Major Haemorrhage and Transfusion

A COLLABORATION PROJECT BETWEEN THE DEPARTMENT OF ANAESTHESIA (UTH), THE ZAMBIA ANAESTHESIA DEVELOPMENT PROGRAMME AND THE ZAMBIA NATIONAL BLOOD TRANSFUSION SERVICE
1. Global Context

2. Case Study: Identifying the challenges at UTH Zambia

3. Case Study: Intervention at UTH Zambia

4. Case Study: Results at UTH Zambia
1. Global Context
Transfusion in low resource environments- donations

- 112.5 million donations annually

- Donation rate is used as an indicator of blood availability in a country

- Approx half are collected in mid-low income countries, which have 81% of the world’s population

WHO Global Database on Blood Safety, 2013
## Transfusion in low resource environments - donations

<table>
<thead>
<tr>
<th></th>
<th>Donations per 1,000 population per year</th>
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</thead>
<tbody>
<tr>
<td>High income countries</td>
<td>32.1</td>
</tr>
<tr>
<td>Upper-middle income</td>
<td>14.9</td>
</tr>
<tr>
<td>countries</td>
<td></td>
</tr>
<tr>
<td>Lower-middle income</td>
<td>7.8</td>
</tr>
<tr>
<td>countries</td>
<td></td>
</tr>
<tr>
<td>Low-income countries</td>
<td>4.6</td>
</tr>
</tbody>
</table>

WHO Global Database on Blood Safety, 2013
Donations can either be:

- Voluntary, unpaid
- Family/ replacement
- Paid

Donation of blood by voluntary donors is recognised as being safer and more sustainable for national blood supplies.
Transfusion in low resource environments - clinical uses for blood

- In low income countries
  - 65% of blood transfusions are given to <5 yr age group
  - Most common indications are pregnancy related complications and severe childhood anaemia

- Unnecessary transfusion and unsafe transfusion practices also expose patients to risk and reduce the blood available for those who clinically need a transfusion
Transfusion in low resource environments - haemovigilance in African countries

- 74% have national guidelines on the use of blood
- 14% of hospitals have a transfusion committee
- 42% participate in clinical audits of the use of blood products
- 17% have systems for reporting adverse transfusion events

WHO Global Database on Blood Safety, 2013
1. Global Context

2. Case Study: Identifying the challenges at UTH Zambia
Zambia

- Population of 16.2 million
- United Nations Human Development Index 0.579
- Ranked 139\(^{th}\) of 188 countries
University Teaching Hospital, Lusaka, Zambia

- Tertiary centre, government funded
- Encompasses the adult hospital, women and newborn, paediatrics, infectious diseases and cancer diseases hospitals
- All surgical services undertaken with many centralised
- Emergency care is free to patients, some charges for elective care
- 1,655 inpatient beds and 250 cots however actual inpatient number far exceeds this
Physician Anaesthesia training started in Zambia in 2011.

17 doctors have finished training to date.

13 doctors currently in training, further 6 recruited for this year.

There is now a Zambian Consultant Anaesthetist as HoD at four hospitals in Zambia.
ZADP/ overseas support

- Established in 2012

- Consultants for mid-long term placements: 4 people, total of 63 months of training time provided

- Trainees: 36, total of 183 months of training time provided

- Multiple Consultant short term visits
Challenges to blood transfusion practice

- **Access** to blood products
- **Availability** of blood products
- **Demand** for blood products
Challenges to blood transfusion practice

**Access** to blood products

- No call system for blood bank - relied on calling the mobile of the blood bank managers or going in person
- No process for a “group and save”
Challenges to blood transfusion practice

**Availability** of blood products

- Donation rate is low
- Donors are commonly school children
- Whole blood is more available than component parts
- If not given to a patient, units are often kept on the ward/lost rather than being returned to blood bank
- Requesting “extra units”
- Requesting blood for cases that are unlikely to need blood
viability of transfused blood defined by
“negative blood culture and potassium concentration of less than 42mmol/l”
samples collected from 83 consecutive units found on the ward
8 samples (10.5%) showed a positive culture
Pseudomonas fluorescens, Corynabacterium, Acinetobacter baumannii and Staphylococcus capitis
The mean potassium content was 12.25mmol/l (±7.4SD)
Challenges to blood transfusion practice

**Demand** for blood products
- Both major haemorrhage and chronic anaemia are common
- Major haemorrhage common in obstetrics and trauma
- Patients presenting for surgery who are profoundly anaemic is high
- Lack of access to an FBC
- Patients often present when disease is advanced

- High Jehovah’s Witness population
Avoidable perioperative mortality at the University Teaching Hospital, Lusaka, Zambia: a retrospective cohort study

Mortalité périopératoire évitable à l’hôpital universitaire de Lusaka (Zambie): une étude rétrospective de cohorte

