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Blood Transfusion in Sub-Saharan Africa: Challenges and Opportunities

Prepared by Canadian Blood Services Knowledge Mobilization Team with special thanks to Heather Hume

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it's in you to give

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KnowledgeInfusion
SPOTLIGHT ON INTERNATIONAL

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Expertise: Pediatric hematology, transfusion medicine

Presentation Learning Objectives:

- ✓ **Describe challenges facing Ugandan health care providers in providing safe and adequate blood transfusion therapy**
- ✓ **Describe the World Health Organization's goals for universal for safe transfusion**

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Blood Transfusion in Sub-Saharan Africa: Challenges and Opportunities

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Makerere University, Kampala, Uganda



Disclosure

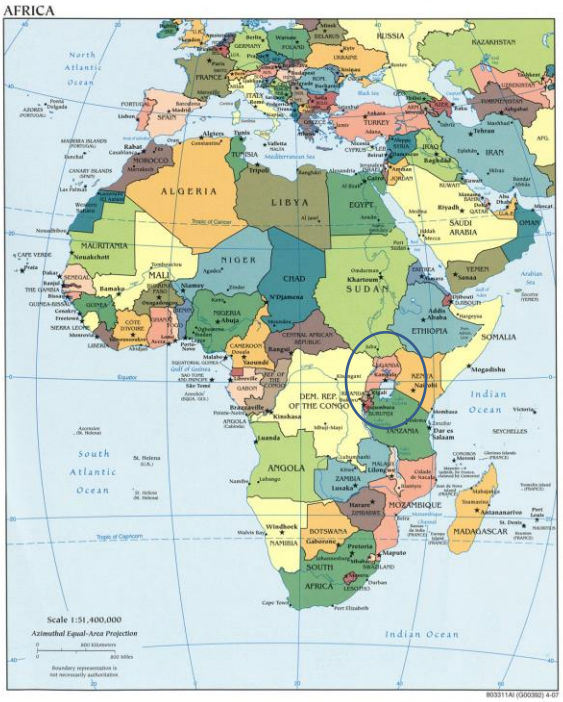
- I have no relevant financial relationships to disclose for this program

Learning Objective

- To appreciate the challenges of practising transfusion medicine in low-resource settings.

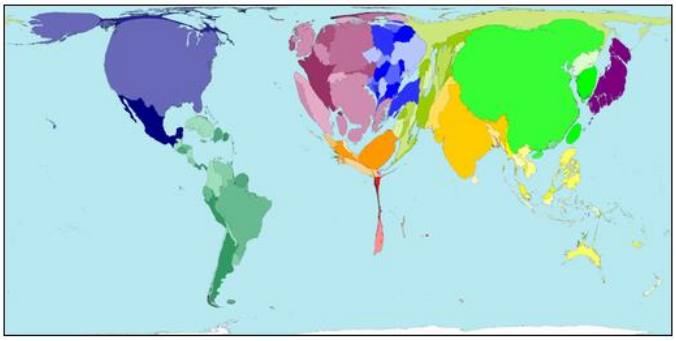
Talk Outline

- Uganda – in perspective
- WHO strategy for blood safety
- Uganda Blood Transfusion Service
- Blood transfusion in Uganda's largest hospital – Mulago National Referral Hospital



	Canada	USA	Uganda
Population	36 X 10^6	321 X 10^6	39 X 10^6
PPP per capita	$44,310	$55,836	$1,825
Health expenditure (HE) per capita	$5292	$9403	$52
HE, % public	71%	48%	25%
Under 5 mortality	5/1000	7/1000	55/1000

http://data.worldbank.org/indicator (2014-15)



www.worldmapper.org physicians working

Country	# MDs /10^5 pop (2004)
Canada	209
USA	549
Uganda	5

Mulago National Referral Hospital
Makerere University College of Health Sciences

Mulago vs McGill
Approximate Stats

	Mulago Kampala	MUHC Montreal
Outpatient visits/yr	820,000	715,000
Inpatients/day	2,000	
Deliveries/yr	39,000	3,000
Surgeries/yr	13,400	35,000
Whole blood/RBC units/yr	17,500 (12,000 donations)	24,000

