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MNSROB009

Dissertation for Master of Medicine (MMED) in Anaesthesia

University of Cape Town

Point-of-care ultrasound in emergency anaesthesia study (PULSE)

The impact of point-of-care transthoracic echocardiography on management of patients presenting for emergency surgery in a resource-limited setting

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Format

Journal ready manuscript. Study is not yet published. Target journal is the Journal of Cardiothoracic and Vascular Anaesthesia which is an American based journal hence the use of United States English spelling.

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The impact of point-of-care transthoracic echocardiography on management of patients presenting for emergency surgery in a resource-limited setting

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HIGHLIGHTS

- Focus Assessed Transthoracic Echocardiography (FATE) is widely used and validated in well-resourced countries
- Studies have demonstrated utility of point-of-care ultrasound (POCUS) in both the preoperative assessment clinic and at the bedside of the patient with cardiac disease presenting for emergency non-cardiac surgery
- In this study done in unscreened patients presenting for emergency surgery in an upper middle-income country, FATE had a significant impact on anesthesia management
- Hypovolemia was demonstrated by FATE in 31% of patients. There was significant association between FATE markers of patient volume status and change in perioperative management

KEY WORDS

Point of care ultrasound; focused assessed transthoracic echocardiography; perioperative management; anesthesia

ABSTRACT

Objective: In this study of patients presenting for non-cardiac, emergency surgery in a resource limited setting, we aimed to evaluate the impact of routine preoperative transthoracic echocardiography on perioperative management.

Design: A prospective before- and after-study of adult patients presenting for emergency, non-cardiac, non-obstetric surgery.

Setting: The study was performed at an academic hospital in Cape Town, South Africa.

Participants: Consenting patients over 18 years of age presenting for emergency surgery enrolled via convenience sampling during working hours over a 10 day period.

Interventions: Basic and advanced Focused Assessment Transthoracic Echocardiography (FATE) was performed to evaluate ventricular function, valvular pathology and fluid status. After completing an assessment and treatment plan, the FATE findings were disclosed to the treating anesthetist. A post FATE plan was subsequently completed.

Measurements and Main Results: A total of 67 patients were scanned with a change in management detected in 55% of cases. Thirty-nine percent of these alterations were in response to fluid management strategies with 31% of patients scanned being assessed as hypovolemic. There was a statistically significant link between patient volume status and change in perioperative management (p=0.0003). The presence or absence of valvular

pathology also led to a significant association with change in management (p=0.020), most commonly in relation to the decision to proceed with surgery or the use of additional monitoring.

Conclusion: This observational study of adult patients presenting for emergency surgery in an upper middle-income country demonstrates that routine preoperative transthoracic echocardiography has an impact on perioperative anesthetic management.

INTRODUCTION

The use of bedside or point-of-care transthoracic echocardiography (TTE) has gained popularity in anesthesia, emergency medicine and critical care. This can be attributed to an improvement in the quality of portable ultrasound equipment and reduction in related costs, the training of non-cardiologist users, and the ease of obtaining important information on hemodynamic status and cardiopulmonary pathology.[1]

The focus assessed transthoracic echocardiography (FATE) protocol developed by Professor Erik Sloth[2] aims to help the clinician to make a diagnosis or to confirm a clinical suspicion as quickly and efficiently as possible.[3] The FATE examination includes the following steps: exclude obvious pathology, assess wall thickness and dimensions of chambers, assess contractility, image pleura bilaterally, relate the information to the clinical context, and perform additional ultrasound assessments.[2]

In the preoperative assessment clinic of a teaching hospital in Tasmania, the use of FATE lead to a change in the perioperative management in 54% of high-risk patients known to have cardiac disease.[4] FATE has also been shown to influence anesthetic technique and perioperative management of emergency surgery patients in high-income settings in 43% and 44% of cases respectively.[1,5] When FATE is performed routinely, the incidental finding of cardiopulmonary disease occurred in 27% of patients presenting for emergency surgery at a regional hospital in Denmark.[6] FATE is easily learned and can be performed in less than two minutes. The practical performance of the investigation at the point of care, allows for use in patients undergoing emergency surgery, where time pressure limits lengthy preoperative

evaluation. FATE adds important information for the anesthetist by confirming or excluding the presence of significant underlying pathologies that may complicate patient care.

The majority of studies concerning FATE have been performed in high-income countries.[2 4–6 7] This data cannot be simply extrapolated to South Africa and other low- and middle-income countries where the emergency surgical population presents with a different spectrum of pathology. Although it is classed as an upper middle-income (UMI) country by the World Bank, South Africa has high levels of income inequality and thus has multiple public health challenges such as poverty related illnesses, rising levels of non-communicable diseases, HIV and related diseases as well as injury and violence-associated trauma.[8] There is a wide disparity between quality of health care in academic centers and rural areas. The majority of surgery performed in South Africa is emergent or urgent (66%).[8] While in high income countries the typical surgical patient may have more diagnosed comorbidities, in a resource-limited setting patients are more likely to present for surgery with undiagnosed cardiopulmonary pathology.[9]

We hypothesized that the addition of routine FATE in the assessment of patients presenting to theatre for emergency surgery would result in additional information on the cardiopulmonary status of the patient and subsequently a change in perioperative anesthesia or surgical management.

METHOD

This study was conducted with institutional review board approval (The Human Research Ethics Committee of the Faculty of Health Sciences of the University of Cape Town). This was a prospective before-and-after study performed at a single large academic referral hospital in South Africa (Groote Schuur Hospital, Cape Town). Participant recruitment took place from September 28 to October 9, 2021. Written informed consent was obtained prospectively by an investigator either in the ward or in the preoperative holding area. The study was conducted with a clear understanding that study activities must not cause delays in patient management. Retroactive consent was obtained from eligible patients who were unable to provide informed consent at the time of enrolment (for example due to time critical surgery or decreased level of consciousness) or if a next-of-kin was unavailable to provide consent. Retroactive consent was considered acceptable due to the low risk of participation, the perceived benefit of participation (availability of additional clinical information) and the fact that exclusion of these patients would lead to a biased study with an underestimation of the true incidence of undiagnosed cardiopulmonary pathology.

We included adult patients (≥ 18 years) presenting for emergency surgery within 24 hours of being scheduled on the hospital electronic emergency surgery triage system (SurgiBank; VerticalApps, Broadlands, USA), regardless of triage score or American Society of Anesthesiologists (ASA) physical status. Surgical disciplines included acute care surgery, trauma, neurosurgery, orthopedics, gynecology, urology, ophthalmology, thoracics, otorhinolaryngology, and maxillofacial-, plastic- and vascular surgery. Pregnant patients presenting for non-obstetric surgery were included, but patients presenting for obstetric

surgery were excluded along with all patients < 18 years old. Only patients scheduled from 07:30 to 16:30 on Monday to Friday were included in the study due to availability of investigators to perform FATE scans. At least one, but up to three operating rooms are dedicated to emergency surgery 24 hours a day, seven days a week.

After enrolment, the on-call anesthetist (either consultant or senior registrar) conducted a routine preoperative evaluation and completed a pre-FATE case report form with an anesthesia management plan. Subsequently a focused echocardiography study was performed, either by a suitably trained investigator or under supervision by one, according to the FATE protocol.[2] FATE scans were performed with either a Vivid Q ultrasound machine (General Electric Healthcare; Chicago, USA), Terason 3200 (Teratech Corporation; Burlington, USA) or a Sonosite Exporte (Fujifilm Holdings Corporation; Minato City, Japan) all equipped with a phased array transducer. Images were converted to the digital- and communications in medicine (DICOM) formats and saved for later additional analysis if required. The results of the FATE investigation were provided to the managing anesthetist in a verbal and written format. Information was presented but no opinion on management or prognosis was provided by the investigator. The attending anesthetist completed a post-FATE case report form, noting any changes in anesthesia management or whether FATE confirmed their preoperative clinical assessment. Additionally, all FATE findings were relayed to the patient's surgical team.

Changes in management could include, but were not limited to: (1) Delay in surgery to enable further referrals, (2) Modification of surgical technique, (3) Request for postoperative ICU care or cancellation of ICU referral, (4) Use of invasive monitoring (for

example invasive blood pressure monitoring and central venous access), (5) Fluid resuscitation or restriction before and/or during surgery or (6) Cancellation of planned cardiology consultation.

The primary outcome was defined as any change in anesthesia management including: diagnosis, change in technique, fluid management, postponement or prevention of postponement of surgery. The prevalence of cardiac and pulmonary disease in the study population was a secondary outcome.

