

Transfusion Medicine Knowledge amongst Specialist Trainees at Groote Schuur Hospital – using the BEST Test

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Andries Petrus Swart

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Format

Journal ready manuscript. The target journal is Transfusion, the journal of the AABB. The study is not yet published. As per the provisions of the BEST Collaborative, I am not allowed to disseminate the particulars of the BEST Test questions themselves as being proprietary to the BEST Collaborative.

Table of Contents

- i. Abstract
- ii. Introduction
- iii. Method
- iv. Results
- v. Discussion
- vi. Limitations
- vii. Conclusions
- viii. References
- ix. Tables
 - 1. Respondents by Department
 - 2. Self-Perception
 - 3. Results of BEST Test
- x. Figures
 - 1. How often do you prescribe blood products?
 - 2. How important do you consider Transfusion Medicine knowledge?
 - 3. Do you feel you require additional training?
- xi. Appendices
 - 1. Informed Consent Form
 - 2. Data Collection Questionnaire

Transfusion Medicine Knowledge amongst Specialist Trainees at Groote Schuur Hospital – using the BEST-TEST

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Key Words: BEST Test; Transfusion Medicine; Medical Teaching

Abstract

Background: The primary aim was to assess transfusion medicine knowledge amongst specialist trainees at a South African tertiary hospital. Secondary aims included identifying shortcomings and describing differences in knowledge between subspecialty groups, comparing self-perceived knowledge against a known standard.

Method: The Biomedical Excellence for Safer Transfusions test, or BEST test,¹ was utilised to assess base knowledge amongst specialist trainees at a large tertiary hospital. It was administered as a secure online REDCap questionnaire sent to all eligible specialist trainees at Groote Schuur Hospital.

Results: There were 104 responses of 241 eligible trainees, a response rate of 43.2%. The overall mean score for correct responses of the BEST test was 44.1% (median 40%), which is similar to studies using the BEST test in non-South African contexts. Most specialist trainees thought more transfusion training was needed (80.8% agreeing or strongly agreeing), and 70.2% rating it as very important. Self-perception of transfusion knowledge did not equate with the BEST test score. Compared to contexts outside Africa, respondents could better identify the risks of transfusion transmitted infections, but had difficulty with the administration of prophylactic platelets. The average scores for the BEST test did not markedly differ between specialties.

Conclusion: Transfusion knowledge amongst specialist trainees in a large, tertiary hospital is deficient, and there is recognition amongst the specialist trainees that further training is required. However, the standard of transfusion knowledge in this institution is similar to other areas of the globe, which suggests that the global knowledge of transfusion medicine is inadequate.

Introduction

Blood transfusion is the most commonly practiced hospital procedure throughout the world. Transfusion of blood and component therapy is convenient and lifesaving in various clinical instances, however this is not without risk and cost.²

With the expansion of Patient Blood Management concepts and practices, transfusion practices have come under scrutiny due to not only the short and long term risks associated with transfusion of blood and other components, but also due to the high cost of procuring, preserving and storing this precious commodity.^{3,4}

In the South African context with limited resources and a burden of violence and trauma, peripartum haemorrhage, HIV/AIDS, tuberculosis and non communicable diseases, it is imperative to ensure the appropriate prescription and transfusion of blood and other products such as fresh frozen plasma or platelets. Practitioners need to be aware of the risks of transfusion and ensure safe and rational use thereof.

Despite the inherent complexity in appropriate prescribing, often in South Africa this task is designated to junior members of the medical team. There is frequently little supervision or guidance regarding appropriate practices.