Publicly Funded Labs
Mulago National Referral Hospital

Hematology Lab

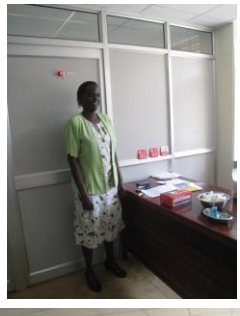
Main Blood Bank

World Health Organization (WHO) Strategy for Blood Safety

- National coordinated blood transfusion service
  - safety, adequacy of the blood supply
- 100% voluntary, unpaid donors
- Testing of all donated blood
- Production of blood components
- Appropriate clinical use of blood
  - safe transfusion practice at the bedside
- Comprehensive quality system
- Hemovigilance

Uganda Blood Transfusion Services

- National system, has been supported by PEPFAR
- Collects approx. 220,000 units annually (5.6 units/1000 population)
- 100% anonymous, voluntary donors
- Repeat donors 58%
- Viral testing on donations
  - HIV – antigen/antibody
  - anti-HCV
  - HBsAg
- HIV
  - population – 7%
  - blood donations – 0.9%

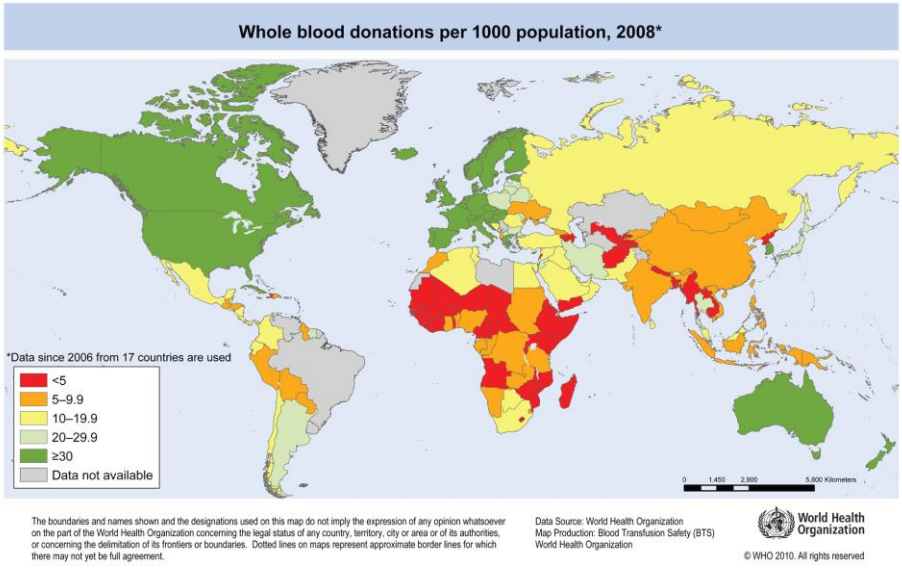


Number of blood donations per 1000 population

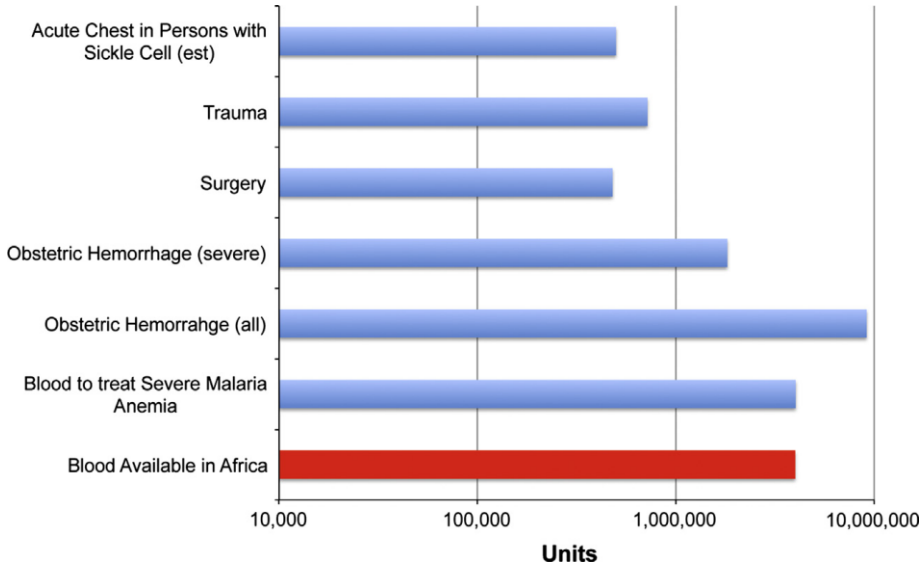
Country income	Median
High	37
Medium	12
Low	4

