Workshop on blood transfusion research in sub-Saharan Africa

Farm Inn, Pretoria, South Africa

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[External Report]

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Executive Summary

The goal of this meeting was to contribute to improving the supply of safe blood in sub-Saharan Africa (SSA) by helping to create sustainable capacity to generate and use research evidence to inform blood transfusion policy and practice. The main objective of the workshop was to update the priorities for blood transfusion research in SSA established at the last research priority setting meeting in Mombasa in 2008, taking into account new evidence and emerging challenges. This report is aimed primarily at researchers and blood service policy makers but will also be of interest to users of blood services, funders of African development projects and international blood service organisations.

Provision of adequate supplies of safe blood for transfusion is an essential and complex component of health systems. Chronic shortages of safe blood is a major public health challenge for countries in sub-Saharan Africa (SSA), resulting in substantial death and disability. International policies and guidelines for blood transfusion- including blood donation, screening, clinical practice and service organisation- are based on experience from, and evidence generated in, high-income countries. Consequently, they are not necessarily appropriate for low and middle-income countries in Africa. However, there is also a critical lack of indigenous transfusion research capacity in SSA, which makes it very difficult to address research priorities and generate an evidence base for the Africa region.

An ongoing review of published transfusion research undertaken in SSA from 2008 to 2015 has so far identified only 350 primary research papers. Half of these concern transfusion-transmitted infections; very few studies focused on the more complex research areas of systems, models, costs and sustainability.

The 35 participants at the 2-day workshop included blood service directors, researchers, clinicians, funders, policy makers, commercial organisations and non-governmental organisations (NGOs). Small group discussions were used to review research priorities under the five themes used in the 2008 Mombasa workshop – biological safety, blood donors, hospital use, supply and distribution, and systems and financing. Research topics were proposed for each theme and discussed after which participants prioritized them by allocating up to three votes each to specific research questions.

Key outcomes from the workshop were: the urgent need for investigating pragmatic and culturally-sensitive approaches to blood donor recruitment; the persistent lack of good evidence on the costs and effectiveness of different blood service models; and the critical need for appropriate IT systems to manage and optimise blood stocks and blood donor recruitment and tracking.

A pervasive thread throughout the workshop was the recognition that despite the variety of models in operation, blood providers and users in different countries in SSA face very similar problems. There is therefore much to be gained by sharing information and tools, and by collaborating with each other to avoid duplication of effort. There are currently very few mechanisms for facilitating these collaborations. Organisations such as the African and International Societies for Blood Transfusion, as well as the proposed African Institute for Transfusion Medicine, may be in a position to provide a suitable collaboration, coordination and knowledge exchange role.

Background

In sub-Saharan Africa (SSA), improving the supply of safe blood is critical for reducing mortality and morbidity, especially in young children and women of reproductive age. Inadequate supplies of safe blood result in many preventable deaths. The challenges faced by transfusion services in SSA include: high rates of family-replacement donation; dependence on secondary school donors; low repeat donation rates; temporal variations in supply and demand; high discard rates due to transfusion-transmitted infection; predominantly emergency rather than elective transfusions; resource constraints and unsustainable external funding models. These challenges are similar across countries in SSA and although some blood services conduct small-scale research to improve their internal operations, there are few coordinated programmes of blood transfusion research.

This 2015 Pretoria workshop built on the outcomes of the first priority setting meeting for blood transfusion research in SSA held in Mombasa, Kenya in September 2008 and funded by the Wellcome Trust. The 2008 Mombasa meeting brought together transfusion service providers, users and researchers to define and prioritise research to fill gaps in the evidence to support improvements in the safety, adequacy and equity of the supply of blood for transfusion in SSA. The focus of the research priorities was to improve the quality and breadth of information about existing transfusion practices and their effectiveness, so that interventions could be targeted at areas where they would have maximum impact.

An additional but key realization from the 2008 meeting that there was almost no transfusion research expertise in SSA, either within blood services or in the wider research community. Other barriers to generating and using research in blood transfusion in SSA are a lack of awareness of research priorities among researchers and research funders, and poor links between blood services and research institutions; and within blood transfusion services, a lack of organisational research culture and leadership, and limited understanding about the research process and the potential benefits of collaborations with research institutions. Until these barriers are overcome it will be very difficult to address the research priorities and produce the evidence needed to improve the supply of safe blood in SSA. In collaboration with the African Society for Blood Transfusion we have therefore organized workshops and projects over the last seven years to raise awareness about the importance of blood transfusion research, and to implement actions to improve the research capacity of blood services in SSA.

This 2015 Pretoria workshop was funded by the European Union through the T-REC project[1] and was coordinated by the Liverpool School of Tropical Medicine. The aim of the workshop was to review progress in addressing the 2008 blood transfusion research priorities, and to revise and update them; and to broadly assess any changes in blood transfusion capacity in SSA.