A recent study by Yudelowitz *et al.* assessing clinicians at a tertiary hospital in Gauteng, revealed poor knowledge of tasks, resources, costs and ordering of blood products. In this study, one of the contributing factors was the limited time spent during clinical training years developing transfusion knowledge.⁵

This study was aimed at assessing registrar trainee knowledge and practices related to transfusion medicine, using a validated, internationally used tool – the Biomedical Excellence for Safer Transfusions (BEST) validated exam.¹ Due to the high rate of inappropriate blood product use in the United States, the BEST Collaborative developed an exam to assess adequate transfusion medicine knowledge amongst physicians. This was developed by members of a panel of international transfusion medicine experts via a modified Delphi approach. The Biomedical Excellence for Safer Transfusions Collaborative Transfusion Education Study (BEST-TEST) administered the 20 question examination to 474 trainees (internal medicine residents) at multiple sites in nine countries in Europe and North America.⁶ The overall mean score was only 45,7%, with junior specialist trainees obtaining significantly lower scores than senior specialist trainees. The premise behind the use of this tool is to establish baseline knowledge of the individual and assess how this informs their practice. To allow for comparison, a similar population of specialist trainees was selected as the target group for this study at Groote Schuur Hospital. These trainees are commonly responsible for the prescription of blood products at Groote Schuur.

Method

The exam consists of 20 questions on transfusion medicine that comprise the BEST Test, with an added demographic questionnaire. Permission from the original authors was obtained to utilise the tool in South Africa. As per the proviso of the original investigators, the questionnaire was to be administered via printed forms during

academic meetings or other appropriate gatherings to the registrars. However, due to the COVID-19 pandemic, academic meetings had become sparse or delivered and attended by electronic means in most cases, leaving this no longer a viable option. An electronic version was thus prepared and allowed to be administered via a secure REDCap online survey by the original investigators. Permission was obtained from the Human Research Ethics Committee of the University of Cape Town to continue (HREC/178/2020).

The questionnaire was sent out for completion from 22 October 2020 till 25 March 2021. Data was collected from the departments of Anaesthesia, General Surgery, Orthopaedics, Obstetrics and Gynaecology, and Internal Medicine specialist trainees at Groote Schuur Hospital via an email link connecting to the REDCap database. Email addresses were collected from departmental lists and 241 eligible specialist trainees were identified amongst the departments. A short introduction and consent form preceded the questionnaire and BEST test, supplied with a contact number of the investigator for any queries or concerns, explaining the rationale and anonymity of participants. If the eligible specialist trainee elected to proceed, data was then collected and captured electronically on a secure REDCap database. Inclusion criteria were active registration as a specialist trainee of the university of Cape Town in the above departments during the time period in which the questionnaire was run. Biweekly reminders were sent during the period to improve the response rate. Information collected included basic demographics such as age and gender, as well as specialty and experience. In addition, trainees were asked to estimate the time spent on teaching in undergraduate and postgraduate phases on transfusion medicine education.

Data was downloaded from REDCap® and the BEST Tests were marked, collated and analysed, along with demographic data, using descriptive statistics as appropriate and then compared to previous instances of the application of the BEST test.

Results

A total of 241 registrars were identified in the departments of Anaesthesia, General Surgery, Obstetrics and Gynaecology, Orthopaedics and Internal Medicine at Groote Schuur Hospital, and active within the period of 22 October 2020 to 25 March 2021. Of these, 104 responses were collected, with a response rate of 43.15%. The average score of the BEST test was 44.1%.

The average age was 34, with a range of participants from 28 years old to 47 years of

age. Average years in the training program was 2.66 years and the years post community service prior to commencement of the program was 4.77 years. Nearly a fifth of trainees reported that prior to beginning their respective training programmes, they had gained additional experience in other specialties. Table 1 breaks down respondents by department. The average scores of the various departments were similar, and comparative statistics were not performed due to the risk of type 2 error.

The respondents reported frequent usage of blood products within their departments, with more than half (51%) reporting weekly usage, and 6.7% daily or multiple times per day administering blood products. These results are presented in figure 1.

When compared with BEST test overall results, self perception of knowledge of Transfusion Medicine resulted in similar scores. Results are summarised below in Table 2. The majority of respondents rated their knowledge as average, constituting two thirds of respondents (67.3%).