According to WHO should be at least 10 per 1000 population

http://www.who.int/features/factfiles/blood_transfusion/blood_transfusion/en/index9.html



RBC Demand Far Exceeds Supply



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Lund TC et al. Transf Apheres Sci (2013), http://dx.doi.org/10.1016/j.transci.2013.06.014

Blood supplies at Mulago

Average day (Nov 2016) 3pm:
0 A, 2 B, 12 AB, no O

Very good day 3 pm:
5 A, 11 B, 14 AB, 2 O

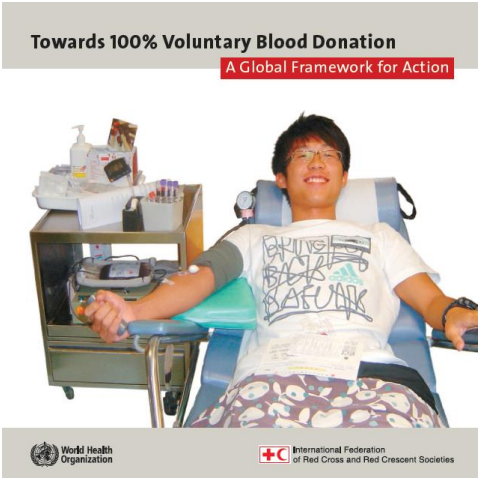
A

B

AB

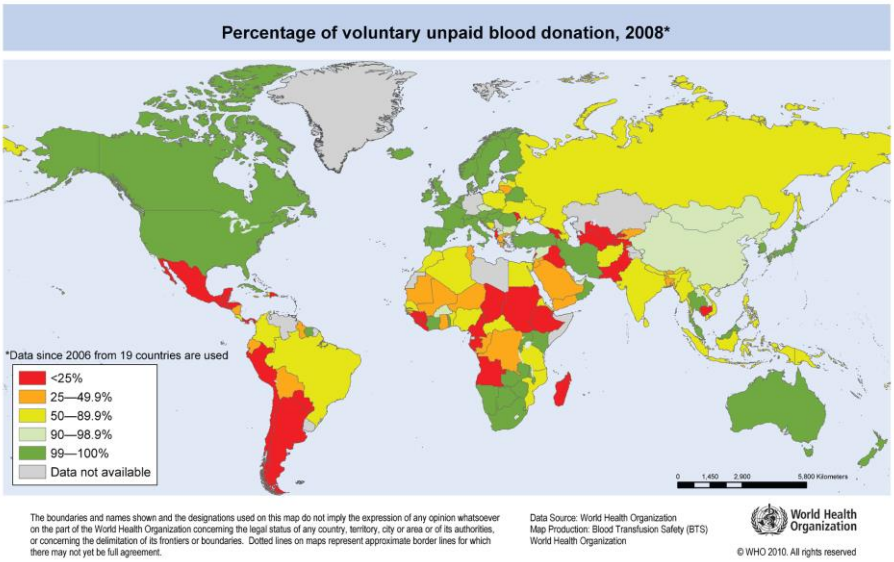
O

WHO goal – worldwide 100% voluntary blood donation by 2020



Donors: donor type

- Voluntary, non-remunerated donors (VNRD)
- Family/replacement donors (FRD)
- Paid donors
- 2008-2013
  - 72/146 countries > 50% donations from FR or paid donors



Prevalence of TTI markers

Table 1. Prevalence of TTIs in blood donations (Median, Interquartile range (IQR)), by income groups

