submit the same manuscript, in the same or different languages, simultaneously to more than one journal. Duplicate submissions identified during peer review will be immediately rejected. Duplicate submissions that are discovered after publication in the Journal will be retracted.

- *Duplicate publication* is prior publication of a manuscript with considerable content overlap, particularly in the research results, by the same author or co-authors. Prior publication may be in the same language or it may be a translation (usually from the author's native language to English). Submitted manuscripts must not have been published elsewhere, in whole or in part, on paper or electronically. This includes personal, departmental, educational, or other Internet sites. This does not apply to abstracts of scientific meetings or to lecture handouts (*e.g.*, IARS Annual Meeting, ASA Annual Meeting). *Anesthesia & Analgesia* requests that authors inform the Journal when results of a submitted manuscript have been previously presented or published in *any* venue. If a manuscript has been published previously, the submission to *Anesthesia & Analgesia* and *A&A Case Reports* will be rejected unless it has already been published by the Journal, in which case it will be retracted.

K. Scientific Misconduct

When *Anesthesia & Analgesia* has concerns or receives allegations of scientific misconduct, *Anesthesia & Analgesia* reserves the right to proceed according to the procedures described below.

Anesthesia & Analgesia recognize its responsibility to appropriately address concerns allegations of misconduct. Examples of misconduct include: fraud, data fabrication, data falsification, plagiarism, improper designations of authorship, duplicate publication, misappropriation of others' research, failure to disclose conflict(s) of interest, and failure to comply with applicable legislative or regulatory requirements. Misconduct also includes failure to comply with any rules, policies, or procedures implemented by *Anesthesia & Analgesia*.

In general, *Anesthesia & Analgesia* follows the recommendations of the Committee on Publication Ethics (COPE) when working to address allegations of misconduct. When a concern or allegation is raised involved parties generally will be contacted to provide an explanation of the situation. As needed, *Anesthesia & Analgesia* may also contact the institution at which the study was conducted and any other involved journals. *Anesthesia & Analgesia* will attempt to determine whether there was misconduct and the Editor-in-Chief will respond with an appropriate action. Examples of action include:

- Sending a letter of explanation only to the person(s) involved or against whom the allegation is made.
- Sending a letter of reprimand to the same person(s), warning of the consequences of future, similar instances.
- Sending a letter to the relevant head of the educational institution and/or financial sponsor of the person(s) involved, expressing the concerns and information collected.
- Publishing in *Anesthesia & Analgesia* a notice of duplicate publication, "salami" publishing, plagiarism, or other misconduct, if clearly documented. In cases of ghostwritten manuscripts, the notice may include the names of the responsible companies as well as the submitting author(s).
- Providing specific names to the media and/or government organizations, if contacted regarding the misconduct.
- Formally withdrawing or retracting the article from *Anesthesia & Analgesia*, and informing readers and indexing authorities
- Banning an author or authors from publishing any manuscript in Anesthesiology for a specified time period, with notice to the author(s) institution.

Section 8: Common Reasons Why a Submission is Returned Without Review (Back to Contents)

1) Incomplete Title Page – e.g., missing conflict of interest statement for each author, missing IRB contact information (for studies involving humans), or incomplete author information

2) Abstract is missing in the Word file or not properly structured

3) Missing page numbers

4) Entire manuscript is not double-spaced

5) Methods section does not begin with IRB approval and written patient consent statement

6) References – e.g., using "et al" instead of listing every author, or incorrect style

7) Completed digital Copyright Transfer Agreement was not uploaded

Appendix 8: Turnitin report

Turnitin_researchreport.docx

ORIGINALITY REPORT

6%	4%	5%	3%
SIMILARITY INDEX	INTERNET SOURCES	PUBLICATIONS	STUDENT PAPERS

PRIMARY SOURCES

1	Submitted to Universita degli Studi di Torino Student Paper	1%
2	Robert Wise, Kirsten Hood, David Bishop, Gary Sharp, Reitze Rodseth. "Analysis of a 5-year, evidenced-based, rational blood utilisation project in a South African regional hospital", Transfusion Medicine, 2023 Publication	1%
3	coek.info Internet Source	1%
4	S. S. Chohan. "Red cell transfusion practice following the transfusion requirements in critical care (TRICC) study: prospective observational cohort study in a large UK intensive care unit", Vox Sanguinis, 4/2003 Publication	1%
5	Submitted to University of Greenwich Student Paper	1%
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7	www.sajaa.co.za Internet Source	<1 %
8	"Abstract of 30th Regional Congress of the ISBT", Vox Sanguinis, 2019 Publication	<1 %
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13	ashpublications.org Internet Source	<1 %

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