Knowledge of Transfusion Medicine was considered to be very important (72%) according to the questionnaire and presented below in figure 2. The need for more training than currently received was strongly supported, with 80.8% agreeing or strongly agreeing that they felt a need for more transfusion medicine training (figure 3)

The scores for each domain ranged from very poor (Transfusion Related Acute Lung Injury [TRALI] reporting [11.5%] and transfusion reactions [16.3%] to excellent (red blood cell transfusion for acute losses [89%]). The full results of each domain are presented in table 3.

Discussion

The BEST Test is an internationally validated tool that has been utilised widely to evaluate transfusion knowledge in a range of contexts.¹ After the BEST collaborative created the BEST Test, it was first applied in a nine-country multicentre study in Europe and North America.⁶ Subsequently, this tool was utilised to assess transfusion knowledge amongst physicians at four hospitals in Rio de Janeiro in Brazil⁷, in a follow up study in the United States amongst haematology registrars⁸, in the Philippines⁹, and as an objective standard in Canada to assess the success of a transfusion medicine teaching programme.¹⁰ The BEST test was used as a standard in Monterrey, Nuevo Leon in Mexico for a similar modified assessment of knowledge amongst trainees at a university training hospital.¹¹ These studies have shown

inadequate knowledge of transfusion medicine, with a strong desire from trainees for more teaching in this regard.¹² To the authors knowledge, this study represents the first application of the BEST test in an African context, and can thus help to gauge deficiencies when compared to global standards. Similar attempts to assess transfusion medicine knowledge have been done in other centers; such as Oman¹³, Israel¹⁴, Sri Lanka¹⁵ and India¹⁶ using their own tools; and have also found knowledge of transfusion medicine to be inadequate.

In South Africa itself, attempts have been made to assess knowledge of usage of blood products previously, at Chris Hani Baragwanath Hospital in a study by Yudelowitz *et al.* in 2016⁵ and in the Witwatersrand affiliated hospitals in 2018¹⁷. Both of these used tools that were derived by the respective authors from the South African National Blood Service clinical guidelines and their own literature research and assessed by four specialists as to its validity. The application of the BEST Test within the population of specialist trainees at Groote Schuur hospital represents an internationally validated tool to assess transfusion knowledge, allowing more direct comparison with global standards and aiding educational intervention. The response rate of 43.2%, though lower than originally envisaged, is a favourable outcome as the average response rate to electronic surveys is often much lower¹⁸.

Results of the BEST Test is summarised below in Table 3 according to domains, and compared to previous studies utilising the BEST Test. The first column labeled GSH represents the findings reported from Groote Schuur Hospital reported in this article. BEST 1⁶ represents findings from a nine-country multicentre study of trainees, BEST 2⁸ its application to haematology trainees in North America, Brazil⁷ refers to a multicentre Brazilian study conducted in Rio de Janeiro amongst specialist trainees, and Mexico¹¹ the application of a transfusion medicine test based upon the BEST test amongst a variety specialist trainees in Monterey, Mexico.

Results are broadly similar across domains of Transfusion Medicine between various uses of the BEST Test. In spite of the electronic format of this study, the numbers of respondents are also comparable, bearing in mind the multicentre nature of previous uses of the BEST Test. At GSH, scores for Infectious Disease Risk was 60.5%, representing a noted difference in the findings from previous studies.

Taking into account that the BEST Test 2 was applied to haematology trainees, other studies with comparative target populations had similar outcomes, with scores from 43.5 to 45.7%^{6,7,8}. The related Monterey study has a slightly higher score of 47.2%¹¹. In the Philippines, results of 39.1%, 40% and 41% were obtained⁹. Although our study revealed comparable results to studies from other countries, substantial room for improvement is noted. Transfusion Medicine knowledge is inadequate according to the authors of many similar transfusion medicine knowledge tests, and this study suggest that most specialist South African trainees desire more comprehensive

transfusion medicine training.