Edwardina Mary Mae Alexandra Lillie, MBChB · Christopher John Holmes, MBChB · Elizabeth Anne O’Donohoe, MBChB · Lowri Bowen, MBChB · Chadwick L. T. Ngwisha, MBChB · Yusuf Ahmed, MPH · David Michael Snell, MBBS · John Alexander Kinnear, MBChB · M. Dylan Bould, MBChB

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Abstract

Purpose  Perioperative mortality has fallen in both high- and low-income countries over the last 50 years. An evaluation of avoidable perioperative mortality can provide valuable lessons to improve care; however, there is relatively little recent data from the Least Developed Countries in the world. We aimed to compare recent methods

Methods  We conducted a retrospective cohort study by identifying perioperative deaths within days of surgery and comparing the operating room and mortuary registers for the 2012 calendar year. Multiple independent raters from anesthesiology and surgery/obstetrics gynecology reviewed case notes, when available, to identify avoidable causes of death.
37 avoidable and probably avoidable deaths identified

Major haemorrhage was a common cause of death

| Surgical factors (53%) | Delay in surgery  
<table>
<thead>
<tr>
<th></th>
<th>Poor pre-operative optimisation</th>
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</thead>
<tbody>
<tr>
<td>Anaesthetic Factors (32%)</td>
<td>Poor post-operative care</td>
</tr>
<tr>
<td>System Factors (30%)</td>
<td>Lack of blood availability</td>
</tr>
</tbody>
</table>
Need for a quality improvement project

- Wanted to develop a project giving local people skills in quality improvement

- Chose major haemorrhage and blood transfusion based on what local people were reporting as a common cause of avoidable death

- Our own experiences of dealing with blood transfusion/ major haemorrhage
Major haemorrhage and safe transfusion

- Initial audit
- Intervention phase
- Re-audit
- Reporting
Baseline survey in 2014 looking at transfusion practices over 6 weeks at UTH

- Only few clinicians were following the current protocol
- Long delay between major haemorrhage being declared and patient receiving blood transfusion
- No crossmatch requests were met
- Packed Red Cells were not given in response to major haemorrhage
Initial audit

- High number of incomplete blood request forms

- High number of patients undergoing elective and emergency surgery without a pre-operative haemoglobin

- High number of “unaccounted” blood products issued from blood bank
1. Global Context

2. Case Study: Identifying the challenges at UTH Zambia

3. Case Study: Intervention at UTH Zambia
The intervention

- Funded by DFID (UK) through a Tropical Health Education Trust

- 20 month project aiming to improve transfusion practice and reduce mortality from major haemorrhage
What did this project do?

- Introduced three new major haemorrhage protocols into clinical practice (adult, obstetric, paediatric)
What did this project do?

- Trained staff at UTH through workshops and simulation
What did this project do?

- Trained staff at UTH through workshops
  - When to transfuse
  - What to transfuse
  - Safe requesting and prescribing of blood
  - Storage of blood products outside of blood bank
  - Post transfusion care/ audit trail
  - Management of major haemorrhage
  - Point of care testing
ZAMBIA NATIONAL BLOOD TRANSFUSION SERVICE
HOSPITAL BLOOD REQUEST FORM
YOU MUST FILL IN ALL DETAILS IN CLEAR WRITING

Patient details
Surname: ___________________________ DoB/Age: 9/12 Gender: F
First name: _________________________ Ward: A04
Patient File no.: ___________________ Blood bank no.: 4587

History
Previous pregnancies: Yes / No Previous transfusions: Yes / No
Blood group (if known): ___________ Previous reactions: Yes / No

Reason for transfusion: _______________________________________________________

Request
Emergency (immediately) Packed red cells 60 units
Urgent (within 1 hour) FFP units
Standard (within 12 hours) Platelets units
Group & save (within 7 days) Cryoprecipitate units

Major haemorrhage protocol instigated

Date required: 19 12 13 Time required: ____________

Name of doctor (print): DR. __________________________ Signature: __________________

Doctor mobile no.: __________________ Date of request: __________________

Time of request: ____________________
What did this project do?

- Conducted outreach clinical-interface workshops in Livingstone, the Copperbelt, and Mansa
What did this project do?

- Introduced blood compatibility forms
What did this project do?

- Recruited and trained staff as “blood transfusion champions” who were then able to provide training to others on point-of-care testing and transfusion practice
What did this project do?