The objectives of the workshop were:

1. To present a review of the current situation regarding blood transfusion research activity and capacity in SSA

[1] http://www.t-rec.eu/

2. To update the 2008 research priorities for blood transfusion in SSA to take account of new evidence
3. To work out the next steps for promoting research uptake and for developing research expertise and research-friendly environments within the blood services in SSA

Workshop outline

The workshop was attended by a diverse group of 35 participants including blood service directors, researchers, clinicians, funders, policy makers, commercial organisations and NGOs who were invited on the basis that they would actively contribute to the proceedings, had a track record of conducting research or using research for policy-making, and provided a diversity of geographic and specialty perspectives (Appendix 1).

The two day workshop began with the presentation of a review of primary blood transfusion research publications from SSA (Section A). Subsequent sessions were run as small group discussions (6-8 people) on the same five themes as the Mombasa workshop: biological safety; blood donors; hospital use of blood; supply and distribution; and systems and financing (Section B). Participants were provided with the detailed list of research priorities from 2008 (Appendix 2) and asked to decide if these topics were still relevant, whether there were any new priorities and, if so, to frame specific research questions. Participants were also asked to consider research topics that may not fall within one of the five themes.

On the second day, there were further discussions on disseminating the research agenda (Section C), in particular identifying the audience for information and the best ways of reaching them, and on potential sources of funds for blood services research (Section D). The final sessions explored how to further strengthen research capacity in blood transfusion research in SSA at both the individual and organisational levels (Section E), and how to promote better uptake of research by decision-makers to impact on increasing the availability of safe blood for patients (Section F).

Acknowledgement

We are grateful to Susan Jones, Tony Cegielka and Selina Wallis for their contributions to the report, and to Denise Wellings, Radhi Chikwereti (African Society for Blood Transfusion) and Ingrid Corbett (Safe Blood for Africa) for logistical support for the meeting.

Outcomes of the workshop

Section A

Review of published blood transfusion research in SSA since 2008

Selina Wallis of LSTM presented a summary of an ongoing study to identify all publications relating to blood transfusion and blood services in SSA since January 2008. The purpose of the review is to map research activity since the 2008 research agenda and to explore co-authorship relationships, North-South partnerships and funders. So far, 350 primary research papers have been identified, half of which concern transfusion-transmitted infections. Very few studies are focused on blood service models, costs and cost-effectiveness, and sustainability. Approximately one third of studies were conducted in Nigeria and one third of all studies were published in journals without an impact factor. All except one of the first authors who had published four or more papers between 2008 and 2015 were based in Africa.

Section B

Research priorities for blood services in SSA

The sections below summarise the discussions at the 2015 Pretoria workshop on the five themes used during the Mombasa 2008 meeting. Each theme was allocated a dedicated session lasting 90-120 minutes. During each session participants in their small groups were asked to decide whether the previous research priorities in each theme were still pertinent, if they should be adapted and, if so, how. They were also asked to identify any new research topics. Almost all the topics identified in 2008 were considered still relevant in 2015. Participants also reconsidered each one in detail to try and define more specific research questions and to expand on the rationale, the context and the aim of the research. At the end of each session each group fed back their results and these were discussed and collated.

Since many knowledge gaps and potential research topics were identified, it was important to gain a better insight into the key priorities for each research theme. This was achieved by making a list of the research questions as they were presented during feedback from each group. Every participant was given three post-it notes and asked to ‘vote’ for the research question(s) they considered to be a priority. Participants could allocate 1, 2 or 3 votes per research question. The research questions were then re-ordered according to the number of votes they received. These are therefore the priority blood transfusion research questions as perceived by the diversity of participants at the workshop (Appendix 3). Key points discussed under each theme are highlighted below and the top five research questions for each theme are presented in tables.

B1 Biological safety

Revisions the current research agenda

- Although transfusion-transmitted infections were still considered to be important research topics, compared to 2008 the emphasis was more on the need to improve systems to support better testing rather than the screening tests themselves. Research topics therefore included evaluations of the pros and cons of combined testing kits and of pre- versus post-donation testing strategies, and mechanisms for establishing quality assurance systems across the different health service tiers
- Malaria in the blood supply remains an important topic with more evidence needed about the infection risk to recipients, a 'gold standard' test for screening donor blood, the impact on the blood supply of testing and rejecting malaria positive donors, and the need for policies adapted to account for differing malaria endemicities.
- Bacterial contamination was considered to be under-reported and/or under-recognised. More data are needed to establish the prevalence and clinical significance of bacterial contamination, along with evaluations of interventions to minimise risks to recipients.

New research areas

- Investigations into the impact of HBV vaccination on HBV prevalence in younger blood donors and the potential impact on blood screening strategies are needed.