In this study, a markedly higher score was obtained for infectious disease risks related to transfusion, with results of 60.5% against 26%, 32.3% and 47% in previous studies^{6,7,8}. In the South African context with its high burden of HIV infection, it seems reasonable to conclude a greater awareness of blood borne infections in general, both in training and in practice. Significant public health campaigns in the past, and the necessity of addressing such concerns when taking consent may be contributing factors. Despite this, South Africa now has some of the safest blood in the world.¹⁹ Thanks to individual donation nucleic acid testing (ID-NAT) testing for Hepatitis B, C and HIV the risk of transfusion-transmitted infections (TTIs) has virtually disappeared with no reports of TTIs on the most recent haemovigilance report in 2018, which covered 1 184 963 units of blood or blood products transfused¹⁹. Other applications of the BEST Test in high income countries might understandably have had less emphasis placed thereon, but it is noted that a lower score was also found in Brazil.

Lower scores on questions related to prophylactic platelet transfusion were found in keeping with Yudelowitz et al.⁵ which showed similar lack of knowledge of platelet transfusion thresholds at Chris Hani Baragwanath Hospital (24% correct responses) in Johannesburg. This remains a concern, as previous work done in South Africa has revealed a high rate of inappropriate platelet use in South Africa²⁰. A better result was obtained in the follow-up study by Laher and Patel at the Witwatersrand affiliated hospitals¹⁷ (67% correct responses), but plasma and platelet transfusion knowledge was singled out specifically within their study for lack of satisfactory knowledge. While these studies are not directly comparable, it is informative that multiple separate South African studies have found lower levels of knowledge related to platelet transfusion than seems to be found in high income settings.

Globally there is a significant need to expand transfusion medicine education, as to the accessibility and variable nature of various educational programmes²¹, and as there is as strong desire for increased teaching of transfusion medicine and the correct utilisation of blood products, it begs the question of how to improve overall knowledge of these topics. Lin et al. conducted a Transfusion Camp at the University of Toronto, consisting of five 1 day sessions with 18 hours of lectures and 11.5 hours of interactive seminars spaced over an academic year.^{10,22} Assessing this with the BEST Test, they found an increase of their scores by an average of 23%. Previously they had offered one month rotations in blood banks with teaching, but this was labour intensive, as lectures were repeated to two or three rotating trainees at a time, and could only accommodate small groups of residents. An alternate approach of using smaller targeted evidence-based teaching and training sessions on transfusion medicine was shown to decrease inappropriate transfusion in an ICU setting in the Netherlands.²³

In Britain, transfusion medicine teaching is reportedly heavily reliant on electronic learning, but has been deemed inadequate to teach the complexities thereof and too often devolves into a “checkbox exercise”.²⁴ Automation of learning does not readily allow for the simulation of clinical decision making in practice, and the incorporation of real case studies and personal experience can be powerful adjuncts to learning.

In South Africa, an audit of the efficacy of transfusion teaching interventions done at Kimberley Hospital Complex, while finding short term improvement negligible, nevertheless found long term improvement in transfusion appropriateness to be durable. In 2012 they audited red blood cell transfusions in the period following a week of short one hour long training sessions to specific departments. Initial improvement was limited, but as this was a repeat of a similar intervention there in 2010, the long term improvement in transfusion standards appear sustainable.²⁵

Bearing in mind the specific context of Groote Schuur hospital, an additional rotation would be impractical, as staff is already often thinly spread to cover clinical duties and would be onerous to the system as a whole. Additional electronic teaching has the advantage of being more cost-effective and less taxing to the system, but would be arguably less effective in their aims if not interactive and face-to-face, as per the British experience. To implement more teaching of blood transfusion into the curricula of specific departments’ current teaching programmes is a feasible option but would require encouraging institutional change and devoting limited teaching time to a subject that might be considered more circumferential to that department’s core concerns. A potential avenue how this might be done is via the Dutch model of incorporating a small subset or core of evidence-based thresholds and interventions into the current ICU rotation. The practice at the moment is for specialist trainees to rotate for various periods through the ICU, and applying a training intervention during this time of training, a time where blood transfusion is also particularly common and such training appropriate to the rotation, might thus have the potential for a greater effect than only individual departments opting to increase their teaching of this subject. Ideally, training should be introduced at an undergraduate level, and certainly during the internship period.