Statistical methods

The analysis was conducted according to a pre-specified statistical analysis plan. Patient characteristics, FATE results and changes in management were summarized in tables. Continuous and interval variables were summarized as mean (standard deviation) or median (interquartile range, [range]) depending on the distribution of the data. Categorical variables were summarized as frequencies and proportions (n, [%]). The primary outcome was analyzed using a Z-test for single proportion and reported as mean (95% confidence interval [CI]). The association between the a priori categories of management change and FATE findings was analyzed by the Chi-square test of independence. A post hoc pairwise comparison was performed if the test of independence was significant at the 5% level. Pairwise comparison was reported in a pairwise table of p-values. Management changes and FATE findings were reported as frequencies and proportions (n, [%]) with 95% CI for individual proportions. The analysis was performed in RStudio (2016; Boston, MA).

To detect an estimated 20% proportion of patients that experienced a change in perioperative management at a 5% significance level with a 10% margin of error, a minimum of 62 patients were required.

RESULTS

During the ten-day study period (28 September to 09 October 2020) sixty-seven patients were enrolled into this study and underwent a FATE scan. The Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) guidelines[10] for reporting observational studies were used to describe the study results.

Baseline characteristics are shown in Table 1. The mean (SD) patient age was 43 (18) years, and 49% of the patients were female. Surgical specialties included were: acute care surgery (15), trauma (11), orthopedics (11), gynecology (5), ophthalmology (5), thoracics (5), otorhinolaryngology (3), neurosurgery (3), maxillofacial (2), urology (2), colorectal (2), vascular (2) and plastics (1).

Table 1. Baseline characteristics of patients presenting for emergency surgery.

Baseline characteristic	**n**	**Mean (SD) or n (%)**
Age (years)	67	43.0 (17.6)
Female sex	67	33 (49%)
ASA physiological status	67	
1		12 (18%)

2	14 (21%)
3	33 (49%)
4	6 (9%)
5	2 (3%)

Notes: SD=standard deviation, n=count, ASA=American Society of Anesthesiologists Physical Status Classification System.

Of the 67 patients scanned, 88% (n=59) were subjectively assessed to have easily obtainable FATE views.

We detected a change in perioperative management when comparing the completed pre-FATE and post-FATE case report form in 55% (n = 37) of patients (Table 2). Changes in fluid management was the most frequent finding, observed in 39% (n = 25) of patients.

Table 2. Primary outcome: The proportion of cases in which management changed after FATE.

	n	**count**	**%**	**95% CI**
Any change	67	37	55	43.4 – 66.5
Specific changes				
Proceed to surgery	66	1	2	0.3 – 8.1
Primary anesthesia plan	66	4	6	2.4 – 14.6

Airway	67	5	8	3.2 – 16.3
Induction	51	5	10	4.3 – 21.0
Fluid	65	25	39	27.6 – 50.6
Monitoring	66	3	5	1.6 – 12.5
Inotropic support	64	2	3	0.9 – 10.7
Surgical approach	16	0	0	0.0 – 19.4
Postoperative placement	66	3	5	1.6 – 12.5

Notes: n=sample size, CI=confidence interval

FATE scan findings are reported in Table 3. Thirty-one percent (n = 21) of patients scanned were assessed as being hypovolemic. Echocardiographic hypovolemia was defined as a left ventricular end diastolic diameter of less than 2,5cm or systolic obliteration of the LV cavity combined with a subjective overall visual assessment of LV filling. The majority of patients had normal left and right ventricular function with only five patients having an ejection fraction less than 50% and only one patient having a reduced tricuspid annular plane systolic excursion measurement (TAPSE) < 16 mm. We found that 10% (n=7) of patients had a pericardial effusion ranging in size from 5 mm to 10 mm, none of which caused any clinically significant tamponade of the right ventricle. 17% of patients (n=11) were found to have valvular pathology, none of which was graded as severe in nature.

We were able to assess whether diastolic dysfunction was present in only 54 (81%) of patients scanned (13 patients not assessed due to time constraints or difficulty in measurement). In 19% of patients (n=10) we found Grade 1 diastolic dysfunction, defined by

an E/A ratio of < 1 or a deceleration time of >230 milliseconds. The rest had normal diastolic function.

Lung pathology was found in 8% (n=5) of patients for whom we performed pleural scanning. Four patients were found to have pleural fluid collections, with the smallest measuring 12 mm and the largest 47 mm, which required the placement of an intercostal drain before surgery could commence. One patient was found to have a unilateral organized hemothorax.

Table 3. FATE findings

	n	**Count**	**%**
FATE views obtained without difficulty	67	59	88
Volume status	67		
Euvolemic		45	67
Hypovolemic		21	31
LV dilatation		1	2
IVC diameter	58		
<2cm		50	86
≥2cm		8	14
IVC collapsibility	59		
≥50%		27	46
<50%		29	49

No collapse		3	5
Normal LV function	67	62	93
(EF>50%)			
RV function	64		
Normal		63	98
Abnormal		1	2
Pericardial effusion	67	7	10
Valvular pathology	66	11	17
LA >3.5cm	67	6	9
LVH >1,2cm	67	3	5
Dilated LV	67	1	2
Dilated RA	67	2	3
Dilated RV	67	1	2
Diastolic dysfunction	54		
Not present		44	81
Present		10	19
Regional wall motion	66	2	3
abnormalities			
Pleural abnormalities	66	5	8
Pleural effusion	66	4	6

Notes: LV=left ventricle, IVC=inferior vena cava, EF=ejection fraction, RV=right ventricle, LA=left atrium, LVH=left ventricular hypertrophy, RA=right atrium,

Table 4 reports on the association between specific FATE findings and the primary outcome, a change in anesthesia management. There was an association between the FATE finding of hypovolemia and the primary outcome (p=0.0003). The presence of valvular pathology was also associated with a change in management (p = 0.020).

Table 4. Association between specific FATE findings and change in management.

	Change in management	**No change in management**	**P-value for Chi square test**
Volume status			
Euvolemia	18	27	0.0003*
Hypovolemia	19	2	
LV dilated	0	1	
IVC diameter			
<2 cm	28	22	1.000
≥2 cm	5	3	
IVC collapsibility			
≥50%	20	7	0.059
<50%	13	16	
No collapse	1	2	
LV function			
Abnormal	2	3	0.807
Normal	35	27	
RV function			

Normal	35	28	1.000
Abnormal	1	0	
Pericardial effusion			
Absent	32	28	0.610
Present	5	2	
Valvular pathology			
Absent	26	29	0.020*
Present	10	1	
Dilated LA (>3.5 cm)			
Absent	32	29	0.307
Present	5	1	
LVH (>1.2 cm)			
Absent	36	28	0.852
Present	1	2	
Dilated LV			
Absent	37	29	0.916
Present	0	1	
Dilated RA			
Absent	35	30	0.568
Present	2	0	
Dilated RV			
Absent	36	30	1.000
Present	1	0	

Diastolic dysfunction			
Not present	21	23	0.357
Present	7	3	
Regional wall motion abnormalities			
Not present	35	29	1.000
Present	1	1	
Pleural abnormalities			
Not present	34	27	1.000
Present	3	2	
Pleural effusion			
Not present	34	29	0.763
Present	3	1	

Notes: LV=left ventricle, IVC=inferior vena cava, RV=right ventricle, LA=left atrium, RA=right atrium.

DISCUSSION

In this study, the use of routine preoperative FATE was associated with a change in anesthesia management in 55% (95% CI 43.4 – 66.5) of patients presenting for emergency surgery at an academic hospital in South Africa.

A systematic review by Heiberg et al. found four studies reporting on the impact of perioperative cardiac and lung POCUS, with the use of ultrasound being associated with a change in anesthesia management in 12 - 82% of cases.[1] When including studies in the

critical care setting, the most common management changes associated with POCUS were in the choice of inotropes or vasopressors (8-25%) and in fluid management (12-65%). In addition to changes in the medical management of patients, the same systematic review also demonstrated that performing FATE had a significant influence on surgical management seen in 7 - 46% of cases.

In this study the greatest impact of FATE was on perioperative fluid management. Overall, 31% of patients scanned were assessed as hypovolemic, with subsequent adjustment of fluid strategies. The high incidence of hypovolemia demonstrated by FATE, could be explained by the long waiting times for theatre commonly experienced in our setting. Although an independent association between the measured inferior vena cava index and fluid responsiveness in spontaneously breathing patients has been questioned[11], it is useful as an additional tool in the overall assessment of patient fluid status. The statistically significant association between assessment of volume status and changes in perioperative management, is not only caused by the presence of hypovolemia but also by the reassuring presence of euvolemia and resultant adjustment to a fluid conservative strategy.

We performed FATE on patients presenting for emergency surgery without any screening for risk factors for cardiovascular disease, so it is to be expected that the prevalence of hemodynamically significant cardiac pathology was lower than that seen in other studies where focused cardiac ultrasound was only performed if patients were suspected to have pathology (31%).[4 7] Our findings are similar to those of Botker et al, who found that routine FATE performed in patients presenting for urgent surgical procedures in a high income setting, showed unexpected cardiopulmonary pathology in 27% of patients [95% CI 19–36].[6]

This led to a change in anesthesia technique or supportive actions in 43% (95% CI 25–63) of patients.