Biological safety – Top research questions	**Total votes cast for this theme = 58**
What challenges do new/emerging/epidemic infections (e.g. Ebola) present for blood supply/safety?	10
What is the value/relevance of existing TTI screening in SSA (e.g. HCV, syphilis)?	9
What is the significance of bacterial contamination for blood safety?	9
What is the role of pathogen inactivation for blood safety in SSA?	9
How can the donor pool/donor recruitment be used as a strategy to increase blood safety?	9

B2 Blood donors and blood donation

Revisions to the current research agenda

- Since the 2008 meeting it clear that there has been increasing recognition of the need to better understand and define different types of blood donor beyond the traditional categories (i.e. family, replacement, voluntary, repeat, professional) since, for example, donors may belong to more than one of the traditional categories (e.g. family donors may also be voluntary). Furthermore, rigorous screening processes have improved the safety of blood across all donor types. It is important to gain a better understanding of what motivates different types of blood donor as each (e.g. school children versus adults; first-time versus repeat donors) may need different motivational messages and

recall mechanisms (e.g. SMS, social media, phone calls), and these may vary by country. This type of research may be addressed by comparative trials.

- Research into donor care issues, particularly around creating a conducive donation environment, evidence on the maximum frequency of blood donations (potentially limited by haemoglobin and iron depletion) and optimising the care package and follow up for donors, remains important.

New research areas

- New research areas regarding blood donors focused on better knowledge about deterrents to becoming a first time donor and also factors which contribute to donor attrition, including during the transition period after leaving school, and the role of parental consent.
- The benefit of using innovative mechanisms to promote blood donation, such as traditional media, new social media, peer-motivators and incorporating blood transfusion information in school curricula need evaluating.
- Donor criteria (e.g. age, haemoglobin), health screening questionnaires and algorithms for screening for transfusion-transmitted infections are predominantly based on those used in high-income countries. However, the high background prevalence of transfusion-transmitted infections in SSA compared to high-income countries and differences in donor profiles means that research is needed to evaluate the usefulness of these in the SSA context and to revise them to improve their effectiveness.
- Donor databases were recognised as a potentially valuable resource held by blood services. In addition to providing information about the donor community they could also provide information about the health of the general population. Currently much of the information on blood donors is recorded manually but to exploit potential opportunities electronic donor records and tracking systems appropriate for SSA need to be developed and implemented. Since similar systems would be needed by all blood services there are significant opportunities for sharing a common system which could be adapted to meet local requirements. Such systems need to be piloted and evaluated.

Blood donors – Top research questions	**Total votes cast for this theme = 80**
How can the new social media be utilised to recruit/retain blood donors?	12
Are African and Western ideas of altruistic blood donation in conflict?	9
How can improved donor (health) care improve blood donation?	6
What strategies are effective in retaining secondary school donors?	5
What incentives are appropriate/effective in recruiting/retaining blood donors?	5
Can successful youth donor recruitment strategies (e.g. Pledge 25) be adopted/adapted for other donor groups?	5

B3 Hospital management of blood and blood transfusions

Revisions to the current research agenda

- Haemovigilance systems are almost non-existent in SSA but are an important mechanism for improving blood safety and for making more effective use of blood. There is almost no evidence to guide the setting up and management of haemovigilance systems in regions such as SSA where resources are very limited and reporting systems are weak.
- Alloimmunisation, iron overload and post-transfusion follow up for transfusion-transmitted infection, particularly in patients receiving multiple transfusions, are all components of haemovigilance systems that are particularly under-researched in the context of SSA.

New research areas

- Hospital transfusion committees (HTC) are a critical, but under-utilised, interface between the blood services and the clinical users. Bridging the producer-user gap is important because, even if blood services make significant improvements to their efficiency, much blood wastage can still occur within hospitals. HTC are generally weak or non-existent in SSA yet they have a crucial role to play in improving the effectiveness of blood services. Priority areas for operational research which may be incorporated into the HTC component of health systems include:
    - developing and implementing guidelines to ensure blood is prescribed and used appropriately
    - knowledge about how to implement guidelines on the clinical use of blood including the appropriate educational approaches for prescribers and clinical staff responsible for monitoring transfusions.
    - evidence about the use of alternatives to blood and ancillary treatments to reduce blood use in the SSA setting
    - evidence around the usefulness of haemoglobin 'triggers'
    - evaluating the role of bedside haemoglobin measurements.
- Research on such topics could focus initially on the groups who are the biggest users of blood such as maternal and paediatric units. Auditing of adherence to guidelines and mechanisms for sharing experiences among different HTCs need to be incorporated into the implementation package along with formative (not punitive) support to improve adherence.
- Leucoreduction is widely implemented in high-income countries but its role, benefits and risks, and cost-effectiveness need to be explored in SSA.