At present, there are certainly opportunities available, such as protocols for blood transfusion in place, opting to present to departmental meetings on blood management, or Patient Blood Management interest group meetings. It is clear however, that these have not been sufficient in and of themselves to adequately teach the subject. These are very much centred on the individual deciding to utilise them or not, and as has been seen, self-assessment of transfusion knowledge does not necessarily correlate with actual knowledge when formally tested.

If the success in improving objective scores in the Canadian Bootcamp model is taken into account, implementing a similar form of intensive teaching regimen would be a

reasonable approach. Having established a baseline, the BEST Test is repeatable and may be used for further evaluations of any interventions at GSH and elsewhere in the country. Intermittent bootcamps could be targeted at times when clinical duties are under less pressure. Alternately, a Managing Emergencies in Paediatric Anaesthesia²⁶ (MEPA) -style course of clinical scenarios and simulations with a discussion afterwards could offer advantages of active learning. With the growth in infrastructure and familiarity with online seminars, the bootcamp model could be arranged remotely, given issues related to COVID19. An intervention to address the inadequacy of transfusion knowledge in this institution should address the appropriateness of blood product transfusion, platelet transfusion, TRALI, TACO and Septic reactions and massive transfusions. The experience of Kimberley²⁵ suggests this would result in robust long-term improvement and a sustained institutional standard of knowledge.

Limitations

Due to the COVID-19 pandemic, the response rate of this study was decreased due to the lack of in-person meetings. The questionnaire had to be retooled into an electronic format and the collection of data was thus curtailed to those willing to complete the online questionnaire, which is estimated to decrease the response rate by 11% or more¹⁸; and a lack of oversight as to time taken to complete the questions or on the use of outside materials. The longer period of recruitment may have increased the risk of prior knowledge of the content of the test material, although the answers were not provided to the trainees.

Direct comparisons with the results of the BEST Test in the Philippines⁹ could not be obtained, and the Nueva Leon study in Mexico¹¹ has limitations as to comparability.

Conclusion

This implementation of the BEST Test at Groote Schuur Hospital has demonstrated a lack of knowledge of transfusion knowledge amongst specialist trainees, and both a desire for more teaching and a lack of self-awareness of their knowledge of transfusion medicine. It is therefore important in practical, clinical and economic terms to address this deficiency. The authors suggest the implementation of a focused blood transfusion teaching programme consisting of lectures and interactive sessions spaced over the academic year would be beneficial. A programme to do just that would be feasible, and if done with a follow up BEST Test, could potentially show the efficacy thereof. Efforts along such lines could be expected to be beneficial to both patients and future clinicians alike. The strain of maintaining blood supplies during the COVID 19 pandemic has highlighted the need for conservation strategies and Patient Blood Management, and now would be an ideal time to intervene^{27,28}.

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Tables

Table 1: Respondents by Department

Department	n (%)	Average score %	Range of scores (min - to max percentage)
Anaesthesia	37 (36.5)	48.9	30 - 75
General Surgery	18 (17.3)	46.9	25 - 70
Orthopaedics	11 (10.6)	40.1	20 - 85
Internal Medicine	27 (26.0)	41.6	15 - 60
Obstetrics and Gynaecology	11 (10.6)	36.7	25 - 50

n = number (percentage)

Table 2: Self perception

Self-Perception of transfusion knowledge	n (%)	Average score on BEST test
Excellent	1 (0.9)	30%
Above Average	19 (18.3)	44.7%
Average	70(67.3)	44.9%
Insufficient	9(8.7)	42.7%
limited	5(4.8)	44%

