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

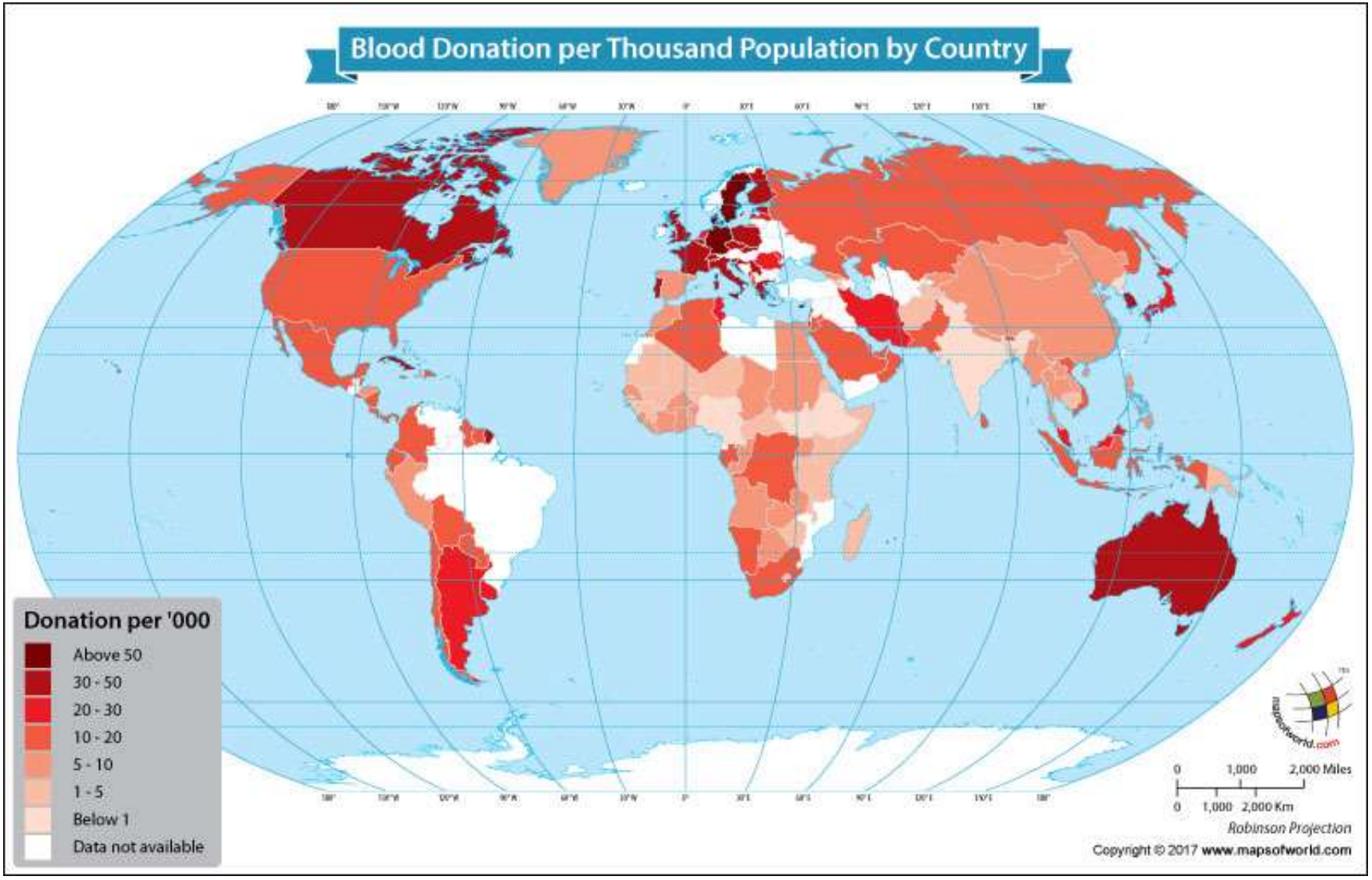
- 112.5 million donations annually
- Donation rate is used as an indicator of blood availability in a country
- Approx half are collected in mid-low income countries, which have 81% of the world's population

WHO Global Database on Blood Safety, 2013

Transfusion in low resource environments- donations

	Donations per 1,000 population per year
High income countries	32.1
Upper-middle income countries	14.9
Lower- middle income countries	7.8
Low-income countries	4.6

WHO Global Database on Blood Safety, 2013


Blood Donation per Thousand Population by Country
Donation per '000
Above 50
30 - 50
20 - 30
10 - 20
5 - 10
1 - 5
Below 1
Data not available
0 1,000 2,000 Miles
0 1,000 2,000 Km
Robinson Projection
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Transfusion in low resource environments- donations

- 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 139th 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