	HIV	HBV	HCV
High-income countries	0.002%	0.02%	0.02%
	(0.0004%-0.02%)	(0.008% - 0.24%)	(0.004% - 0.22%)
Middle-income countries	0.12%	0.64%	0.37%
	(0.03% - 0.2%)	(0.19% - 2.33%)	(0.13% - 0.71%)
Low-income countries	0.85%	3.59%	1.07%
	(0.48% - 2.0%)	(2.01% - 6.08%)	(0.63% - 1.96%)

These differences reflects the variation in prevalence among population who are eligible to donate blood, the type of donors (such as voluntary unpaid blood donors from lower risk populations) and the effectiveness of the system of educating and selecting donors.

http://www.who.int/mediacentre/factsheets/fs279/en/

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Prevalence/reactivity of viral markers and type of donors

Allain JP. BJH 2011;154:763-9

Viral marker	Donor type	N studies	Mean prevalence	
			Not confirmed	Confirmed
HBsAg	Replacement	8	11.6	12.0
	1st time VNRD	8	11.4	15.1
	Repeat VNRD	6	NA	3.6
Anti-HIV	Replacement	9	5.2	2.6
	1st time VNRD	7	3.4	2.1
	Repeat VNRD	5	1.3	0.03
Anti-HCV	Replacement	6	3.3	0.7
	1st time VNRD	6	2.3	0.4
	Repeat VNRD	3	0.7	0.1

From 42 references collected in SSA literature

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	1st time VNRD	6	2.3	0.4
	Repeat VNRD	3	0.7	0.1

From 42 references collected in SSA literature

Family/replacement donors (FRD) versus Voluntary non-remunerated donors (VNRD)

- Advantges of FRD (vs VNRD)
  - less expensive first-time donor
  - may be more readily available
- Disadvantages of FRD (vs VNRD)
  - concern that these donations may be used in facilities with less robust quality systems
  - less able to build a group of repeat donors
    - less able to build an adequate supply of blood

Whole blood vs components

Country income level	% blood collected processed into components
High	95%
Medium	80%
Low	45%

http://www.who.int/features/factfiles/blood_transfusion/blood_transfusion/en/index9.html

Whole blood versus components debate

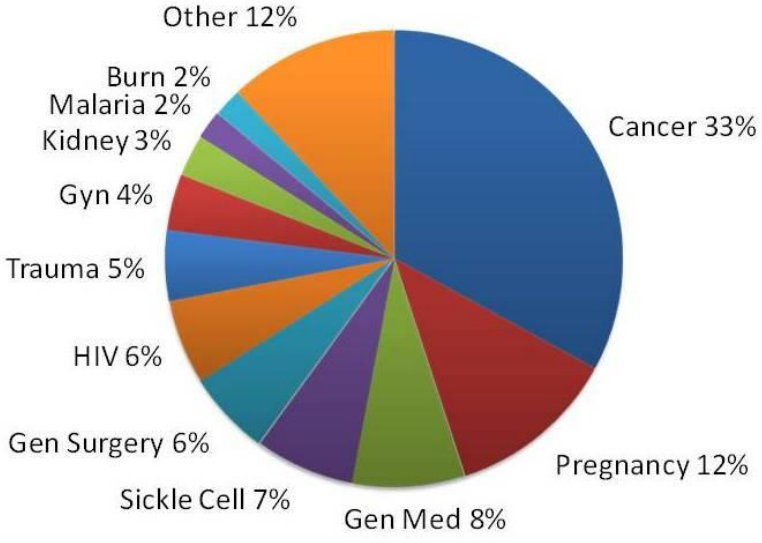
- Pro – use only what the patient needs, use exactly what the patients needs, make best use of each donation
- But in resource-limited settings.....
  - Components are expensive
  - Many transfusions are for acute hemorrhage
  - Component production would lead to waste of plasma units which cannot (at least currently) be used for fractionation
- Best approach – centre-specific and likely a mix with a varying amount of whole blood not separated