Table 3: Results of BEST Test

	GSH	BEST 1 ^a	BEST 2	Brazil	Mexico ^b
Total respondents	104	474	149	106	186
TRALI reaction	16.3	8.9 ^a	16.1	19	
TRALI reporting	11.5	9.7 ^a	47.3	8	38.4*
TRALI prevention	6.7	13.5 ^a	48.3	15	
Allergy	24.0	14.4	42.6	29	24.7
RBC transfusion (symptomatic)	21.1	16.5	20.1	13	7.5
Septic Reaction	20.1	17.1	68.5	12	
Massive Transfusion	23.1	20.9	53.0	25	33.3
TACO ^c	14.0	23.8	37.2	20	51.3
Infectious Disease risk	60.5	32.3	47.0	26	87.6
Platelet Transfusion post-surgery	49.0	49.4	59.7	46	
Warfarin	55.7	53.2	69.8	59	88.2
Plasma transfusion (procedure prophylaxis)	62.5	59.5	71.8	63	66.7
Reaction reporting	77.0	66.0	73.7	54	64.5
Platelet transfusion (prophylaxis)	36.5	67.1	90.6	46	37.1
RBC transfusion (prophylaxis)	66.3	67.7	68.5	73	74.7
Acute haemolytic transfusion	50.0	67.9	64.4	80	26.9

reaction					
Acute haemolytic transfusion reaction	67.3	77.9	75.2	32	47.6
Platelet transfusion (procedure prophylaxis)	63.0	79.5	87.9	87	57
Irradiation	67.0	81.9	96	64	16.7
RBC transfusion for acute loss	89.0	88.0	95.3	99	37.1
Totals	44.1	45.7	61.6	43.5	47.2

a: Transfusion Related Acute Lung Injury (TRALI) differentiated by reaction, reporting and prevention in GSH, BEST Test 2 and Brazilian studies, but not in BEST Test 1 or Mexican study – the former is listed by ascending value and the latter only has one TRALI result reported.

b: Mexican study listed as comparison, which used BEST Test as reference for self developed tool¹¹

c: TACO – Transfusion associated circulatory overload

Figures

Figure 1: How often do you prescribe blood products

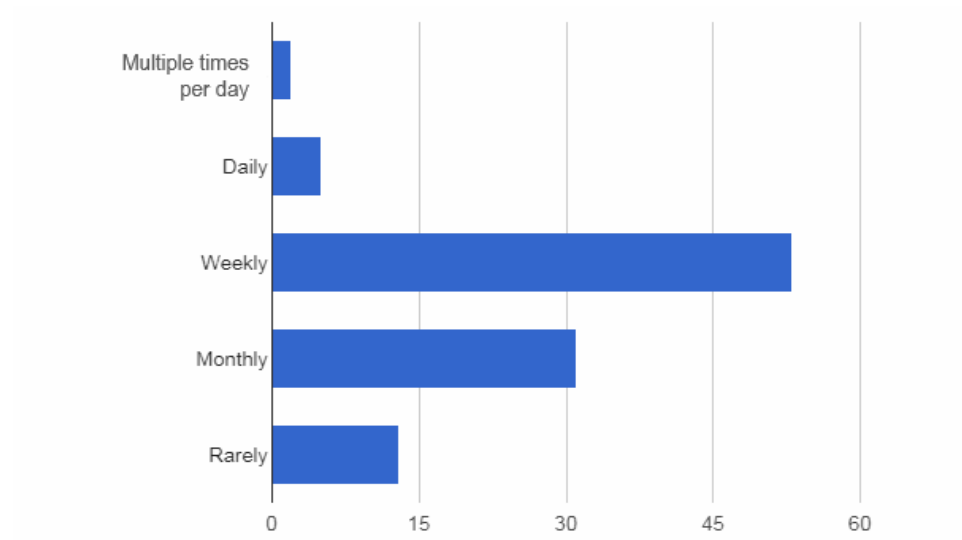


Figure 2: How important do you consider Transfusion Medicine knowledge?