- 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)

THE VIABILITY OF WHOLE BLOOD AND PACKED CELLS AT THE TIME OF TRANSFUSION
Dr. Abel Mwale, Dr Dylan Bould, Dr. Joseph Mulenga
2016, unpublished work

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

Can J Anesth/J Can Anesth
DOI 10.1007/s12630-015-0483-z

REPORTS OF ORIGINAL INVESTIGATIONS

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

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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 *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 Poor pre-operative optimisation
Anaesthetic Factors (32%)	Poor post-operative care
System Factors (30%)	Lack of blood availability

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

Initial audit

- 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

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3. Case Study: Intervention at UTH Zambia

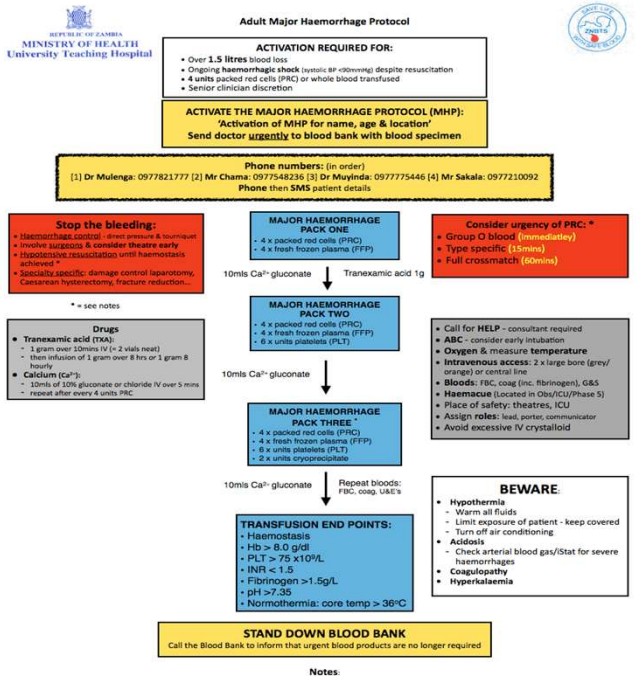
The intervention

- 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)



REPUBLIC OF ZAMBIA
MINISTRY OF HEALTH
University Teaching Hospital

Adult Major Haemorrhage Protocol

ACTIVATION REQUIRED FOR:
- Over **1.5 litres** blood loss
- Ongoing **haemorrhagic shock** (systolic BP <90mmHg) despite resuscitation
- **4 units** packed red cells (PRC) or whole blood transfused
- Senior clinician discretion

ACTIVATE THE MAJOR HAEMORRHAGE PROTOCOL (MHP):
'Activation of MHP for name, age & location'
Send doctor urgently to blood bank with blood specimen

Phone numbers: (in order)
[1] **Dr Mulenga**: 0977821777 [2] **Mr Chama**: 0977548236 [3] **Dr Muyinda**: 0977775446 [4] **Mr Sakala**: 0977210092
Phone then **SMS** patient details

Stop the bleeding:
- Haemorrhage control - direct pressure & tourniquet
- Involve surgeons & **consider theatre early**
- Hypotensive resuscitation until haemostasis achieved *
- Specialty specific: damage control laparotomy, Caesarean hysterectomy, fracture reduction...

* = see notes

Drugs
- **Tranexamic acid (TXA):**
  - 1 gram over 10mins IV (= 2 vials neat)
  - then infusion of 1 gram over 8 hrs or 1 gram 8 hourly
- **Calcium (Ca^{2+}):**
  - 10mls of 10% gluconate or chloride IV over 5 mins
  - repeat after every 4 units PRC

MAJOR HAEMORRHAGE PACK ONE
- 4 x packed red cells (PRC)
- 4 x fresh frozen plasma (FFP)

10mls Ca^{2+} gluconate
Tranexamic acid 1g

MAJOR HAEMORRHAGE PACK TWO
- 4 x packed red cells (PRC)
- 4 x fresh frozen plasma (FFP)
- 6 x units platelets (PLT)

10mls Ca^{2+} gluconate

MAJOR HAEMORRHAGE PACK THREE *
- 4 x packed red cells (PRC)
- 4 x fresh frozen plasma (FFP)
- 6 x units platelets (PLT)
- 2 x units cryoprecipitate

10mls Ca^{2+} gluconate
Repeat bloods: FBC, coag, U&E's

TRANSFUSION END POINTS:
- Haemostasis
- Hb > 8.0 g/dl
- PLT > 75 x10^9/L
- INR < 1.5
- Fibrinogen >1.5g/L
- pH >7.35
- Normothermia: core temp > 36°C

Consider urgency of PRC: *
- Group O blood (immediatley)
- Type specific (15mins)
- Full crossmatch (60mins)