Blood Transfusion – Mulago Hospital
Feb-April 2014

Component	Number (%) transfused
Whole blood	3808 (60%)
Red cells	1970 (31%)
Platelets	349 (6%)
FFP	132 (2%)
Unknown	71 (1%)

Butler E et al. Transfusion 2015; 55:1058

Distribution of Blood Use at Mulago Hospital, Kampala



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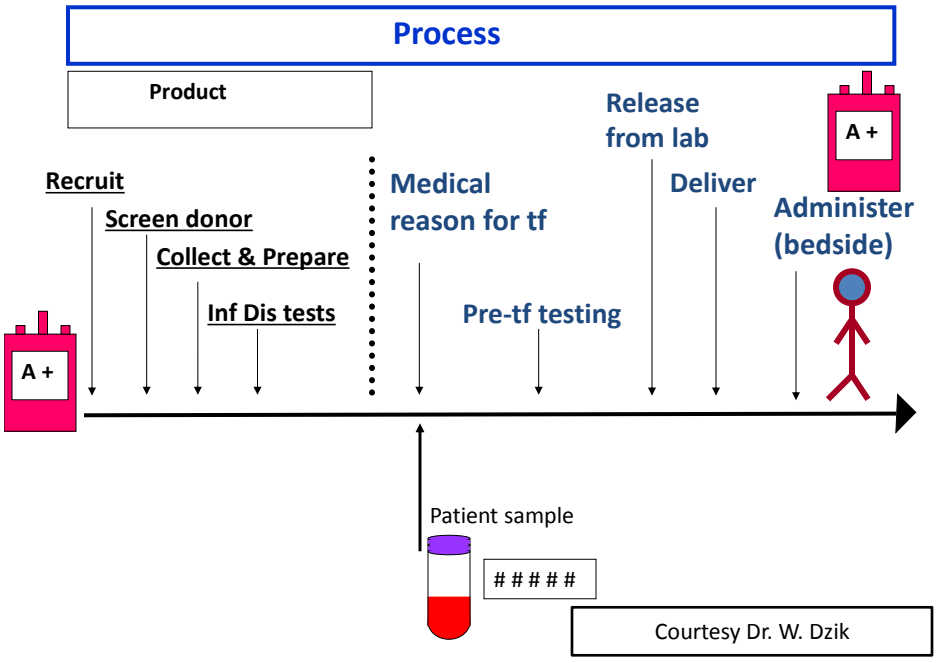
Butler E et al. Transfusion 2015; 55:1058

Safe Transfusion: Processes not just product.



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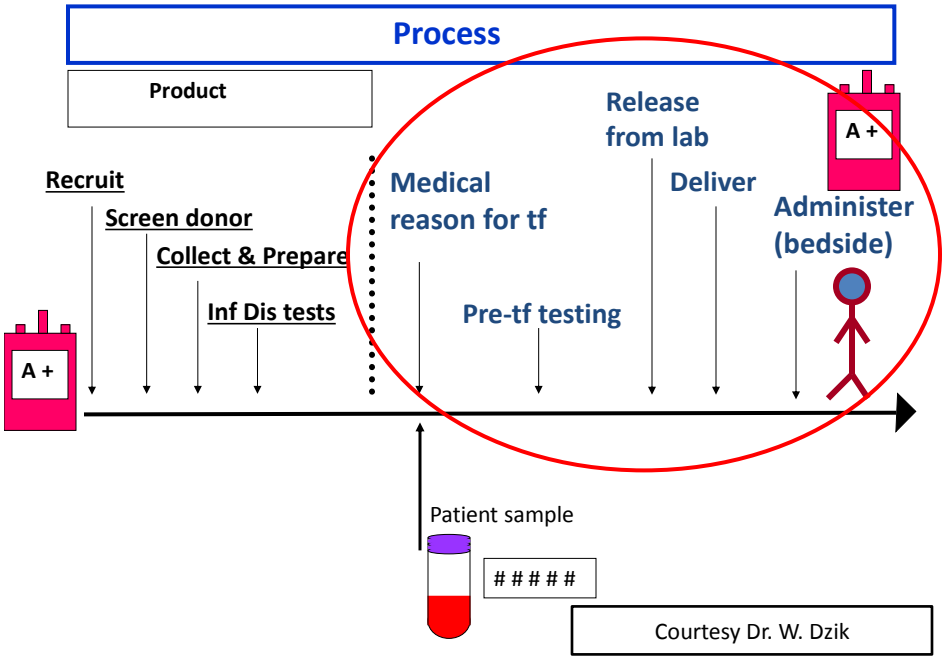