Hospital management of blood and blood transfusions – Top research questions	**Total votes cast for this theme = 51**
How can the role of hospital transfusion committees be strengthened?	14
How can haemovigilance systems be implemented/strengthened in SSA?	13

How does affordability and patient need influence access to blood transfusion?	11
How can countries in SSA best capture, analyse and disseminate/share clinical guidelines, audits and protocols?	11
How can adherence to clinical transfusion guidelines be monitored/improved?	9

B4 Adequate supplies and equitable distribution

Revisions to the current research agenda

- The topics identified in 2008 were all still considered to be relevant but there is little understanding about the mechanisms for collecting high quality data which is essential for decision-making. For example there is no, or very limited, information on the amount of blood needed nationally and how this varies among countries (e.g. according to disease burden). The relationship between the actual need for blood (including for individuals and communities that do not access health services) compared to requests for blood is unknown.
- The lack of IT systems needed for tracking trends in requests, use and discards for blood and components means that it is not currently possible to produce data-driven models and tools which are essential before instigating a system of blood ordering schedules .
- Financial data also need to feed into these models but a lack of individuals with financial skills and a good understanding of blood service systems is holding back progress on improving the cost-effectiveness of blood services.

New research areas

- The costs of the individual components of the vein-to-vein process need to be measured, used and standardised in order to minimise the cost per unit of blood while ensuring that the services are sustainable. This will be highly variable between centralised and hospital-based systems so the context will need to be taken into account.
- Systems for tracking blood use, and for stock ordering, management and distribution need developing and piloting. There may be opportunities to build on existing IT systems such as those operated by Safe Blood for Africa and commercial companies. The ISBT Blood Management Working Party is also beginning to tackle some of these issues.
- Mechanisms are needed to make the procurement systems more effective, possibly by negotiating bulk contracts across several blood services. This will require good international coordination and communication.
- Although the use of blood components is being strongly promoted in SSA there is very little understanding of the need for various components in SSA, the situations when they may be of benefit and clinicians' knowledge about prescribing components. The lack of fractionation facilities is also an important factor to be considered in research on blood components in SSA since without such facilities, plasma, which is a by-product of producing packed red cells, may be wasted.

Adequate supplies and equitable distribution – Top research questions	Total votes cast for this theme = 83
Can partnership with a commercial partner help develop an effective stock management model for blood services in SSA?	17
What tools/data-driven models can be used to estimate blood and component requirements?	16
How much blood do countries in SSA need (estimation of blood and component requirements)?	14
What structural gaps exist between blood banks and hospital systems that lead to mismanagement of blood stocks?	14
Can maximum blood order schedules impact on blood stock management in SSA?	5

B5 Transfusion systems and sustainable financing

Revisions to the current research agenda

- Blood services played an important role in the recent Ebola outbreak in West Africa. The outbreak highlighted the fragility of blood service systems and the need for blood services to be able to respond more rapidly to demands for blood and also possibly for plasma from well-documented donors and convalescent patients.
- There was general agreement that blood service systems needs strengthening but that more evidence is needed about how to do this effectively in different contexts. Better definitions and descriptions of blood service systems, models and structures will facilitate standard-setting, and comparison and sharing of best practice among blood services. If such definitions can be agreed, it will open up the possibility of achieving consensus on common 'leading' indicators which in turn will enable within and between country comparisons.

New research areas

- Benchmarks need to be developed for the various blood service models and more information generated about the risks and benefits of various models.
- As blood is now being categorised as an 'essential medicine', blood services in SSA are becoming subject to new and different regulation. This is a new role for the regulators so research is needed about the skills the regulators will need and how their role can be used to improve, and not overburden, the blood services.
- The applicability and replicability of various costing models needs to be assessed both from the perspective of the national/system level and from the individual donor/recipient perspective.
- The risks of blood services' dependence on donor funds needs to be documented and ways of mitigating the risks explored. Innovative sustainable financing mechanisms need to be implemented and evaluated such as the acceptability and feasibility of tax levies and the role of the commercial sector.
- Factors affecting motivation and retention of blood services staff are poorly understood and more evidence is needed about how to promote blood services as a desirable career

and how to systematically integrate continuing professional development, particularly to promote team working.

Transfusion systems and sustainable financing – Top research questions	**Total votes cast for this theme = 86**
What sustainable cost-recovery models already exist in SSA and how can they be adopted in other countries?	22
What has been the impact on, and sustainability of, blood safety programmes of external financial donor input (and withdrawal)?	17
How can blood services transition from external donor funding (e.g. PEPFAR) to 'internal' (local) funding?	12
How can the cost of production of blood units be minimised to ensure sustainability?	8
Can a dynamic model be developed to determine a vein-to-vein cost (using established models for HIV/maternal health) of a blood transfusion?	6

Section C

Dissemination of the revised research priorities

The most important topics to disseminate were identified as the key research achievements and changes to the research priorities since 2008, and any impacts that the research had on changing blood service policies or practices. Individuals and organisations that would be interested in hearing about the revised research agenda were identified as: Ministries of Health, universities and research institutes, WHO, research funders, international societies and networks including AfSBT, ISBT and professional associations, regulators, media, transfusion researchers and blood services staff and managers.