Valvular pathology was detected in 11 patients (17%) in our cohort, consisting of aortic (8%)-, mitral (8%)-, tricuspid (6%)- and pulmonary valve (3%) involvement. We did not grade any of these lesions as severe in nature, however there was a significant association between the presence or absence of valvular pathology and a change in perioperative anesthesia management (p=0.020). Two studies have shown that POCUS diagnosis of cardiac pathology, specifically valvular pathology, correlates well with subsequent formal transthoracic echocardiography.[6,11] There is great utility in screening for severe cardiac lesions associated with poor patient outcomes in a cost-effective and timely manner, resulting in less delay before surgery, and/or a change in the level of monitoring applied.

Groote Schuur Hospital is a tertiary referral center with one of the largest level one trauma centers in the world,[13] with an annual turnover of more than 12000 patients. The two most common causes of injury are assault with either a blunt or penetrating object.[13] The utility of adding lung POCUS in our context was evident, as we identified four patients with an undiagnosed hemothorax. In one patient we found a large hemothorax (±1000 ml) that had been missed during initial assessment prior to surgery. This finding necessitated the perioperative placement of an intercostal drain.

In a survey done among anesthetists in South Africa which examined the availability of POCUS in the perioperative setting, almost 98% of respondents worked in institutions which had ultrasound available but only 26% and 17% used the machines for routine cardiac and

lung POCUS respectively. A proposed reason for the low application of POCUS was a perceived lack of skills and teaching.[14] This concurs with a survey of clinicians from 44 lower- and middle-income countries (LMIC), and showed that the most common perceived barrier to the application of POCUS was a lack of training as well as the prohibitive cost of necessary equipment.[15] Other factors included the lack of ultrasound gel and an inconsistent supply of electricity. Our pragmatic study adds evidence for the benefit of point-of-care echocardiography in resource-limited settings.

South Africa, as a middle-income country, has a growing burden of cardiovascular disease in addition to the epidemics of trauma and HIV related diseases.[16] [17] POCUS has been proposed as a useful low-cost modality to aid in the diagnosis and management of diseases that affect LMIC,[18] considering the lack of access to trained sonographers and cardiologists. Efforts to improve the availability of POCUS and proficiency in its use, should be prioritized as part of anesthesia training, and appropriate teaching should be included in continuous professional development programmes.[19]

Limitations of our study include the small sample size and the confinement of patient enrollment to normal working hours, which excluded a cohort of patients and pathology which may have differed from our recruited individuals. While the utility of perioperative FATE is that it is a quick and easy investigation for making point-of-care decisions, some patients were excluded because they were taken to surgery while investigators were recruiting and examining other patients.

In conclusion, we have demonstrated that POCUS performed routinely preoperatively in emergency surgical patients in South Africa altered the perioperative management in 55% of patients, with the greatest effect seen in fluid management strategies and patients with valvular pathology. These results are probably generalizable to other centers, both in South Africa and other limited- resource environments, since POCUS is fast becoming more accessible to perioperative clinicians in these environments.

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Appendix A: Informed Consent Form

PULSE: Point-of-care ULtraSound in Emergency anaesthesia study

The impact of focused transthoracic echocardiography on patient management presenting for emergency surgery in a resource-limited setting

Investigators: Dr R Munsie/Dr M Gibbs

Date of study d d m m y y y y

Study number	###

Informed consent form

Department of Anaesthesia and Perioperative Medicine

Groote Schuur Hospital

Anzio Road

Observatory, 7925

HREC :

Patient sticker

CONSENT FORM

This study seeks to gather information about patients presenting for emergency surgeries at Groote Schuur Hospital by using an ultrasound machine to look at their heart and lungs. This

will give extra information to the anaesthetist looking after you. This information will help the anaesthetist manage your medical and surgical care. By signing this form, I am giving consent for all the information from the ultrasound study to be shared with the anaesthetist involved with my case and with any other Medical Practitioner if or when required so as to assist in the management of my case. I also allow for my data to be used in future research and/or audits to improve medical care and that every reasonable effort will be taken to protect my confidentiality and privacy.

This information will be stored both on paper and on computer. To protect your privacy, the information will be labelled in a way that will not identify you. If the results of these studies are published, your identity will be kept confidential.

Please read this form carefully and ask the investigator (study doctor) to explain any words or information that are not clear to you. This will help to ensure you understand the details of your participation before you give your consent. You will be given a copy of this consent form to take home with you. The doctors will answer any questions you may have about this consent form and about the studies.

These research projects have been approved by the University of Cape Town's Human Research Ethics Committee. If you have any ethical concerns or questions about your rights or welfare as a participant in this research, the Human Research Ethics Committee can be contacted on 021 406 6338.

If you have any questions, please contact Dr Robert Munsie (Anaesthetics Registrar, Groote Schuur Hospital) via 021 404 5001, or robbiemunsie@gmail.com

Please make sure you understand the following points below:

- I have read the above information form and understand that the study involves research.
- I understand that the doctors will make a copy of some of my routinely recorded data from my standard patient care.

- I have had the opportunity to ask questions. All my questions have been answered to my satisfaction.
- I understand that any information that leaves the doctor's office will be de-identified (i.e., identifying information will be removed from the documents).

_____YES _____ NO

Participant/Legal Representative's name (printed): Signature

Date:

Name of person obtaining consent (printed): Signature

Date:

Appendix B: Data Capture Form

Demographics

Record ID

_____

Demographics

Date of study

_____

Patient's Ward

_____

Theatre

- ○ Any of the Emergency Theatres
- ○ C6
- ○ C8
- ○ Other

If other, please specify

_____

Triage Colour	○ Blue ○ Green ○ Yellow ○ Orange ○ Red
Surgical Discipline	○ Emergency Surgery ○ Trauma Surgery ○ Orthopaedic Surgery ○ Colorectal ○ HP ○ Vascular ○ Gynaecology ○ Ophthalmology ○ EN ○ Neurosurgery ○ Maxillofacial Surgery ○ Urology ○ Thoracics
Description of surgery booked	_____
Other referrals	☐ Cardiology ☐ Medical ☐ Respiratory ☐ ICU

Patient Consent

Date	_____
Patient consent for PULSE study	○ Yes ○ No
Upload consent	

Patient Profile and Comorbidities

Age	_____ (In years)
Sex	○ Male ○ Female
Height	_____ (In cm)
Weight	_____ (In Kg)
BMI	_____
ASA	○ I ○ I ○ II ○ I ○ V
Chronic co-morbid disease (tick all that apply)	☐ Known hypertension ☐ Coronary artery disease ☐ Heart failure (past 30 days) ☐ Valve replacement ☐ Congenital cardiac disease ☐ Stroke or Transient ischaemic attack ☐ Asthma ☐ COPD ☐ Known HIV / ☐ Previous PTB ☐ Chronic renal disease ☐ Diabetes (without insulin) ☐ Diabetes (requiring insulin) ☐ Peripheral vascular disease ☐ Smoker (within 1 year) ☐ Rheumatoid Arthritis ☐ Hypercholesterolaemia ☐ Hyperthyroidism ☐ Hypothyroidism ☐ Other ☐ Autoimmune disease
If other, please specify	_____
NYHA classification	○ I ○ I ○ II ○ I
CCSA classification	○ I ○ I ○ II ○ I
If autoimmune disease, please specify	

mMRC dyspnoea scale	○ I ○ I ○ II ○ I

Functional status

○ Totally Independent ○ Partially dependent ○ Totally dependent ○ METS ≥ 4 ○ METS < 4

Current medications (tick all that apply)	☐ ACE-I or ☐ Diuretic ☐ B-Blocker ☐ Calcium channel blocker ☐ Alpha-blocker ☐ Statin ☐ Any Sulfonylurea (glibenclamide/ glimepirid glipizide/ glyburide/ ☐ Metformin ☐ Insuli ☐ Inhalers ☐ Prednisone ☐ Aspiri ☐ Clopidogrel ☐ Heparin ☐ Warfarin ☐ IV Antibiotics

Clinical examinations

SBP

_____

(In mmHg)

DBP

_____

(In mmHg)

HR

_____

(In bpm)

Sinus rhythm	○ Yes ○ No
	(Per minute)
CVS Examination	○ Normal ○ Abnormal ○ Raised JVP ○ Other
If abnormal, please select the reason	○ Systolic murmur ○ Diastolic murmur ○ Parasternal heave/P2

SaO2

_____

(In %)

