Executive Summary

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Blood transfusion services and systems in developing countries are faced with several challenges that threaten the availability, affordability, accessibility and safety of blood and blood components. Some of these challenges include inefficient blood supply structures; blood shortages, inequitable access and increasing needs; weak quality systems, high risk of transfusion transmissible infections and inappropriate or unnecessary use of blood and blood components. These challenges threaten the goal of ensuring universal access to safe blood and blood products. Efforts to alleviate these challenges are often hampered by unstable economies, lack of suitable infrastructure, inadequate human resources and expertise; inadequate institutional frameworks; managerial and technological capacities.

Countries in SSA have been placed under increasing global market and internal pressures to import modern health technology due to the high burden of TTIs and the rapid advances in technology experienced over the past few decades. However, attempts to introduce advanced technologies to ensure safety from new and emerging infectious agents, meet stringent regulatory demands, implement quality management systems, and comply with internationally recognized standards of ethics and practice often lead to increases in the production costs of blood and blood components. The resulting cost increases are coming at a time when the gap between needs and available resources is widening at an alarming rate, hence the need for applying health economic analyses as one of the tools to inform decision makers on how and where to allocate the limited health care resources. Health economic analyses involve careful assessment of the costs and benefits of adopting such standards and interventions. Whilst the use of health economic analyses in blood safety decision-making is evident in developed countries, its application in SSA remains limited. The unavailability of appropriate setting or country specific data, a major problem in SSA, may have been the limiting factor since health economic analyses are generally data intensive exercises.

This thesis presents the health economics of blood transfusion in a resource-limited setting, with the aim of helping decision-makers understand the cost-effectiveness of introducing a blood safety measure, nucleic acid testing (NAT), using decision-tree analysis. In particular, it discusses the chronic challenges in the collection, availability, accessibility and quality of empirical data; and their impact in informing health economic models and subsequently decision making relating to blood safety. The chapters in this thesis describe the various approaches undertaken and challenges met in collecting data required to populate a health economic model that can be applied to inform blood safety decision-making. It also includes a set of recommendations for enhancing data collection, completeness and quality in SSA. The data elements collected were applied in a health economic model assessing the CEA of introducing NAT in addition to current serological screening of blood donations in Zimbabwe.
The blood-screening decision-tree model used in this thesis (Chapter 7) is considered conceptually in three parts. In the first part of the conceptual model, whole blood donations are screened for TTIs and processed into components/units suitable for transfusion and subsequently transfused into patients. The screening costs for the serology tests currently implemented in Zimbabwe are presented in Chapter 6. The costs for NAT screening were estimated based on supplier quotations and information obtained from the blood service. The second part of the model comprises of the total numbers of transfusion recipients, who potentially acquire HBV, HCV or HIV infections, estimated for each screening strategy. The risk of receiving an infected unit of blood was calculated from blood transfusion utilization data (Chapter 2) and the number of blood components processed from one 450 ml unit of whole blood. The third part of the conceptual model utilizes disease specific Markov models to estimate the outcomes using life expectancy, quality of life and healthcare costs, for a cohort of transfusion recipients, by incorporating disease-specific estimates of lifetime cost and quality-adjusted life expectancy based on patient studies (Chapters 2, 4 & 5) or published data. The mean age of transfusion recipients (35 years) and the in-hospital mortality used to adjust for life expectancy were derived from Chapter 2. The adverse events following a blood transfusion (Chapter 3) were not incorporated into the model because their economic burden could not be evaluated due to lack of information on their management. The utility weights used to adjust for quality of life for patients infected with HIV were derived in Chapter 4, whilst the healthcare costs for HIV were obtained from Chapter 5. Other parameters were derived from literature. The incremental cost-effectiveness ratio was US$17,780 (more than 3X GNI per capita for Zimbabwe, demonstrating that the introduction of ID-NAT in addition to the current serological screening for blood donations in Zimbabwe cannot be considered cost-effective (Chapter 7). In Chapter 8, a systematic approach was adopted and used to review the research capacity within Zimbabwe’s national blood service. The review demonstrated that the NBSZ had the basic foundations for performing and participating in high quality research activities.

In conclusion, the studies presented in this thesis demonstrates the feasibility of various approaches which can be undertaken to collate data required to inform health economic models that can be used as tools to aid blood safety decision-making in resource limited settings. The different chapters also emphasized the need for context specific data to inform blood safety decision-making for a specific locality or country. It is important to note that a cost-effectiveness analysis is simply one of several methods used to formally compare the relative value of any new technology based on the mix of technologies to which the technology is judged against. Therefore, despite the fact that our analysis showed that the introduction of ID-NAT in addition to serological testing cannot be considered cost-effective, the technology may still be adopted. There is need to perform additional assessments on contextual issues such as social or ethical concerns about the risk of TTIs or their management, legal, political and stakeholders’ considerations as these will have an impact on the decision on whether or not the additional technology should be introduced. These assessments and/or priorities may override health economic considerations leading to the adoption of ID-NAT.