Mechanisms for disseminating this information included reports and websites of national blood services, AfSBT, ISBT and T-REC. All participants have a responsibility for sharing the workshop outputs and there was agreement that a standard presentation about the research agenda (*action T-REC secretariat*) would aid dissemination as well as using opportunities for face-to-face discussions at conferences and seminars. It was also agreed that a brief summary would be prepared for Transfusion Today (*action LM*) and a more detailed, academic publication could be produced possibly by the T-REC PhD students (*action T-REC supervisors*)

Section D

Sourcing funds for research priorities

Potential funders of the revised priority research topics included: Wellcome Trust, national research bodies (e.g. Medical Research Councils), EU (Horizon 2020), NIH, Fogarty, JICA, Medical Education Partnership Initiative (Duke University, USA), Global Fund, Foundations (e.g. Rockefeller, BMGF), commercial companies, Universities (African and non-African), Red Cross/Crescent, EFSO + Sanguine, INTS (Francophone), societies such as ISBT and AfSBT, World Bank, national insurance companies, international charities such as Lions, Rotary etc, and programmes involved in HIV, maternal and neonatal health, and malaria.

Section E

Strengthening research skills and communities

Ways of increasing the number of individuals generating research for blood services in SSA included for the services to host PhD students, promoting more in-service research by blood service staff, advertising blood service projects for MSc and BSc students, and ensuring that blood service issues were covered in the curricula of schools and universities. Blood services could offer incentives for their staff to undertake research such as: education grants for research skills courses; funding attendance at meetings and workshops; recognising research activities for promotion or as recruitment criteria; public recognition of individuals' research contributions through ceremonies and newsletters; encouraging non-researchers to submit concept notes and helping them to work these up into formal proposals; and creating a research-conducive environment within the services.

The creation of formal links with academic institutions was also recognised as important for blood services to promote and produce research. Potential mechanisms to achieve this included using blood service resources (e.g. samples, donor data, quality test results) to attract university researchers to work with the blood service and for blood service staff to teach in universities. Some blood services may also be able to host a research office and act as a resource for research information. There are a small number of blood transfusion research networks in SSA, such as the Francophone/REDS3 and T-REC networks, which can act as dissemination channels and foci for research activities. There was strong support for reactivating the African Institute for Transfusion Medicine as a mechanism for bringing all the research SSA activities together under one organisation.

Section F

Research Uptake

Uptake of research evidence to improve services is notoriously difficult so participants made practical suggestions about how this might be achieved in the context of blood services in SSA. Mechanisms by which decision-makers at national and international level could access research evidence relevant for SSA included: through publication in scientific journals (by

subscribing to journals or through staff linked to universities), from websites such as NEQAS, from proceedings of meetings (e.g. AfSBT, ISBT), and through presentations at, for example, grand rounds, journal clubs and scientific research meetings. To promote research uptake at national and international level and influence change in guidelines it was important to understand the needs of the policy makers and regulators and to involve them at all stages of the research process. It was recognised that WHO now has very little capacity to lead evidence reviews and policy changes in blood transfusion and that the role of AfSBT and ISBT in driving this may need to be significantly enhanced in the future. Opportunities for promoting more use of evidence within individual blood services included sharing research results with clinical collaborators, providing training for blood service decision makers in how to critically review evidence, establish internal mechanisms for commissioning research, reviewing results and instigating evidence-based change.

Section G

Short-term actions from the Pretoria 2015 workshop

The following short-term (3-6months) actions were agreed:

Action
Produce a standard presentation about the research agenda
Prepare a brief summary of the workshop for Transfusion Today
Produce a detailed, academic publication about the workshop
Reactivate the African Institute for Transfusion Medicine

Next steps

To capitalise on the excellent progress, goodwill and collaboration generated at the Pretoria 2015 workshop, the following next steps were identified.

1. Dissemination of the research priorities identified as described in Section C.
2. Completion and dissemination of the situation analysis described in Section A, including using bibliographic and network analysis to identify and illustrate: geographical distribution of transfusion research and researchers in SSA; subject areas and impact of research activity; and research networks and collaborations.
3. Encourage the maintenance of a database of individuals interested in transfusion research in SSA by one of the international organisations (ISBT, AfSBT) with a view to its use as a platform to enhance collaboration and networking.
4. Individuals, blood services and research institutions to use the research priorities identified to lever funds for transfusion research and/or research collaborations (see Section D for potential funders).
5. Blood services to promote a research culture and encourage collaborations with other blood services and academic institutions (see Section E)
6. Transfusion researchers, blood services and international organisations to establish effective mechanisms for research evidence to guide policy and practice (see Section F).