Indications for transfusion

Can be difficult anywhere –

harder in Africa

Mulago Transfusion Audit March 29-31, 2010
Pretransfusion Hb testing

Pediatric medical	Number	Pretf Hb done	Median g/dL (range)
Known transfused	36	30	
UTD if transfused	3	2	
Total	39	32 (82%)	3.85 (1.9-9.6)

Adult/sx/obs-gyn	Number	Pretf Hb done	Median g/dL (range)
Known transfused	66	10	
UTD if transfused	13	0	
Total	79	10 (12.6%)	5.9 (3.4-12.6)

Important difference in Hb testing is the availability of testing in the pediatric lab versus the main hospital lab.

Ensuring ABO compatibility –

also more difficult in Africa….

Determining an unique identity

- Many hospitals do not have patient identification bands
- And if they did, ensuring unique identity is not always straightforward

- Names are not always spelled the same way

NAZZIRWE Hanifah
or
NAZIRWE Khanifah

LWEGELA or MULENGA or WENEGALA ??

- One person may have 2 names

SEB….. Shina
name father calls child

NAN…… Husna
name mother calls child

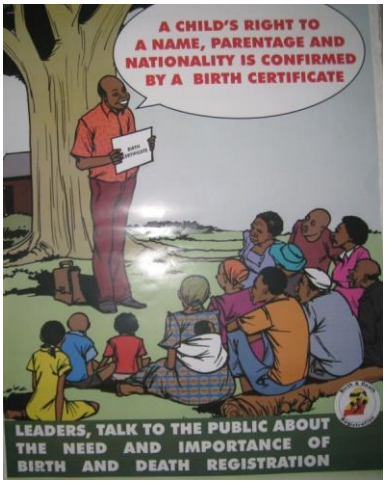
Names are similar....

Nam Wi	NW	F	5	16		16C	hemolytic anemia, possible sepsis	2.9	O
Nam Ma	NM	F	2	10		16A	malaria, splenomegaly	5	A
Nam J	NJ	F	4	10		1C	SCD, fever, pain, pallor, gallop	7	O
Nal An	NA	F	0.83	8		16C	malaria	3.4	O
Nak Pe	NP	F	2	10.5		1C	SCD	4.8	O
Nak Ja	NJ	F	5			16A	malaria, convulsions, BS +++	4.6	B
Nak An	NA	F	1	NI	NI	16C	malaria	4	B
Nab Yu	NY	F	6	19		11	SCD with CVA	9.6	O
Nab Yu	NY	F	6	19		11	SCD, CVA	7	O
Nab Sh	NS	F	1	11		ACU; 16C	malaria	ND	O
Nab Ma	NM	F	1	10		16A	malaria	3	O

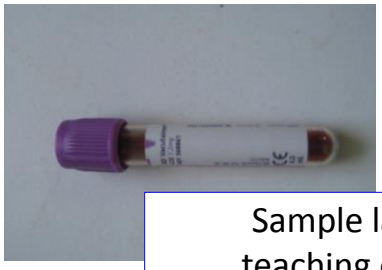
Birth dates are not always known....

All these were told me by my maternal grandfather, Sergeant Otto Bwangomoi, after I had grown up into a little boy. He had come home on a short leave from *Keya*, King's African Rifles, when I was born, and he had written down the name of the day, the moon and the year, and had kept the book in a small wooden box. Unfortunately, when I began to smoke, I used leaves from the book to wrap my *abugwe*, tobacco, and now I cannot tell the exact date on which I was born. But I suppose that it does not really matter, does it?