Respiratory rate

_____

Respiratory ExaminationNormal
If abnormal, please specify why

- ◯
- ◯
- ◯ Abnormal
- ◯
- ◯ Crepitations
- ◯ Decreased air entry

Chest drain in situ
Wheeze
Other

Special Investigations

Haemoglobin

_____
(in g/dL)

MCV

_____
(in fL)

Platelets

_____
(x10(9)/L)

Sodium

_____
(in mmol/L)

Potassium

_____
(in mmol/L)

Creatinine

_____
(In µmol/L)

T4 / TSH

_____
(In µmol/L)

HbA1c

_____
(In %)

Total Cholesterol

_____
(in mmol/L)

Preoperative Blood Gas Parameters

pH

_____

pO2

	_____
pCO2	_____
HCO3-	_____
BE	_____
Lactate	_____
Na	_____
K	_____
Ca2+	_____
Cl-	_____
Hb	_____
Glucose	_____
ECG	○ Yes ○ No
ECG	☐ Normal ☐ Irregular Rhythm ☐ LV ☐ Strain ☐ Old Infarct ☐ Ischemia ☐ Axis deviation ☐ Left bundle branch block ☐ Right bundle branch block ☐ Other
If other, please specify	_____

CX	○ Yes ○ No
CX	☐ Normal ☐ Hyperinflation ☐ CTR>50 ☐ Calcified Ao ☐ Pleural effusion ☐ Consolidation ☐ Trachea deviation ☐ Chronic interstitial changes ☐ Other
If other, please specify	_____

Anaesthetic Plan Pre-FATE

Anaesthetic Plan pre-FATE

Proceed with surgery	○ Yes ○ No
The surgery was	○ Cancelled ○ Postponed

Reason for cancellation

○ Too ill for anaesthetic ○ Too ill for surgery ○ Additional investigations (Other than Formal Echocardiography) ○ No ICU bed ○ Additional optimisation needed

Reason for postponement

○ Additional investigations (Other than Formal Echocardiography) ○ Further consultation from other specialities ○ Further resuscitation ○ Await ICU bed ○ Await formal echocardiography

Any change in diagnosis	○ Yes ○ No
If yes, please explain	_____

Anaesthetic Management

○ General anaesthetic ○ Regional anaesthetic ○ Combined regional and general anaesthetic
○ Procedural sedation ○ Combined regional anaesthetic and procedural sedation

ETT/IPP	○ Yes ○ No
LMA	○ Yes ○ No
Cardiac stable induction	○ Yes ○ No
If regional anaesthetic, please specify the type	_____
If combined regional and general, please specify the type	_____

If procedural sedation, please specify drugs used

_____

If combined regional anaesthesia and procedural sedation, please specify the type

_____

Fluid management

Preoperative resuscitation ○ Yes ○ No

○ Conservative ○ Libera

Monitoring

○ Standard (NIBP/3 lead ECG/O2 Saturation/Capnography/Multi Gas Analysis/Temp) ○ Additional monitoring

If additional monitoring, please specify

○ Above plus Invasive Arterial Blood Pressure
○ Above plus Central Venous Catheter
○ Above plus other advanced monitoring

If other, please specify

_____

Anticipated need for inotropes ○ Yes ○ No

If intra-abdominal surgery, please choose surgical technique
(Tick all that apply)
○ Open ○ Laparoscopic

If open

○ Damage control ○ Definitive

Post-operative plan

○ Patient to ward ○ Patient to PAHCU ○ Patient to ICU ○ Patient to High Care (Ward Setting)

Please add any other comments on anaesthetic plan

FATE Study

Ultrasound machine	○ GE vivid ○ GE vivid q ○ Phillip ○ Sonosite ○ Other
If other, please specify	_____
Image quality	☐ Good views ☐ Difficult views ☐ Poor image quality ☐ Data saved ☐ Sitting ☐ Supine
Basic FATE	☐ S ☐ A4C ☐ PSLA ☐ PSA ☐ Advance views ☐ Doppler ☐ Colour
Volume status (LV Volume during systole)	○ Euvolemic (3 - 5.6cm) ○ Hypovolemic (< 3cm) ○ Dilated (>5,6cm)

IVC

Diameter	○ < 2cm ○ ≥ 2cm
Collapsibility	○ ○ < ○ No collapse / ≥ 50% distended

Left Ventricle

Ventricular Fx	○ Normal ○ Abnormal
Normal ☐ EF >	
MAPSE	_____ (In mm)
Abnormal ○ EF > ○ EF > ○ EF <	

Right Ventricle

Right ventricular function
○ Normal ○ Abnormal

TAPSE	_____ (In mm)
Pericardial effusion	○ Yes ○ No
Size	_____ (In mm)
RV collapse during expiration	○ Yes ○ No
Valves	○ Normal ○ Abnormal
Please specify which valves are affected	☐ AV ☐ MV ☐ T ☐ PV

AV

AV pathology	☐ Stenosis ☐ Regurgitation
Regurgitation Grade	○ Mild ○ Moderate ○ Severe
jet/LVOT diameter	_____ (%)
Vena Contracta	_____ (mm)
Stenosis Grade	○ Mild ○ Moderate ○ Severe
Mean Gradient	_____ (mmHg)
AVA (Continuity equation)	_____ (cm2)

MV

MV pathology		☐ Stenosis ☐ Regurgitation
Regurgitation		○ Mild ○ Moderate ○ Severe
Mean Gradient	(mmHg)	_____
Vena Contracta	(mm)	_____
Stenosis		○ Mild ○ Moderate ○ Severe
Mean Gradient	(mmHg)	_____
MVA (PHT)	(cm2)	_____

TV

TV pathology		☐ Stenosis ☐ Regurgitation
Regurgitation		○ Mild ○ Moderate ○ Severe
RVSP (peak gradient)	(mmHg + CVP)	_____
Vena Contracta	(mm)	_____
Stenosis		○ Mild ○ Moderate ○ Severe
Mean Gradient		

(mmHg)	_____ _____
TVA (PHT)	
(cm2)	_____ _____

PV

Select all that apply for PV	☐ Stenosis ☐ Regurgitation
Regurgitation	○ Mild ○ Moderate ○ Severe
Mean Gradient	
(mmHg)	_____ _____
Vena Contracta	
	_____ _____ _____ _____ _ (mm)
Stenosis	○ Mild ○ Moderate ○ Severe

Other Measurements

Chambers	☐ LA > 3.5cm ☐ LVH >1.2 cm ☐ Dilated LV ☐ Dilated RA ☐ Dilated RV
Diastolic function	○ E/A=1-2,DT 130-230,E/e' < 8 ○ E/A< 1 DT >230 (gr ○ E/A=1-2 DT 130-230 E/e' >12 (○ E/A>2 DT < 130 (gr
Regional Wall Motion Abnormality (RWMA)	○ Yes ○ No
Mid papillary Segments (tick all that apply)	☐ A ☐ AS ☐ I ☐ I ☐ I ☐ A
Contractility	○ Hypokinetic ○ Dyskinetic ○ Akinetic ○ Hyperkinetic

Lungs

Pleura	○ Normal ○ Abnormal
if Abnormal, please specify	☐ B-lines ☐ Pleural Effusion ☐ Pneumothorax
If yes, maximum measured diameter during expiration (mm)	_____
Site of pneumothorax?	○ Left side ○ Right side ○ Bilateral
Other notes	_____ _____

Anaesthetic Plan Post-FATE

Anaesthetic Plan post-FATE

Proceed with surgery	○ Yes ○ No
The surgery was	○ Cancelled ○ Postponed
Reason for cancellation	○ Too ill for anaesthetic ○ Too ill for surgery ○ Additional investigations ○ No ICU bed ○ Additional optimisation needed
Reason for postponement	○ Additional investigations (Other than formal echocardiography) ○ Further consultation from other specialities ○ Further resuscitation ○ Await ICU bed ○ Await formal echocardiography
Any change in diagnosis	○ Yes ○ No
If yes, please explain	_____

Anaesthetic Management

○ General anaesthetic ○ Regional anaesthetic ○ Combined regional and general anaesthetic
○ Procedural sedation ○ Combined regional anaesthetic and procedural sedation

ETT/IPP	○ Yes ○ No
LMA	○ Yes ○ No
Cardiac stable induction	○ Yes ○ No
If regional anaesthetic, please specify the type	_____
If combined regional and general, please specify the type	_____
If procedural sedation, please specify drugs used	_____
If combined regional anaesthesic and procedural sedation, please specify type	_____

Fluid management

Preoperative resuscitation	○ Yes ○ No

○ Conservative ○ Libera

Monitoring

○ Standard (NIBP/3 lead ECG/O2 Saturation/Capnography/Multi Gas Analysis/Temp) ○ Additional Monito

If additional monitoring, please specify	○ Above plus Invasive Arterial Blood ○ Above plus Central Venous Cathet ○ Above plus other advanced monito
If other, please specify	_____
Anticipated need for inotropes	○ Yes ○ No

If intra-abdominal surgery, please choose surgical technique
(Tick all that apply)

○ Open ○ Laparoscopic

If open

○ Damage control ○ Definitive

Post-operative plan

○ Patient to ward ○ Patient to PAHCU ○ Patient to ICU ○ Patient to High Care (Ward Setting)

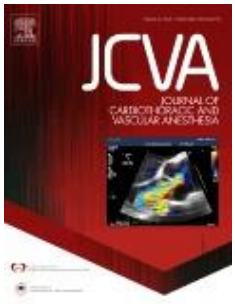
Please add any comments on how FATE influenced your anaesthetic plan

Appendix C: JVCA Author Guidelines

JOURNAL OF CARDIOTHORACIC AND VASCULAR ANESTHESIA

AUTHOR INFORMATION PACK

TABLE OF CONTENTS



ISSN: 1053-0770

DESCRIPTION

The *Journal of Cardiothoracic and Vascular Anesthesia* is primarily aimed at anesthesiologists who deal with patients undergoing **cardiac**, **thoracic** or **vascular surgical procedures**. *JCVA* features a multidisciplinary approach, with contributions from cardiac, vascular and thoracic surgeons, cardiologists, and other related specialists. Emphasis is placed on rapid publication of clinically relevant material. The journal is international in scope and encourages innovative submissions from all continents.