Appendix 1

Workshop participants

Name	Organisation
Mary Wanjiku Kariithi	Africa Society for Blood Transfusion, Kenya
Claude Tayou Tagny	French Network
Daniel Ansong	GBTS
Francis Sarkodie	GBTS
Lucy Asamoah Akuoko	GBTS
Shirley Owusu-Ofori	GBTS
Judith Chapman	ISBT
Josephat Gathitu Muhia	Kenya Red Cross
Charles Ameh	LSTM
Denise Wellings	LSTM
Imelda Bates	LSTM
Oliver Hassall	LSTM
Selina Wallis	LSTM
Susan jones	LSTM
Tony Cegielka	LSTM
Bridon M'baya	Malawi Blood Transfusion Service
Faustine Ndugulile	Member of Parliament - Tanzania
Magdalena Lyimo	Muhumbili University of Health & Allied Sciences
David Mvere	NBSZ
Jean Emmanuel	NBSZ
Esther Massundah	NBSZ
Lucy Marowa	NBSZ
Nyashadzaishe Mafirakureva	NBSZ
Radhi Chikwereti	NBSZ
Tonderai Mapako	NBSZ
Pete Zacharias	Safe Blood for Africa Foundation
Nolwazi Putuka	SANBS
Nigel Talboys	Terumo
Bernard Appiah	Texas A & M University, USA
Ed Murphy	UCSF
Rene van Hulst	University of Groningen, Netherlands
Henrik Ullum	University of Copenhagen, Denmark
Grace W. Kitonyi	University of Nairobi
Jessie Githanga	University of Nairobi
Dora Mbanya	University of Yaounde, Cameroon

Appendix 2

Mombasa 2008 Research Priorities

Increasing recruitment and retention of safe donors

Problem statement

About 80% of the blood in SSA comes from replacement donors. A large proportion of voluntary donors are secondary schoolchildren. There is very little published information about what motivates and deters blood donors/non-donors in SSA. Without this information, meaningful recruitment and retention strategies cannot be implemented and tested. There are no mechanisms to measure the impact and cost-effectiveness of locally appropriate donor strategies. Donor care (post-test counselling, referral and treatment) is an important transfusion service responsibility with implications for donor recruitment and retention and wider public health, but practice is not standardised or evidence-based.

Research questions/topics

1. What evidence exists about donor motivation and retention in SSA? How can this be disseminated and used to develop appropriate and cost-effective education and marketing strategies? Does the private sector have a role in donor recruitment and/or screening? What incentives are acceptable? How can the safety and supply of replacement donations be improved? Are SMS and other technologies useful?
2. What are existing practices for referring donors for management of TTIs and anaemia? Evidence is needed to inform an effective but practical donor care strategy. What is the impact of regular donation on haematinic balance in donors in SSA? Should donors be offered HBV vaccination and could donors who clear HBV and syphilis infections be re-recruited instead of deferred for life?
3. What are the lessons and costs of different donor recruitment models, including databases, lookback systems, testing algorithms and donor counselling? Could donor screening be integrated with VCT/HIV services?

Promoting appropriate use of blood transfusion

Problem statement

There is significant inappropriate use of blood and blood products in SSA coexisting with lack of supply. The problem is compounded by lack of knowledge about use of blood/component transfusions and poor/unknown quality of haemoglobin measurements which are critical to guide decisions to transfuse and for monitoring transfusion effectiveness. There is little evidence available to guide hospital management of children with uncomplicated severe anaemia (Hb 4-6g/dl) and the evidence underpinning transfusion guidelines for adults and children is weak. There is almost no information about the prevalence and patterns of transfusion reactions in SSA and no system for detecting and reporting these reactions; patterns are likely to be different from those in other regions.

There is mistrust between hospital staff and transfusion services which hampers effective use of blood. Blood transfusion committees may be one mechanism to bridge this gap in larger hospitals but they are difficult to establish and maintain.

Research questions/topics

1. What is the evidence to guide emergency pre-transfusion management of adults and children with severe anaemia and for prescribing transfusions including those to stable children with Hb 4-6 g/dl. How can accurate, rapid haemoglobin measurements always be available to inform transfusion practice?
2. How can clinicians ensure that guidelines for appropriate use of blood/products are adhered to at all health service tiers in SSA, and how can the impact of adherence by evaluated? What are the alternatives to transfusion in SSA (e.g. iron, autologous transfusion, anti-fibrinolytics) and how should they be used? In what circumstances would outpatient rather than inpatient transfusions be cost-effective?
3. What are the patterns and prevalence of transfusion reactions in different settings in SSA including alloimmunisation in multiply-transfused patients, and incidence of detect delayed reactions and infections. How can severe reactions be effectively confirmed, communicated and lessons learnt and disseminated?
4. What factors hinder good collaborations between hospital and transfusion service staff? Would a haemovigilance officer and/or blood transfusion committee peer review of blood utilisation practices facilitate better blood use?