- Introduced transfusion trolleys and point-of-care testing in major haemorrhage at 5 hospitals
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## Outcomes

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<thead>
<tr>
<th>Aim at the start of the project</th>
<th>Outcome</th>
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</thead>
<tbody>
<tr>
<td>To train 73 healthcare professionals at UTH through a workshop</td>
<td>511 healthcare professionals at UTH were trained through the workshop</td>
</tr>
<tr>
<td></td>
<td>85 healthcare professionals attended an outreach clinical interface workshop</td>
</tr>
<tr>
<td></td>
<td>32 healthcare professionals attended a training workshop at the SAZ conference</td>
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<tr>
<td></td>
<td>Number tested</td>
</tr>
<tr>
<td>------------------</td>
<td>---------------</td>
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<tr>
<td>Pre-test</td>
<td>474</td>
</tr>
<tr>
<td>Post-test</td>
<td>483</td>
</tr>
<tr>
<td>Follow up</td>
<td>39</td>
</tr>
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Significance calculated by two-tailed Fisher’s exact test

https://www.graphpad.com/quickcalcs/contingency2/
### Outcomes

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<tr>
<td>To train 6 local healthcare professionals to train others through the workshops</td>
<td>7 healthcare professional at UTH are now trained and part of the workshop and outreach project faculty</td>
</tr>
<tr>
<td>To develop 3 transfusion protocols for clinical practice</td>
<td>3 protocols were developed</td>
</tr>
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Other achievements

- **Hospital Transfusion Committees x 2**

- **Research** was conducted which validated the Prospect point-of-Care device in the Zambian population.

- Major haemorrhage and Safe blood handling was agreed by the Board of Graduate Studies to be considered in the next review of all of the MMed Medicine curriculums.
Other achievements

- The Scottish National Blood Transfusion Service kindly allowed use of their **e-learning modules for local staff**

- One doctor we met through an outreach workshop came to train in MMed Anaesthesia!
“The blood transfusion project has been one of the best things I have done in my time as an MMED trainee. The knowledge gap in the transfusion practice was and still is obvious among those that have not yet had a transfusion workshop. **Blood is an expensive resource and hence requires proper management.** My involvement as part of faculty has been really rewarding. **The feedback we have gotten after the training always gave me a reason to want to train even more people**”

Physician Anaesthetist
“Thank you so much for having given us an opportunity to be part of that project and much more the knowledge I personally got and a number of people that you trained. I have worked at UTH for 5 years now and particularly in the ICU. Blood transfusion was not treated as an emergency because we didn’t have much knowledge about the blood products. Blood was left outside the box and was given at a wrong time. In most cases blood was being wasted and patients used to die. The case is different now.”

ICU Nurse
Key Stakeholders

“This project enabled capacity building within the Zambian team. It wasn’t just about giving people the technical know-how, but was more about mentorship, teaching skills and managerial training. This team are now known as our Blood Transfusion Champions!”

Manager, ZNBTS
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<tbody>
<tr>
<td><strong>29.4%</strong> (32/109) of patients presenting for emergency surgery had a documented Hb measurement</td>
<td><strong>44%</strong> (56/126) of patients presenting for emergency surgery had a documented Hb</td>
<td>0.0215</td>
</tr>
<tr>
<td><strong>2.2%</strong> (8/363) of request forms for cross-matched blood had a documented Hb</td>
<td><strong>19.6%</strong> (52/265) of request forms for cross-matched blood had a documented Hb</td>
<td>0.0001</td>
</tr>
</tbody>
</table>

Significance calculated by two-tailed Fisher's exact test
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<tbody>
<tr>
<td><strong>44%</strong> (196/446) of cross-matched blood products were unaccounted for</td>
<td><strong>23.6%</strong> (94/399) of cross-matched blood products were unaccounted for</td>
<td><strong>0.0001</strong></td>
</tr>
<tr>
<td><strong>28%</strong> (7/25) of major haemorrhage cases had blood products requested in line with the MH protocol</td>
<td><strong>41%</strong> (7/17) of major haemorrhage cases had blood products requested in line with the MH protocol</td>
<td><strong>0.5076</strong></td>
</tr>
<tr>
<td><strong>0%</strong> (0/25) of major haemorrhage cases received blood products in line with the MH protocol</td>
<td><strong>0%</strong> (0/17) of major haemorrhage cases received blood products in line with the MH protocol</td>
<td><strong>1.0000</strong></td>
</tr>
</tbody>
</table>
Was there sustainable change?

- QI, leadership, teaching skills experience for local people
- Opportunity for a multidisciplinary project
- Evidence of measurable change but difficult to know if this will be sustainable
Involved in the project

- Zambia National Blood Transfusion Service
  Dr. Joseph Mulenga, Mr David Chama

- Blood Transfusion Champions at University Teaching Hospital
  Dr. Abel. Mwale, Dr. Ninza Sheyo, Mrs Lillian Mwape, Mrs Esther Musama, Dr. Jacqueline Mulundika

- Hospital Transfusion Committee at University Teaching Hospital

- ZADP team
  Dr. Peter Hart, Dr. Nathan Oates, Dr. Janaki Pearson, Dr. Holly Blackwood, Dr. Laura Saunders, Dr. Victoria Simiyu, Dr Emma Coley, Dr. Dylan Bould

- Mr. Brian Hockley, NHS Blood Transfusion, UK