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Publication

The *Journal of Cardiothoracic and Vascular Anesthesia* will consider for publication suitable articles on all topics related to anesthesia for cardiac, vascular, and thoracic surgery. The scope of this Journal is broad and seeks to consolidate all material pertinent to cardiothoracic anesthesiology, including topics from critical care medicine, history, internal medicine, medical education, monitoring, perfusion technology, pharmacology, surgery, pain management, and transplantation.

Article Types

For examples of all article types, see any recent issue of the Journal.

The following article types may be submitted: Research Papers, Case Reports, Review Articles
(Regular Review Articles, Emerging Technology Reviews, and Expert Reviews), E-Challenges & Clinical Decisions, Case Conferences (including Case Conference Commentary), Pro and Con Articles, Diagnostic Dilemmas, Special Articles (those not easily suited to another type), Editorials, and Letters to the Editor.

Research Papers

This article type requires a Structured Abstract, limited to 250 words, and split into the following 7 sections:

Objectives: What scientific question was the study designed to answer?

Design: A phrase describing whether a study is prospective, randomized, blinded etc.

Setting: Type of hospital or laboratory; university or community setting; single or multi-institutional.

Participants: Patients, volunteers, animals.
Interventions: What interventions were done to the participants?
Measurements and Main Results: How was the outcome of the intervention(s) assessed? What were the major finding(s) of interest?
Conclusions: What conclusion(s) may be reasonably drawn from the results of the study?

The manuscript must be double-spaced throughout and must contain the following sections: Introduction; Methods; Results; Discussion; References.

A detailed description of the statistical approach must be included in the methods section. For metaanalyses and related advanced statistical analyses, a statement from a statistician must be included as part of the Cover Letter. This signed statement must attest to the validity of the statistical methods and presented results.

Additional information regarding statistical methodology is discussed under "Article Structure".

A list of no more than 8 keywords should be included.

Review Articles

This article type requires the following: Cover Letter, Title Page, and Manuscript.

The Cover Letter should clearly indicate if the submission has been invited.

The Abstract should summarize the main text in no more than 250 words. It should contain no headings or references.

The manuscript must be double-spaced throughout.

The first paragraph of the Manuscript document should introduce the essential points to be discussed, and the concluding paragraph should express future objectives.

A list of no more than 8 keywords should be included.

Case Reports

There should be no Abstract for this article type.

The Manuscript should begin with a short introduction to the clinical context of the case and its significance and follow with 3 identified sections: Case Report, Discussion, and References.
A brief summary should complete the Discussion.

There should be no reference to case report in the title i.e. "A Case Report —".

A list of no more than 8 keywords should be included.

Case Conferences

These articles are handled by a Section Editor for Case Conferences. Some offline communication between authors and editors may be required.

There are 3 parts to each Case Conference: case presentation, case discussion, and case conference commentary(ies).

The case presentation and case discussion will originate from 1 institution. Their authors are invited to solicit expert commentators not involved in the case.

The case presentation and case discussion should be set up as a case report. The discussion should focus on the perioperative management of the patient. The commentaries provide input from related specialties and/or other viewpoint(s) on anesthetic, surgical, or intensive care management of the case.

A Case Conference Commentary should be submitted with its author's full name, degrees, affiliation, and e-mail address on its Title Page. The commentators may be from any appropriate medical or medically-related discipline within the same or another institution.

The Journal reserves the right to solicit commentaries appropriate to a submitted Case Conference and to make final determination of commentators.

Figures, tables, and references from all contributors are desirable to expand the teaching value of the case.

A maximum of 8 keywords should be included.

Diagnostic Dilemmas

This article type is divided into two parts:
In the first part, a short case with a difficult diagnosis is presented, which can be diagnosed from graphic evidence. This graphic material can be an echo image, video, or other diagnostic modalities including an ECG or pressure tracings. The reader is then invited to project a tentative diagnosis. In the second part, the results of further investigation are provided to resolve the dilemma.

High quality figures and/or video clips are vital for these submissions.

A maximum of 8 keywords should be included.

Letters to the Editor

Letters should be brief, and concisely focused. They must have a title.

Cited works must have full, accurate references.

Figures, video clips, and tables may be included.

Keywords are not required.

E-Challenges
These articles are handled by a Section Editor for E-challenges.

They must contain a brief, unstructured Abstract of no more than 200 words.

The following elements must be included: Title page Abstract 4-8 Keywords Background Clinical Case E-Challenge Clinical Course Discussion.
The total word count should be 1500-2500 words, including references.

Submission Checklist

You can use this list to carry out a final check of your submission before you send it to the journal for review. Please check the relevant section in this Guide for Authors for more details.

Ensure that the following items are present:

One author has been designated as the corresponding author with contact details:
- E-mail address
- Full postal address

All necessary files have been uploaded:
Manuscript:
- Include keywords
- All figures (include relevant captions)
- All tables (including titles, description, footnotes)
- Ensure all figure and table citations in the text match the files provided
- Indicate clearly if color should be used for any figures in print

Graphical Abstracts / Highlights files (where applicable)
Supplemental files (where applicable)

Further considerations
- Manuscript has been 'spell checked' and 'grammar checked'
- All references mentioned in the Reference List are cited in the text, and vice versa
- Permission has been obtained for use of copyrighted material from other sources (including theInternet)
- A competing interests statement is provided, even if the authors have no competing interests todeclare
- Journal policies detailed in this guide have been reviewed

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BEFORE YOU BEGIN

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Please see our information on Ethics in publishing.

Studies in humans and animals

If the work involves the use of human subjects, the author should ensure that the work described has been carried out in accordance with The Code of Ethics of the World Medical Association (Declaration of Helsinki) for experiments involving humans. The manuscript should be in line with the Recommendations for the Conduct, Reporting, Editing and Publication of Scholarly Work in Medical Journals and aim for the inclusion of representative human populations (sex, age and ethnicity) as per those recommendations. The terms sex and gender should be used correctly.

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the Attach/Upload Files step. **Note: Please do not convert the .docx template to another file type. Author signatures are not required.** If there are no interests to declare, please choose the first option in the template. More information.

Submission declaration and verification

Submission of an article implies that the work described has not been published previously (except in the form of an abstract, a published lecture or academic thesis, see 'Multiple, redundant or concurrent publication' for more information), that it is not under consideration for publication elsewhere, that its publication is approved by all authors and tacitly or explicitly by the responsible authorities where the work was carried out, and that, if accepted, it will not be published elsewhere in the same form, in English or in any other language, including electronically without the written consent of the copyrightholder. To verify originality, your article may be checked by the originality detection service Crossref Similarity Check.

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Changes to authorship

Authors are expected to consider carefully the list and order of authors **before** submitting their manuscript and provide the definitive list of authors at the time of the original submission. Any addition, deletion or rearrangement of author names in the authorship list should be made

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PREPARATION

Use of word processing software

It is important that the file be saved in the native format of the word processor used. The text should be in single-column format. Keep the layout of the text as simple as possible. Most formatting codes will be removed and replaced on processing the article. In particular, do not use the word processor's options to justify text or to hyphenate words. However, do use bold face, italics, subscripts, superscripts etc. When preparing tables, if you are using a table grid, use only one grid for each individual table and not a grid for each row. If no grid is used, use tabs, not spaces, to align columns. The electronic text should be prepared in a way very similar to that of conventional manuscripts (see also the Guide to Publishing with Elsevier). Note that source files of figures, tables and text graphics will be required whether or not you embed your figures in the text. See also the section on Electronic artwork.

To avoid unnecessary errors you are strongly advised to use the 'spell-check' and 'grammar-check' functions of your word processor.