Managing supply, stocks and equitable distribution

Problems statement

In contrast to wealthy countries, the majority of transfusions in SSA are emergencies. Most deaths from lack of blood occur in the community and/or primary health facilities so efforts should focus on improving blood supply in the periphery. The need for blood in SSA is unknown. Tools are needed to provide reliable estimates of units needed/capita so that adequacy of supply at all health services tiers can be assessed. Transfusion services have no mechanisms for predicting changes in trends in blood/component usage (e.g. due to impact of ACTs, ITNs and ARVs). There is inequitable distribution with those living close to a central BTS having better access but the degree of inequity needs to be quantified and mapped. Inequity is exacerbated by poor distribution and management of existing blood stocks and lack of evidence to guide discard policies (e.g. 30 minute 'out of fridge' rule). There is no system in the region for utilising excess plasma produced by centres which prepare blood components.

Research questions/topics

1. How much blood do the countries of SSA need? What tools and what models can be developed to estimate this need, to document unmet need and to prioritise facilities with the greatest gap in supply? What factors contribute to unmet need, what is the

impact of unmet need on morbidity and mortality and how can this be measured, addressed and monitored?

2. How much does mismanagement of stocks within facilities contribute to inadequate supply (e.g. ordering, stock management, inappropriate transfusions)? What is the evidence to guide discard policies in SSA including the effect of using domestic refrigerators for storage and the '30 minute rule'? Could Maximum Blood Ordering Schedules work in SSA? How can changing trends in transfusion needs for HIV and malaria patients be predicted and catered for in different transfusion systems?

3. What is the distribution policy in centralised systems? What is the degree of inequity in access to blood supply in all systems? What factors contribute to this inequity and what mechanisms can be used to improve existing hospital-based systems? What is the true cost of blood to families in different countries/systems (including hidden costs such as donor recruitment)? How do hospitals make rational choices about transfusion recipients when supplies are inadequate? What interventions can improve equitable access to blood?

4. What are the options in SSA for contract fractionation that would be ethical and acceptable to donors and what evidence-based recommendations can be made?

Transfusion service models – cost, effectiveness and sustainability

Problems

The hospital-based system provides 80% of blood in SSA. It is sustainable and based predominantly on replacement donors but it cannot meet all demand and it is difficult to ensure quality. Centralised systems are more controllable, predictable and produce safer blood from voluntary donors but there is no evidence that they reliably reach the most peripheral communities. Hybrids of these two models exist in several countries. Rigorous evidence is lacking regarding the effectiveness and sustainability of different transfusion systems in SSA (ie. centralised/zonal, hospital-based, hybrids) and there is virtually no public information about the economics of these systems including the proportion spent on donor recruitment and care. There is a lack of skilled and knowledgeable staff in all disciplines within the transfusion service and difficulty in attracting and retaining high calibre staff.

Research questions/topics

1. What structures within each type of system are effective/ineffective in meeting supply and safety needs, and impacting on clinical outcomes in SSA, and what are the reasons for success/failure? What indicators can be used to compare equitability, effectiveness and sustainability of different systems?

2. What is the full economic cost of 'donor vein' to 'recipient vein' blood, and associated pre-and post-vein activities, from different perspectives (e.g. health provider, recipients) in different systems? What is the cost-effectiveness of different models of transfusion services taking account of societal costs, willingness to pay, level of automation, morbidity and mortality (e.g. at 2 years). What are the DALYS for various conditions (especially those relating to maternal and child health), and how do they vary with

context in SSA? Can this information be used to derive societal costs of the lack of blood?

3. How will cost-effectiveness of each type of system change if, for example, the appropriateness of blood usage improves, workload increases or local quality reagents are available? What is the gap between government funding and the full cost of producing a safe unit of blood in different systems and are there models for how this gap can be filled (e.g. cost-recovery)? Can comparative inter-country case studies of models that are successful/unsuccessful be synthesized, particularly from countries that no longer have donor funding?
4. What attracts, motivates and retains professional transfusion staff? What career development structures are needed? What human resource skills are needed in the different systems? What educational methods should be used and how can they be evaluated?

Appendix 3

Pretoria 2015 Research priorities by research theme
(Numbers are the number of votes allocated)

1. Biological safety

Testing strategies (20)
Can POCT in some settings be superior to centralised testing? 7
What infrastructure is needed to support centralised testing? 2
Is national regulation of decentralised testing a way of improving TTI safety? 0
What is the value/relevance of existing TTI screening in SSA (e.g. HCV, syphilis)? 9
Can a centralised/co-ordinated national blood service provide advice/guidance on validated test kits for TTI? 2

Bacterial contamination (10)
What is the significance of bacterial contamination for blood safety? 9
What operational search is required to monitor bacterial contamination and other adverse reactions? 1

New/emerging infections (10)
What challenges do new/emerging/epidemic infections (e.g. Ebola) present for blood supply/safety? 10
What is the significance of the use of convalescent serum (e.g. Ebola) for transfusion services in SSA? 0

Pathogen inactivation (9)
What is the role of pathogen inactivation for blood safety in SSA? 9

Malaria (7)
How big a problem is transfusion-transmitted malaria? 6
Should at risk donors be screened for malaria? 1
Screening for malaria or treatment post-transfusion- which is more cost-effective? 0