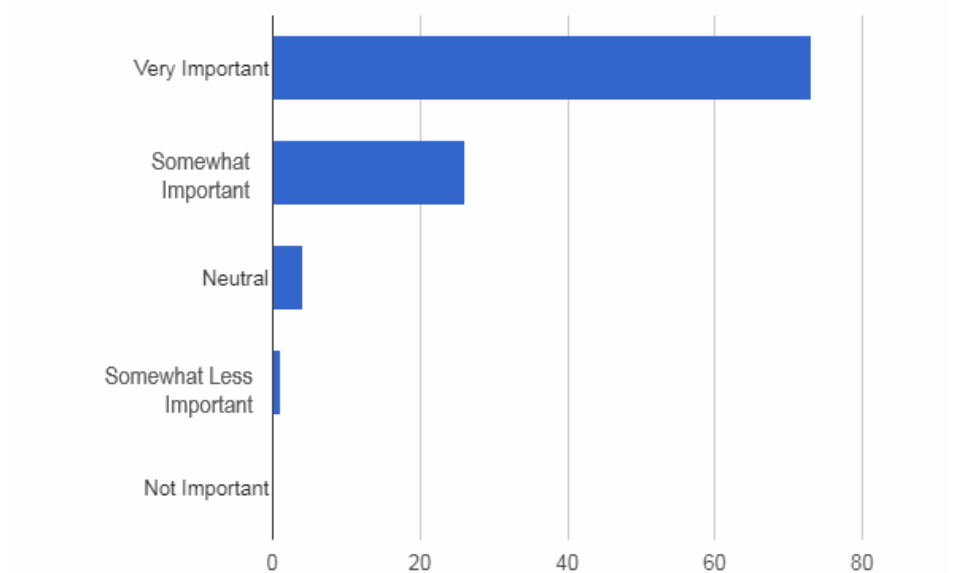
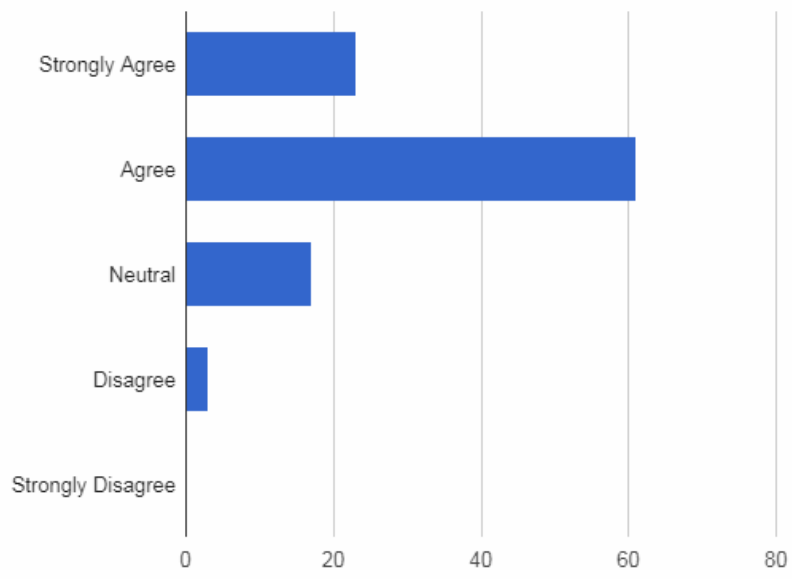


Figure 3: Do you feel you require additional training?