Article structure

Cover Letter

A **cover letter** should be supplied addressed to the Editor in Chief. The letter must include at the end a list of all authors as if for signature. Cover letters scanned from official letterhead with all signatures are strongly encouraged. **The cover letter must state that the authors agree with and are responsible for the data presented.**

Subdivision - unnumbered sections

Divide your article into clearly defined sections. Each subsection is given a brief heading. Each heading should appear on its own separate line. Subsections should be used as much as possible when crossreferencing text: refer to the subsection by heading as opposed to simply 'the text'.

Essential title page information

- ***Title.*** Concise and informative. Titles are often used in information-retrieval systems. Avoid abbreviations and formulae where possible.
- ***Author names and affiliations.*** Please clearly indicate the given name(s) and family name(s) of each author and check that all names are accurately spelled. You can add your name between parentheses in your own script behind the English transliteration. Present the authors' affiliation addresses (where the actual work was done) below the names. Indicate all affiliations with a lowercase superscript letter immediately after the author's name and in front of the appropriate address. Provide the full postal address of each affiliation, including the country name and, if available, the e-mail address of each author.
- ***Corresponding author.*** Clearly indicate who will handle correspondence at all stages of refereeing and publication, also post-publication. This responsibility includes answering any future queries about Methodology and Materials. **Ensure that the e-mail address is given and that contact details are kept up to date by the corresponding author.**
- ***Present/permanent address.*** If an author has moved since the work described in the article was done, or was visiting at the time, a 'Present address' (or 'Permanent address') may be indicated as a footnote to that author's name. The address at which the author actually did the work must be retained as the main, affiliation address. Superscript Arabic numerals are used for such footnotes.

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Highlights are optional yet highly encouraged for this journal, as they increase the discoverability of your article via search engines. They consist of a short collection of bullet points that capture the novel results of your research as well as new methods that were used during

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Highlights should be submitted in a separate editable file in the online submission system. Please use 'Highlights' in the file name and include 3 to 5 bullet points (maximum 85 characters, including spaces, per bullet point).

Abstract

See information under individual article types above.

Graphical abstract

Although a graphical abstract is optional, its use is encouraged as it draws more attention to the online article. The graphical abstract should summarize the contents of the article in a concise, pictorial form designed to capture the attention of a wide readership. Graphical abstracts should be submitted as a separate file in the online submission system. Image size: Please provide an image with a minimum of 531 × 1328 pixels (h × w) or proportionally more. The image should be readable at a size of 5 × 13 cm using a regular screen resolution of 96 dpi. Preferred file types: TIFF, EPS, PDF or MS Office files. You can view Example Graphical Abstracts on our information site.
Authors can make use of Elsevier's Illustration Services to ensure the best presentation of their images and in accordance with all technical requirements.

Keywords

Immediately after the abstract, provide a maximum of 8 keywords, using American spelling and avoiding general and plural terms and multiple concepts (avoid, for example, 'and', 'of'). Be sparing with abbreviations: only abbreviations firmly established in the field may be eligible. These keywords will be used for indexing purposes.

Formatting of funding sources

List funding sources in this standard way to facilitate compliance to funder's requirements:

Funding: This work was supported by the National Institutes of Health [grant numbers xxxx, yyyy]; the Bill & Melinda Gates Foundation, Seattle, WA [grant number zzzz]; and the United States Institutes of Peace [grant number aaaa].

It is not necessary to include detailed descriptions on the program or type of grants and awards. When funding is from a block grant or other resources available to a university, college, or other research institution, submit the name of the institute or organization that provided the funding.

If no funding has been provided for the research, please include the following sentence:

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

Units

Follow internationally accepted rules and conventions: use the international system of units (SI). If other units are mentioned, please give their equivalent in SI.

Math formulae

Please submit math equations as editable text and not as images. Present simple formulae in line with normal text where possible and use the solidus (/) instead of a horizontal line for small fractional terms, e.g., X/Y. In principle, variables are to be presented in italics. Powers of e are often more conveniently denoted by exp. Number consecutively any equations that have to be displayed separately from the text (if referred to explicitly in the text).

Footnotes

Footnotes should be used sparingly. Number them consecutively throughout the article. Many word processors can build footnotes into the text, and this feature may be used. Otherwise, please indicate the position of footnotes in the text and list the footnotes themselves separately at the end of the article. Do not include footnotes in the Reference list.

Methods

Adhering to best practices

The journal strongly encourages authors to follow these suggested practices regarding methodology and statistics.

Registration: Registration of clinical trials and systematic reviews prior to trial start of data gathering is recommended. Clinical Trials should be registered at clinicaltrials.gov or the appropriate local repository of clinical trials. Care should be taken to ensure the clinical trial registration and institutional review board approvals are documented prior to patient recruitment. Systematic Reviews should be registered at PROSPERO, the International prospective register of systematic reviews (https://www.crd.york.ac.uk/prospero/).

Reporting Guidelines: Authors are strongly encouraged to follow the reporting guidelines of the Enhancing the QUAlity and Transparency Of health Research (EQUATOR) network. Specifically, authors are encouraged to follow the STROBE guidelines for observational studies (https://www.equator-network.org/reporting-guidelines/strobe/), and the PRISMA guidelines for systematic reviews (https://www.equator-network.org/reporting-guidelines/prisma/).

For meta-analyses, authors are encouraged to follow either the MOOSE

(https://www.equator-network.org/reporting-guidelines/meta-analysis-of-observational-studies-in-epidemiolo or PRISMA-NMA (http://prisma-statement.org/Extensions/NetworkMetaAnalysis) guidelines.
Use of Routinely-collected health data in retrospective studies: Special attention is drawn to retrospective studies utilizing routinely collected health data. These studies should follow the RECORD extension to the STROBE guidelines (https://www.equator-network.org/reporting-guidelines/record/).

Authors are encouraged to submit the relevant EQUATOR checklist as a supplementary table with their article.

Statistical Methods: Authors are encouraged to clearly define all variables either within the body of the methods section or as a supplementary table. If authors are utilizing a publicly available dataset, citation of the appropriate data dictionary is suggested. Methods of analysis, including software used to perform the analysis and, if appropriate, specific packages within the software should be noted. Sample size decisions should be explained and, where appropriate, a power analysis performed. If a retrospective study is performed, the authors should clearly specify the study's alpha level of significance and how the alpha of significance was adjusted for multiple comparisons.

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You are urged to visit this site; some excerpts from the detailed information are given here. *Formats*

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Regardless of the application used other than Microsoft Office, when your electronic artwork is finalized, please 'Save as' or convert the images to one of the following formats (note the resolution requirements for line drawings, halftones, and line/halftone combinations given below):

EPS (or PDF): Vector drawings, embed all used fonts.
TIFF (or JPEG): Color or grayscale photographs (halftones), keep to a minimum of 300 dpi.
TIFF (or JPEG): Bitmapped (pure black & white pixels) line drawings, keep to a minimum of 1000 dpi. TIFF (or JPEG): Combinations bitmapped line/half-tone (color or grayscale), keep to a minimum of 500 dpi.

Please do not:

- Supply files that are optimized for screen use (e.g., GIF, BMP, PICT, WPG); these typically have alow number of pixels and limited set of colors;
- Supply files that are too low in resolution;
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Please make sure that artwork files are in an acceptable format (TIFF (or JPEG), EPS (or PDF) or MS Office files) and with the correct resolution. If, together with your accepted article, you submit usable color figures then Elsevier will ensure, at no additional charge, that these figures will appear in color online (e.g., ScienceDirect and other sites) in addition to color reproduction in print. Further information on the preparation of electronic artwork.

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Ensure that each illustration has a caption. Supply captions separately, not attached to the figure. A caption should comprise a brief title (**not** on the figure itself) and a description of the illustration. Keep text in the illustrations themselves to a minimum but explain all symbols and abbreviations used.

Tables

Please submit tables as editable text and not as images. Tables can be placed either next to the relevant text in the article, or on separate page(s) at the end. Number tables consecutively in accordance with their appearance in the text and place any table notes below the table body. Be sparing in the use of tables and ensure that the data presented in them do not duplicate results described elsewhere in the article. Please avoid using vertical rules and shading in table cells.

References

Citation in text

Please ensure that every reference cited in the text is also present in the reference list (and vice versa). Any references cited in the abstract must

be given in full. Unpublished results and personal communications are not recommended in the reference list, but may be mentioned in the text. If these references are included in the reference list they should follow the standard reference style of the journal and should include a substitution of the publication date with either 'Unpublished results' or 'Personal communication'. Citation of a reference as 'in press' implies that the item has been accepted for publication.

Reference links

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A DOI is guaranteed never to change, so you can use it as a permanent link to any electronic article. An example of a citation using DOI for an article not yet in an issue is: VanDecar J.C., Russo R.M., James D.E., Ambeh W.B., Franke M. (2003). Aseismic continuation of the Lesser Antilles slab beneath northeastern Venezuela. Journal of Geophysical Research, https://doi.org/10.1029/2001JB000884. Please note the format of such citations should be in the same style as all other references in the paper.