Iron overload (2)
Which blood recipients are at risk of iron overload? 1
What interventions can reduce the burden of iron overload in multiply transfused patients? 1

Others (20)
What impact does poor blood supply have on blood safety? 8
How can the donor pool/donor recruitment be used as a strategy to increase blood safety? 9

2. Blood donors

How can the new social media be utilised to recruit/retain blood donors? 12

Are African and Western ideas of altruistic blood donation in conflict? 9

How can improved donor (health) care motivate blood donation? 6

What strategies are effective in retaining secondary school donors? 5

What incentives are appropriate/effective in recruiting/retaining blood donors? 5

Can successful youth donor recruitment strategies (e.g. Pledge 25) be adopted/adapted for other donor groups? 5

How can education on blood donation/transfusion be incorporated into school curricula? 5

How can the profile (Quality? Impact?) of blood donor recruitment research in SSA be improved? 5

What strategies are effective in encouraging FRD to become repeat donors? 4

What elements of successful 'youth' blood donation programmes (e.g. Pledge 25) can be adopted by other countries? 4

What are the most effective strategies for recalling repeat blood donors? 3

What is the role of public/private partnerships in recruiting/retaining blood donors? 3

What is an appropriate blood donation interval for repeat blood donation in SSA? 3

How does a service estimate its blood needs? 3

How can blood donors be recruited from previously 'neglected' populations (e.g. religious groups/certain cultures)? 2

What are the health effects of repeated blood donation in SSA? 2

What is the impact of conventional media (e.g. print, broadcast) on blood donor motivation/recruitment/retention? 2

What is a safe/ethical minimum (maximum?) age of blood donation in SSA? 2

What is the potential for blood donor recruiters/champions to increase donor recruitment/retention? 0

3. Hospital management of blood and blood transfusions

Transfusion Committees (20)
How can the role of hospital transfusion committees be strengthened? 14
Are hospital transfusion committees effective? 6

Clinical management and guidelines (18)
How can adherence to clinical transfusion guidelines be monitored/improved? 9
To what extent are blood transfusion clinical guidelines in SSA evidence-based? 2
What are the appropriate Hb triggers for transfusion in SSA? 5
What evidence is there to guide pre-transfusion management in SSA context? 2

Haemovigilance (13)
How can haemovigilance systems be implemented/strengthened in SSA? 13

Others
How does affordability and patient need influence access to blood transfusion? 11

How can countries in SSA best capture, analyse and disseminate/share clinical guidelines, audits and protocols? 11

What factors hinder/enhance collaboration/communication between blood providers and blood users? 4

Does outpatient transfusion in the management of patients with sickle cell disease and haematological malignancy improve clinical outcomes? 4

What is the significance/impact of alloimmunisation in transfused patients in SSA? 3

What impact would leucoreduction have on alloimmunisation/transfusion reactions? 2

What is the role/need for near-patient testing of patient Hb? 2

What is the role of new/ancillary techniques for blood saving/salvage and/or alternatives to conventional transfusion? 2

Will the adoption of blood as an 'essential medicine' impact on the appropriate use of blood? 2

4. Adequate supplies and equitable distribution

Estimation of blood requirements
How much blood do countries in SSA need (estimation of blood requirements)? 14
What tools/data-driven models can be used to estimate blood requirements? 16

Can partnership with a commercial partner help develop an effective stock management model for blood services in SSA? 17

What structural gaps exist between blood banks and hospital systems that lead to mismanagement of blood stocks? 14

Can MSBOS impact on blood stock management in SSA? 5

How can appropriate IT systems minimise discard rates? 4

What metrics can be developed to compare blood supply systems? 4

What is the impact of centralised systems on the distribution of/access to blood? 3

Can inter- and intra-country comparisons of blood supply management influence policy? 3

What IT systems are appropriate for SSA to improve blood supply management? 3

Can an existing, validated stock management model used in high-income setting be adopted/adapted for SSA? 0

5. Transfusion systems and sustainable financing

What sustainable cost-recovery models already exist in SSA- and how can they be adopted in other countries? 22

What has been the impact on, and sustainability of, blood safety programmes of external financial donor input (and withdrawal)? 17

How can blood services transition from external donor funding (e.g. PEPFAR) to 'internal' (local) funding? 12

How can we minimise the cost of production of blood units to ensure sustainability? 8

Can a dynamic model be developed to determine a V2V cost (using established models for HIV/maternal health) of a blood transfusion? 6

What corporate social responsibility investment is available to support transfusion services in SSA? 5

What is the socioeconomic impact of an ineffective blood transfusion system to an individual/family/community? 5

How would the public perceive a tax/charge to support blood safety? 4

Does a model of 'whole staff team training' improve staff retention and motivation? 3

What 'procurement' systems support best quality and lowest prices? 3

How can blood services rebrand blood safety as a desirable career option? 1