Appendices

1. Informed Consent Form

Transfusion Medicine knowledge amongst specialist trainees at Groote Schuur Hospital – using BEST TEST

Principle Investigator: Dr Matthew Gibbs

Co-Investigator: Dr Andries Swart

Department of Anaesthesia and Perioperative Medicine

UCT HREC Reference Number: HREC/178/2020

Consent Form

Introduction

Blood transfusion is the most commonly practiced hospital procedure throughout the world. Transfusion of blood and component therapy is efficient and perhaps lifesaving in various clinical instances, however this is not without risk and enormous cost. With the expansion of Patient Blood Management concepts and practices, transfusion practices have come under scrutiny due to not only the short and long term physiological risk associated with transfusion of blood and other components, but also due to the high cost of procuring, preserving and storing this precious commodity. Despite the inherent complexity in appropriate prescribing, regrettably in South Africa this task is frequently designated to junior members of the medical team. There is often little supervision or guidance regarding appropriate practices.

Due to the high rate of inappropriate blood product use in the United States, the Biomedical Excellence for Safer Transfusions (BEST) Collaborative developed an exam to assess adequate transfusion medicine knowledge amongst physicians, the BEST exam. This was developed by members of a panel of international transfusion medicine experts via a modified Delphi approach. Although this test is internationally utilised, it is yet to be validated in the South African setting. We hope to be the first to use the BEST Test in our South African context. Our goal is to assess baseline knowledge of transfusion medicine, according to a known international standard and identify themes that may be addressed in improving knowledge and practises among our specialist trainees.

Aim of the study

The aim of this study is to provide an overview of the current status of knowledge of Transfusion Medicine in specialist trainees working at Groote Schuur Hospital, utilising the BEST test. The results of our study will be used to identify and target deficient areas in general registrar knowledge of transfusion medicine, with the view

to addressing further education and training requirements. This improvement in knowledge, targeted at key areas to inform better practice, will assist us in providing better medical care to our patients and thereby promote better patient health.

What does my participation involve?

You are invited to take part in this study, as you are currently training to be a specialist at Groote Schuur hospital. The BEST Test consists of 20 questions on transfusion medicine. The questionnaire will be administered via printed forms, during academic meetings or other appropriate gatherings.

What data is being collected?

The results of the BEST Test will be recorded and utilised to assess the baseline of knowledge during training, in order to assist education and training in future. In addition, basic demographics such as age, speciality and experience will be recorded; along with estimates of time spent on transfusion medicine in undergraduate and postgraduate training programs. This data is to be collected to help pinpoint where improvements could potentially be made in the South African setting.

Do I have to take part in this study, and if I do, what happens to the data that is collected?

It is voluntary, and if you choose not to take part, that is completely acceptable. De-identified data will be collected and captured electronically on a password protected computer. Hard copies will be stored in a locked archive in the D23 Research hub, for the South African Good Clinical Practice guidelines' period of time and in the required manner.

Who has reviewed this research project?

This study has been reviewed and approved by University of Cape Town's Human Research Ethics Committee. The UCT's Faculty of Health Sciences Human Research Ethics Committee can be contacted on 021 406 6338 in case you have any ethical concerns or questions about your rights or welfare as a participant on this research study.

I agree to take part in the study, and that my answers and responses on the BEST test and demographic questionnaire may be used for it.

Name:

Signature:

If you have any enquiries, please contact Dr AP Swart (Anaesthetics registrar) telephonically at 0720101970 or email: alltheswarts@gmail.com

2. Data Collection Questionnaire

Demographics

Age:

Department:

Anaesthesia	Obstetrics and Gynaecology	General Surgery	Orthopaedics	Internal Medicine
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Years experience in speciality training programme:

Years experience post community service, prior to specialty training programme:

If different specialty than current one, please indicate which:

Undergraduate training Institution:

Estimation of hours received in transfusion medicine training

Undergraduate:

Post-Graduate:

How often do you prescribe blood products?

Multiple times a day	Daily	Weekly	Monthly	Rarely
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How do you rate your knowledge in Transfusion Medicine?

Excellent	Above average	Average	Insufficient	Limited
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How important do you consider Transfusion Medicine knowledge?

Very Important	Somewhat Important	Neutral	Somewhat less Important	Not Important
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Do you feel you require additional training?

Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
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Do you think there is a need for more teaching of Transfusion Medicine for future medical undergraduates?

Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
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