- Call for **HELP** – consultant required
- **ABC** - consider early intubation
- **Oxygen** & measure **temperature**
- **Intravenous access**: 2 x large bore (grey/orange) or central line
- **Bloods**: FBC, coag (inc. fibrinogen), G&S
- **Haemacue** (Located in Obs/ICU/Phase 5)
- Place of safety: theatres, ICU
- Assign **roles**: lead, porter, communicator
- Avoid excessive IV crystalloid

BEWARE:
- **Hypothermia**
  - Warm all fluids
  - Limit exposure of patient - keep covered
  - Turn off air conditioning
- **Acidosis**
  - Check arterial blood gas/iStat for severe haemorrhages
- **Coagulopathy**
- **Hyperkalaemia**

STAND DOWN BLOOD BANK
Call the Blood Bank to inform that urgent blood products are no longer required

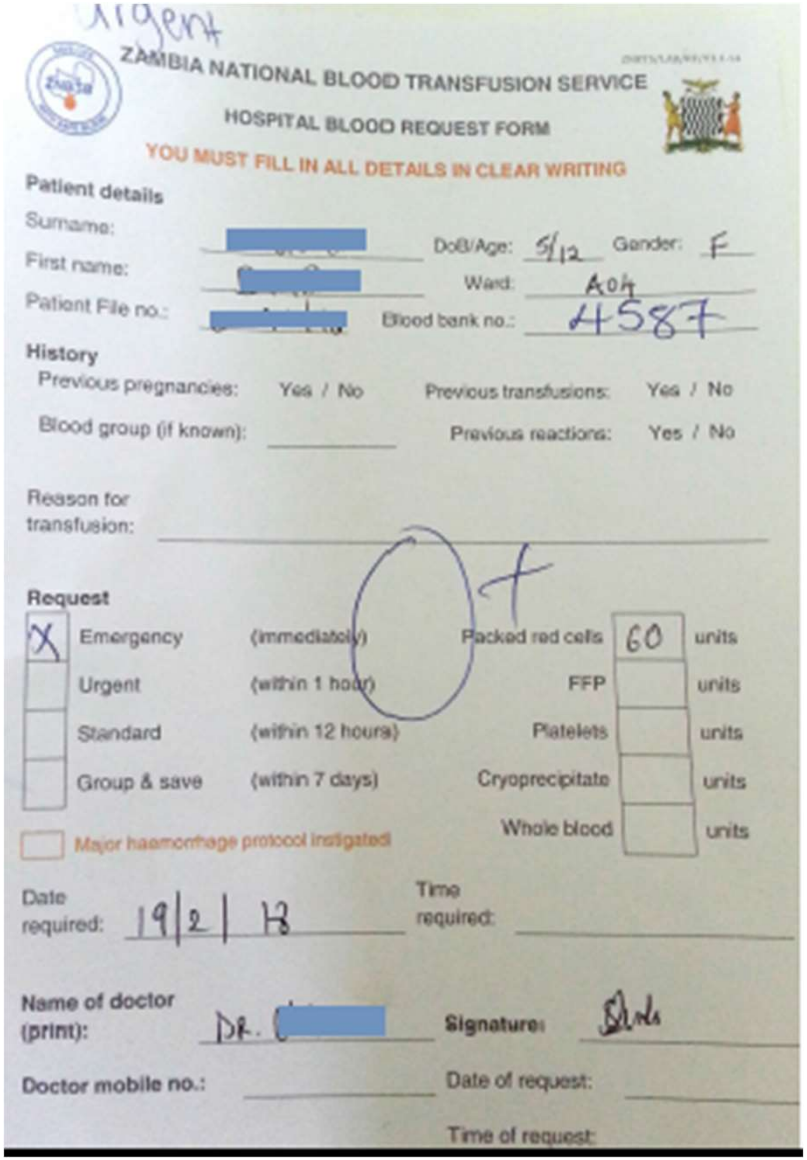
Notes:

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



URGENT

ZAMBIA NATIONAL BLOOD TRANSFUSION SERVICE

HOSPITAL BLOOD REQUEST FORM

YOU MUST FILL IN ALL DETAILS IN CLEAR WRITING

Patient details

Surname: [redacted] DoB/Age: 5/12 Gender: F

First name: [redacted] Ward: A&E

Patient File no.: [redacted] 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

X	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
			Whole blood		units

☐ Major haemorrhage protocol instigated

O+

Date required: 19/2/13 Time required: _____

Name of doctor (print): DR. [redacted] Signature: [signature]