Web references

As a minimum, the full URL should be given and the date when the reference was last accessed. Any further information, if known (DOI, author names, dates, reference to a source publication, etc.), should also be given. Web references can be listed separately (e.g., after the reference list) under a different heading if desired, or can be included in the reference list.

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This journal encourages you to cite underlying or relevant datasets in your manuscript by citing them in your text and including a data reference in your Reference List. Data references should include the following elements: author name(s), dataset title, data repository, version (where available), year, and global persistent identifier. Add [dataset] immediately before the reference so we can properly identify it as a data reference. The [dataset] identifier will not appear in your published article.

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Reference style

Journal Article (one to three authors)

1.Finley A, Greenberg C. Heparin sensitivity and resistance: management during cardiopulmonary bypass. Anesth Analg. 2013;116:1210-1222.
2. Alkhouli M, Rihal CS, Holmes DR, Jr. Transseptal Techniques for Emerging Structural Heart Interventions. JACC Cardiovasc Interv. 2016;9:2465-2480.

Journal Article (four or more authors)

3. Mathis MR, Duggal NM, Likosky DS, et al. Intraoperative Mechanical Ventilation and Postoperative Pulmonary Complications after Cardiac Surgery. Anesthesiology. 2019;131:1046-1062.

Journal Article in Press

4. Mack M, Carroll JD, Thourani V, et al. Transcatheter Mitral Valve Therapy in the United States: A Report From the STS-ACC TVT Registry. J Am Coll Cardiol (in press).

Complete Book

5. Kaplan JA, Augoustides JGT, Manecke GR, et al. Kaplan's cardiac anesthesia : for cardiac and noncardiac surgery. 7th ed. Philadelphia, PA: Elsevier, 2017.

Chapter of Book

6. Rhee AJ, Chikwe J. Reoperative Cardiac Surgery, in Kaplan JA (ed): Kaplan's cardiac anesthesia : for cardiac and noncardiac surgery. 7th ed. Philadelphia, PA: Elsevier, 2017.

Chapter of Book That Is Part of Published Meeting

7. Poirier VL, Frazier OH: Portable electric systems for long-term use, in Akustsu T, Koyanagi H (eds): Heart Replacement, Artificial Heart 4. Proceedings of the Fourth International Symposium on Artificial Heart and Assist Devices, August 7-8, 1992, Tokyo. New York, NY, Springer-Verlag, 1993, pp 103-114.

Chapter of Book That Is Part of Unpublished Meeting

8. Polliak A. A morphologic study of the lymphoproliferative lesions induced by excess vitamin A. First Meeting, European Division, International Society of Hematology, Milan, Italy, 1971, p 181.

Abstract

9. Kodali S, Hahn R, Eleid M, et al. TCT CONNECT-2 The PASCAL Transcatheter Valve Repair System for the Treatment of Tricuspid Regurgitation: 30-Day Outcomes From the CLASP TR Early Feasibility Study. Journal of the American College of Cardiology. 2020;76:B1.

Letter to the Editor

10. Zhan Y, Brovman EY, Cobey F. When Will We Stop Debating on the Value of TEE in CABG? Journal of the American College of Cardiology. 2021;78:137.

Journal abbreviations source

Journal names should be abbreviated according to the List of Title Word Abbreviations.

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AFTER ACCEPTANCE

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Appendix D: Form F18 Declaration/Word Count Form

UNIVERSITY OF CAPE TOWN

FACULTY OF HEALTH SCIENCES

FORM D18 - DECLARATION/WORD COUNT FORM -- MASTER'S DEGREE CANDIDATES

Title:	Dr	***Student No:***	MNSROB009
Name, Surname:	Robert David Munsie		
Tel No's:	0734318818		
Email add:	robbiemunsie@gmail.com		
Dissertation Title:	PULSE: Point of Care Ultrasound in emergency anesthesia study		

Supervisor	Dr Matthew Gibbs	**Word count**	4096	**No. of pages**	23

1. IMPORTANT NOTES:

1.1 Candidates for graduation in June and December may expect to receive notification of the outcome of the examination of the dissertation not later than 1st week in June and last week in November, respectively, provided the dissertation was submitted by the due date. Where a dissertation has been submitted well in advance of the due date, earlier notification will be given, if possible. However, the University does not undertake to reach a decision by any specific date.

1.2 Candidates who are required to revise and re-submit for re-examination are required to register during the revision phase. Fees will be calculated according to the date of the notification of the "revise and re-submit" result and the date of re-submission. [Faculty will advise Fees by sending copy of R&R result to Fees.]

1.3 Candidates are asked to note that the University will not permit degree/diploma qualifiers to graduate if they have any outstanding fees, fines, interest or dues**. The final date for payment of outstanding amounts is 30 April in the** case **of qualifiers for June graduation and 31 October in the case of qualifiers for December graduation.**

1.4 Please note that should your examination process run into the following year, you will have to re-register in order to be considered for graduation.

2 DECLARATIONS:

2.1 I am presenting this dissertation in FULL/PARTIAL fulfilment of the requirements for my degree.

2.2 I know the meaning of plagiarism and declare that all of the work in the dissertation, save for that which is properly acknowledged, is my own.

2.3 I hereby grant the University of Cape Town free licence to reproduce for the purpose of research either the whole or any portion of the contents in any manner whatsoever of the above dissertation.

Signature		***Date:***	16/02/2022

3 FUNDING AND FEES:

Candidates submitting have a choice in regard to fees and funding options:

3.1 To claim a fee rebate* and discontinue funding through the PGFO, if applicable (the student remains registered until graduation or the start of the next academic year (see University Rule G5.2).
*(Only applicable in second or subsequent year in which the dissertation is being completed - Fee Rule 8)

3.2 To remain registered and engaged in the department while **writing up a paper for publication**, with full student rights and full access to facilities, full liability for fees for the year and continued eligibility for funding already awarded for that academic year. Access will extend only until such time as you graduate. Should you need access beyond this, you will need to arrange for 3rd party access within your department.

Please indicate your preference

I wish to claim the rebate and discontinue funding (if applicable) and physical and library access**	
I wish to continue fee liability, funding eligibility (if applicable) and access to all facilities	

****Students asking for a fee rebate acknowledge**

a) the implications of the fee rebate on their access to facilities and eligibility for funding, and

b) that if they were to stay on in the department and receive payment through the payroll, such payment is taxable.

Signature		***Date:***	

FOR COMPLETION BY FACULTY OFFICE

I acknowledge receipt of the uploaded copy (on PeopleSoft) of the Master's dissertation of the above candidate submitted for examination:

Signature		***Date:***	
Abstract submitted	Yes		No

cc **Fees**
IAPO
PGFO
Student Housing

Appendix E: Ethics Approval Letter

FHS016: Annual Progress Report / Renewal

HREC office use only (FWA00001637; IRB00001938) This serves as notification of annual approval, including any documentation described below.			
☑ Approved	Annual progress report	Approved until/next renewal date	30-01-2022
☐ Not approved	See attached comments		
Signature Chairperson of the HREC/ Designee		Date Signed	17/1/2021

Note: Please note that incomplete submissions will not be reviewed.
Please email this form and supporting documents (if applicable) in a combined pdf-file to hrec-enquiries@uct.ac.za.
Please clarify your plan for research-related activities during COVID-19 lockdown

Comments to PI from the HREC
Thank you for the deviation document

Principal Investigator to complete the following:

1. Protocol information

Date (when submitting this form)	14/01/2021		
HREC REF Number	379/2019	Current Ethics Approval was granted until	30/08/2020
Protocol title	PULSE: Point-of-care ultrasound in emergency anaesthesia study; the impact of focused transthoracic echocardiography on patient management presenting for emergency surgery in a resource limited setting (MMED Candidate: Dr R Munsie) HREC: 379/2019 (Approved: 14 August 2019)		
Protocol number (If applicable)			
Are there any sub-studies linked to this study?	no		
If yes, could you please provide the HREC Ref's for all sub-studies? Note: A separate FHS016 must be submitted for each sub-study.			
Principal Investigator	Dr Matthew Gibbs		

(Note: Please complete the Closure form (FHS010) if the study is completed within the approval period)

Department / Office Internal Mail Address	matthew.gibbs@uct.ac.za

1.1 Does this protocol receive US Federal funding?	no	
1.2 If the study receives US Federal Funding, does the annual report require full committee approval? **Note:** Any annual approvals for **Full Committee** review MUST be submitted on the monthly HREC submission dates. (Please send electronic copy for full committee review to hrec-enquiries@uct.ac.za)	☐ Yes	☐ No
If yes in 1.2 please complete section 1.3 below for invoicing purposes		
1.3 Annual Approval for **full committee** review	- R 3450 (inclusive of vat)	
For invoicing purposes, please provide:		
Sponsor's name		
Contact person		
Address		
Telephone number		
Email Address		