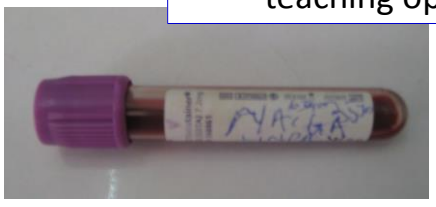
From *White Teeth* by Okot p'Bitek - First published as *Lak Tar* in 1953

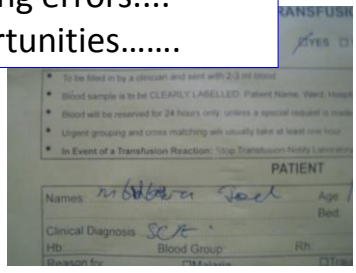


Troubles with the patient sample/request…..



Sample labelling errors....
teaching opportunities…….





Mulago 20 Apr 2015

Pretransfusion testing at Mulago

- Patient (recipient) ABO grouping
  - tile method
  - forward (cell) grouping only
- Patient (recipient) Rh(D) typing
- No screen for irregular RBC antibodies
- Verify ABO group of the unit
- Cross-match
  - room temperature, using tile method
  - no AHG or equivalent testing

Mulago Transfusion Audit March 29-31, 2010
Cross Matches – Done vs Not Done (or not documented?)

	Sx/Ob-gyn/adult medical	Pediatric medical
Cross match done	46 (55%)	34 (87%)
Cross match not done (or done but not documented)	37 (44%)	2 (5%)
Unable to determine	1 (1%)	3 (8%)
Total	84	39

No relation to the urgency of the transfusion
No relation to the time of day
Clinicians were unaware that this was happening

Example of a missing cross-match....

- Event identified as part of a study on acute transfusion reactions at Mulago (Nov 2011)
- 43 yr female receiving whole blood for severe anemia
- Stable before & at 15 min after beginning the transfusion
- At 1 hr observation point
  - chills/rigor
  - vomiting
  - anxiety – “felt like electricity going through my body”
- Transfusion was stopped
- Receiving group AB blood
- Investigation subsequently revealed that she was blood group O

Why are there "missing" cross-matches?

- Not related to the urgency of the transfusion
- Sometimes due to absence of a technologist
  - but then may be done by the intern or resident (though that too is a problem)
- Lack of understanding of the importance of performing a cross-match
- Hospitals are only beginning to understand & implement laboratory quality essentials
- Highlights the need for education
  - transfusion medicine
  - quality systems

RBC Alloimmunization in Transfused Ugandan Patients

	Sickle cell patients[1]	Non-sickle cell patients[2]
Patients	428	214
Age in years*	12 (2-44)	29 (2-80)
Previously pregnant	18	77
Units of blood transfused*	3 (2-10)	5 (2-65)
Patients with alloantibodies	26 (6.1%)	13 (6.1%)
Identified alloantibodies	30	12
Alloantibody specificities	Rh 20; MNS 5	Rh 7; MNS 3

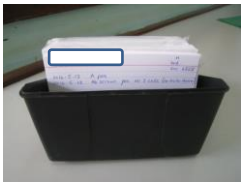
*median (range)

1. Natukunda B et al. Transfusion 2010;50:20-25
2. Natukunda B et al. Vox Sang 2010;98:167-171

What to do about RBC alloimmunization in Uganda?

- Is 6.1% important?
- Lab manuals produced by the Ugandan Ministry of Health indicate that an AHG cross match should be performed
  - but it is not being done in the public hospitals
- UBTS is not currently able to provide phenotyped blood
- But we are starting to do something...
  - necessary equipment has been donated
  - lab management & technical staff in agreement
  - gradual approach beginning with sickle cell anemia patients requiring frequent transfusions
  - have home-made screening RBCs
  - doing some antibody screens (not identifications)
  - AHG cross-match if Ab screen positive

Antibody screening at Mulago Hospital



CBS donation to Mulago

Often cannot use the same solutions as those we are used to in high income countries but that does not necessarily mean that there is not a solution!

Save lives - become a repeat blood donor today!

THANK YOU FOR ATTENDING
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Mia Golder
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Canadian Blood Services
it's in you to give

Centre for Innovation