Doctor mobile no.: _____ Date of request: _____

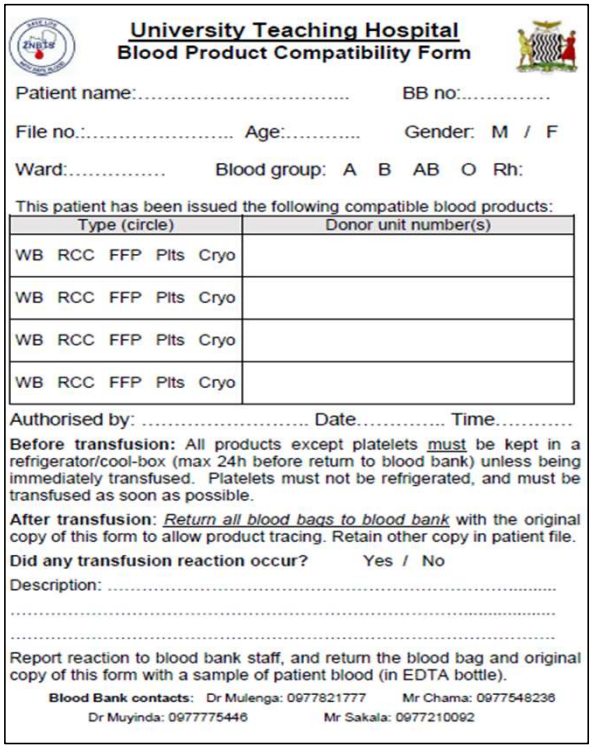
Time of request:

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



University Teaching Hospital
Blood Product Compatibility Form

Patient name:..... BB no:.....

File no.:..... Age:..... Gender: M / F

Ward:..... Blood group: A B AB O Rh:

This patient has been issued the following compatible blood products:

Type (circle)	Donor unit number(s)
WB RCC FFP Plts Cryo	
WB RCC FFP Plts Cryo	
WB RCC FFP Plts Cryo	
WB RCC FFP Plts Cryo	

Authorised by: ..... Date..... Time.....

Before transfusion: All products except platelets must be kept in a refrigerator/cool-box (max 24h before return to blood bank) unless being immediately transfused. Platelets must not be refrigerated, and must be transfused as soon as possible.

After transfusion: *Return all blood bags to blood bank* with the original copy of this form to allow product tracing. Retain other copy in patient file.

Did any transfusion reaction occur? Yes / No

Description: .....

.....

.....

Report reaction to blood bank staff, and return the blood bag and original copy of this form with a sample of patient blood (in EDTA bottle).

Blood Bank contacts: Dr Mulenga: 0977821777 Mr Chama: 0977548236
Dr Muyinda: 0977775446 Mr Sakala: 0977210092

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

Aim at the start of the project	Outcome
To train 73 healthcare professionals at UTH through a workshop	**511 healthcare professionals at UTH were trained through the workshop** 85 healthcare professionals attended an outreach clinical interface workshop 32 healthcare professionals attended a training workshop at the SAZ conference

	Number tested	MCQ score, median [IQR]	Number achieving >70%	p=	p=	p=
Pre-test	474	6 [5-7]	149 (31%)	0.0001	0.0001	
Post-test	483	9 [8-10]	451 (93%)			0.1825
Follow up	39	8 [7-9]	34 (87%)			

Significance calculated by two-tailed Fisher's exact test
https://www.graphpad.com/quickcalcs/contingency2/

Outcomes

Aim at the start of the project	Outcome
To train 6 local healthcare professionals to train others through the workshops	**7 healthcare professional at UTH are now trained and part of the workshop and outreach project faculty**
To develop 3 transfusion protocols for clinical practice	**3 protocols were developed**

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!

Key Stakeholders

- *"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

Key Stakeholders

- *"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

Initial audit (2015)	Re-audit (2017)	p=
29.4% (32/109) of patients presenting for emergency surgery had a documented Hb measurement	**44%** (56/126) of patients presenting for emergency surgery had a documented Hb	0.0215
2.2% (8/363) of request forms for cross-matched blood had a documented Hb	**19.6%** (52/265) of request forms for cross-matched blood had a documented Hb	0.0001

Significance calculated by two-tailed Fisher's exact test
https://www.graphpad.com/quickcalcs/contingency2/

Initial audit (2015)	Re-audit (2017)	p=
44% (196/446) of cross-matched blood products were unaccounted for	**23.6%** (94/399) of cross-matched blood products were unaccounted for	0.0001
28% (7/25) of major haemorrhage cases had blood products requested in line with the MH protocol	**41%** (7/17) of major haemorrhage cases had blood products requested in line with the MH protocol	0.5076
0% (0/25) of major haemorrhage cases received blood products in line with the MH protocol	**0%** (0/17) of major haemorrhage cases received blood products in line with the MH protocol	1.0000

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**