2. List of documentation for approval

3. Protocol status (tick ✓)

☐	Open to enrolment
✓	Closed to enrolment (tick ✓)
✓	Research-related activities are ongoing
☐	Research-related activities are complete, long-term follow-up only
☐	Research-related activities are complete, data analysis only
☐	Main study is complete but sub-study research-related activities are ongoing
☐	Study is closed → Please submit a Study Closure Form (FHS010)

4. Enrolment

(Note: Please complete the Closure form (FHS010) if the study is completed within the approval period)

Number of participants enrolled to date	62
Number of participants enrolled, since last HREC Progress report (continuing review)	0
Additional number of participants still required	0

5. Refusals

Total number of refusals (participants invited to join the study, but refused to take part)	0

6. Cumulative summary of participants

Total number of participants who provided consent	52
Number of participants determined to be ineligible (i.e. after screening)	
Number of participants currently active on the study	62
Number of participants completed study (without events leading to withdrawal)	62
Number of participants withdrawn at participants' request (i.e. changed their mind)	0
Number of participants withdrawn by PI due to toxicity or adverse events	0
Number of participants withdrawn by PI for other reasons (e.g. pregnancy, poor compliance)	0
Number of participants lost to follow-up. Please comment below on reasons for loss of follow-up.	0
Number of participants no longer taking part for reasons not listed above. Please provide reasons below:	
Awaiting telephonic consent for 10 patients who were unable to provide informed consent at time of study	

7. Progress of study

Please provide a brief summary of the research to date including the overall progress and the progress since the last annual report as well as any relevant comments/issues you would like to report to the HREC:
Data collection complete In write-up phase Awaiting consent from 10 patients

8. Protocol violations and exceptions (tick ✓ all that apply)

(Note: Please complete the Closure form (FHS010) if the study is completed within the approval period)

✓	No prior violations or exceptions have occurred since the original approval
☐	Prior violations or exceptions have been reported since the last review and have already been acknowledged or approved
☐	Unreported minor violations that have occurred since the last review, as well as significant deviations not yet reported, are attached for review

9. Amendments (tick ✓ all that apply)

☐	No prior amendments have been made since the original approval
✓	Prior amendments have been reported since the last review and have already been approved
☐	New protocol changes/ amendments are requested as part of this continuing review (See note below)

Note: If new protocol changes are being requested in this review, please complete an amendment form (FHS006).
Specific changes in the amended protocol and consent/assent forms must be **bolded**, *italicised* or tracked and all changes must include a rationale.

10. Adverse events

10.1 Please provide below or attach a narrative summary of serious adverse events and/ or unanticipated problems since the last progress report. Please indicate changes made to the protocol and informed consent document(s) as a result (if not already reported to the HREC). Please comment on whether causality to any study procedure or intervention could be established.
nil

10.2 Have participants received appropriate treatment/ follow-up/ referral when indicated (e.g. in the case of abnormal or incidental clinical findings, distress or anxiety)?		
☐ Yes	☐ No	✓ Not applicable
If yes, please describe:		

11. Summary of Monitoring and Audit Activities (tick ✓)

11.1 Was this study monitored or audited by an external agency (e.g. SAHPRA, FDA)?		
☐ Yes	☐ No	✓ Not applicable

11.2 Did a Data and Safety Monitoring Board publish a report?		
☐ Yes	☐ No	✓ Not applicable

11.3 If yes, please identify the agency and attach a summary of the findings.					
Agency Name		Report attached	☐ Yes	☐ No	✓ Not applicable

(Note: Please complete the Closure form (FHS010) if the study is completed within the approval period)

	DSMB report attached	☐ Yes	☐ No	☐ Not applicable

11.4 Has there been any agency, institutional or other inquiry into non-compliance in this study, or any finding of non-compliance concerning a member of the research team?	
☐ Yes	✓ No
If yes, please explain:	

12. Level of risk (tick ✓)

12.1 In light of your experience of this research, please indicate whether the level of risk to participants has:	
☐	Increased
☐	Decreased
✓	Shown no change
If there has been a change, please explain:	

12.2 Please provide a narrative summary of recent relevant literature that may have a bearing on the level of risk.

13. Statement of conflict of interest

Has there been any change in the conflict of interest status of this protocol since the original approval? (tick ✓)	
☐ Yes	✓ No
If yes, please explain and if necessary, attach a revised conflict of interest statement (Section #7 in the New Protocol Application Form FHS013):	

14. Signature

My signature certifies that the above is complete and correct.			
Signature of PI		Date	14/01/2021

(Note: Please complete the Closure form (FHS010) if the study is completed within the approval period)

Form FHS011: Study deviation

HREC office use only (FWA00001637; IRB00001938)			
This serves as acknowledgement of a protocol deviation as described below.			
Chairperson of the HREC signature/ Designee		Date	17/1/24

Note: Please note that incomplete submissions will not be reviewed.
Please email this form and supporting documents (if applicable) in a combined pdf-file to hrec-enquiries@uct.ac.za.

Please clarify your plan for research-related activities during COVID-19 lockdown

Principal Investigator to complete the following:

1. Protocol Information

Date (when submitting this form)	14/01/2021
HREC REF Number	379/2019
Project Title	PULSE: Point-of-care ultrasound in emergency anaesthesia study; the impact of focused transthoracic echocardiography on patient management presenting for emergency surgery in a resource limited setting (MMED Candidate: Dr R Munsie) HREC: 379/2019 (Approved: 14 August 2019)
Protocol number (if applicable)	
Principal Investigator	Dr Matthew Gibbs
Department / Office Internal Mail Address	Matthew.gibbs@uct.ac.za

2. Protocol deviation description

Please describe the deviation below, including the reason why the deviation occurred.
There was a deviation as the 2020 annual progress report was not submitted in August 2020 and this was an error by the research team.

3. Follow-up actions

3.1 Please describe any follow-up action(s) taken or planned as a result of this deviation e.g. DSMB reporting, report to sponsor, informing participants.
nil
3.2 Please describe what action(s) have or will be taken to prevent similar deviations in future.

nil

4. Principal Investigator's acknowledgement of responsibility

This signature indicates the PI has reviewed the deviation, taken appropriate follow-up action and implemented or plans to implement preventative steps where possible.			
Signature of PI		Date	14/01/2021

Western Cape Government
Health

Appendix F: Groote Schuur Hospital Research Approval Letter

GROOTE SCHUUR HOSPITAL
Enquiries: Dr Bernadette Eick
e-mail: Bernadette.Eick@westerncape.gov.za

Dr Matthew Gibbs
ANAESTHESIA & PERIOPERATIVE MEDICINE

E-mail: matthew.gibbs@uct.ac.za / robbiemunsie@gmail.com

Dear Dr Gibbs,

RESEARCH PROJECT: PULSE: Point of Care Ultrasound In Emergency Anaesthesia Study; The Impact Of Focused Transthoracic Echocardiography On Patient Management Presenting For Emergency Surgery In A Resource Limited Setting (HREC 379/2019)

Your recent letter to the hospital refers.

You are granted permission to proceed with your research, which is valid until **30 January 2022.**

Please note the following:

a) Your research may not interfere with normal patient care.
b) Hospital staff may not be asked to assist with the research.
c) Confidentiality must always be maintained.
d) No additional costs to the hospital should be incurred as indicated in your Annexure 2 i.e. Lab, consumables or stationery. **If access to TRACK Care/NHLS is required, kindly attach our letter of approval to the application form and approach Information Management to assist with data.**
e) **No patient folders may be removed from the premises or be inaccessible.**
f) Please provide the research assistant/field worker with a copy of this letter as verification of approval.
g) Should you at any time require photographs of your subjects, please obtain the necessary indemnity forms from our Public Relations Office (E45 OMB or ext. 2187/2188).
h) Should you require additional research time beyond the stipulated expiry date, please apply for an extension.
i) Please discuss the study with the HOD before commencing.
j) Please introduce yourself to the person in charge of an area before commencing.
k) On completion of your research, please forward any recommendations/findings that can be beneficial to use to take further action that may inform redevelopment of future policy / review guidelines.
l) Please contact Michelle Riley (Patient Fees) at ext. 2276 to ascertain if there will be charges for conducting the Research and to obtain a quote or to discuss charges
m) Kindly submit a copy of the publication or report to this office on completion of the research.
n) At no time should any posters encouraging patients to partake in research, be displayed within a clinical area.
o) Please adhere to ALL COVID-19 regulations and Groote Schuur Hospital policies.

I would like to wish you every success with the project.

Yours sincerely

DR BERNADETTE EICK
CHIEF OPERATIONAL OFFICER
Date: 2 February 2021

C.C. Mr. L. Naidoo / Dr S. Peters / Professor J. Swanevelder