

## MAXIMIZING THE VALUE OF DONATED MEDICAL EQUIPMENT IN RESOURCE-LIMITED SETTINGS: THE ROLES OF DONORS AND END-USERS

Dinsie B. Williams, Jillian C. Kohler  
*University of Toronto*

### INTRODUCTIONS

Without access to diagnostic equipment in sub-Saharan Africa, millions of deaths go uninvestigated or misdiagnosed.[1] Clinical diagnosis without the support of medical technology is associated with low accuracy, which often leads to excessive or unnecessary use of resources, inappropriate treatment plans, and increased mortality.[1] Access to medical equipment considerably improves the capacity of clinicians to assess, diagnose, treat, and monitor patients. Medical equipment is also critical in preventing the spread of infectious diseases.[2] In resource-limited settings, there is an urgent need to fill the gap in access to medical equipment left by local governments with competing priorities. We propose that, until local governments prioritize healthcare delivery in some resource-limited settings, end-users should employ a value-based approach to identify viable transnational medical equipment donations and optimize donations.

By virtue of their collective composition and funding power, transnational donors are uniquely positioned to facilitate access to medical technologies and medicines in resource-limited settings.[3] Unfortunately, over decades and despite having a wealth of resources at their disposal, donors have not been successful at sustainably improving access to medical equipment in these settings. There is growing evidence that rather, than fill the gap, donors have been complicit in creating a burden for end-users by funding the distribution (trafficking) of waste in the form of inappropriate equipment.[4] Donor funds enable equipment to be distributed to end-users who have neither the technology, nor the resources to safely or effectively adopt or dispose of certain classes of equipment. The proliferation of high volumes of inappropriate

equipment places a financial burden on the end-users (clinicians and administrators) who must resort to re-allocating their meagre resources from basic patient care to (often) unsuccessful attempts to repair or dispose of the equipment.[5] In some cases, end-users have little recourse but to abandon the equipment in unsafe, uncontrolled stockpiles, potentially generating harmful environmental waste.[5]

The WHO has gone as far as to suggest that uncontrolled foreign donors are primary contributors to dumping of medical equipment in developing countries.[4] These assertions are based on the only available published estimates that 80% of medical equipment in developing countries are purchased with the assistance of transnational donors, and as much as 70% of all medical equipment lies abandoned and unused.[3,4] See Figure 1. Though these estimates may vary by country and type of equipment, it is clear that neither donors nor end-users gain value overall.

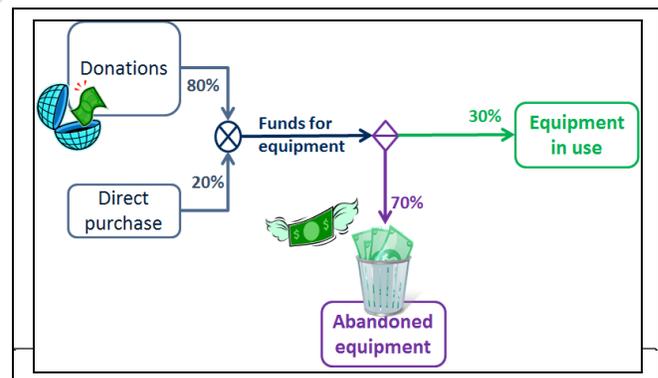


Figure 1: Allocation of Donated Medical Equipment

On the donors' side, for every dollar spent on medical equipment 62.5 to 87.5 cents goes to waste. Hypothetically, this means that in a

clinic with 10 devices, 8 (80%) would have come from donations and 2 from organic or governmental funding. Of the 10 devices, 3 (30%) would be put to use. In the best-case scenario for donations, the 3 devices would come from the set of 8 donations. The remaining 5 of 8 or 62.5% would end up abandoned. In the worst-case, one of the donated devices and both organically funded devices would be put to use. This would leave 7 out of 8 or 87.5% of the donations ending up abandoned. At this level of return, donors are aware that funds are not being used properly.

Given that technology is intended to improve lives, the majority of donated equipment ought not to end in waste piles. We hypothesize that a value-based approach to acquiring donations will result in less waste.

## OBJECTIVES

In this paper we propose to explore the roles of donors and end-users in defining and implementing equipment donation and funding policies at the national and institutional levels. The study will explore how existing policies on equipment donation incorporate transparency and accountability. The study will also identify opportunities for optimizing the value of donations in resource-limited settings and minimizing waste.

### Research questions

The following research questions will focus the inquiry:

1. What are the parameters end-users consider when evaluating donations?
2. What are the critical parameters that determine the success or failure of a donated piece of equipment?
3. What are the barriers to achieving these parameters?
4. What are the roles of donors and end-users in ensuring that these parameters are met?
5. How can end-users incorporate these metrics into a value-based (viability) model for accepting or rejecting donations?

## METHODOLOGY

### Mixed-methods case study & viability model

We will build a case study around a qualitative review of national and international policy and guideline documents, and interviews of healthcare facility owners, equipment technicians, nurses, physicians, and staff of funding organizations. See Table 1. The key informants or interviewees will be selected from non-governmental healthcare facilities. See Table 2. The interviews will centre on experiences with patient monitoring and diagnostic imaging devices. See Table 3. Questions will focus on motivations to accept donations, preparation, demand for equipment, validation of needs, quality of donated equipment, and disposal challenges. From the data obtained through the interviews, we will design a model to determine the viability (value) of externally funded electro-medical equipment from the perspective of end-users.

The case study methodology is appropriate for inquiry into a new research area where existing theories lack application.[6] Case studies are also uniquely suited for descriptive or exploratory research into complex topics. Medical equipment donation processes are complex phenomena with each donation constituting a unique combination of donor motivations, equipment availability, and recipient contexts. According to Yin,[7] "a case study is an empirical inquiry that investigates a contemporary phenomenon within its real-life context". The challenges of utilizing the case study methodology include defining the evidence as it is collected, asking the right questions, and interpreting the answers [8]. The research questions, hypothesis or proposition and theoretical context determine parameters of the case.

We will assess documents with established evaluation methods. The unit of analysis for the interviews will be a participant. We will consider accessibility of individuals, research resources, and the scope of the research questions when selecting participants.

Table 1: Participants

Donors	End-user
Administrator	Facility owners
Program manager	Clinical staff
Field officer	Technicians
//	Other non-clinical staff

Table 2: Healthcare facilities

For-profit	Not-for profit	Non-profit
//	Faith-based	
Secular		

Table 3: Electro-medical devices

Monitoring	Imaging
Pulse oximeters	Ultrasound
Oxygen concentrators	X-ray
Sphygmomanometers	Computed Tomography
EKGs	Magnetic Resonance Imaging

Designing the viability model

Interviews of end-users will help identify parameters that are important to maintaining the capacity and ability to accommodate medical equipment. Parameters such as capital cost savings, cost ceilings for operating, maintaining, and disposing of equipment at end-of-life will be explored, along with benefits to their patient population.

There is currently no universal method for end-users to compare the benefits with the 'costs' associated with receiving, using and disposing of donated medical equipment. A value-based approach will enable end-users to link the value (or viability) of donations to patient outcomes, ownership costs, and costs for decommissioning and disposing of equipment safely prior to accepting a funder's offer to donate equipment.

We suggest a viability model that determines thresholds for accepting or rejecting donations of patient monitoring and diagnostic imaging equipment. Such a model will transform donation processes and optimize future transnational donations. It will ensure adequate balance is maintained between end-users' needs and capacity and donors' motivations and goals.



Figure 2: Maintaining a balance between end-users and donors

**POTENTIAL IMPACT**

This study will:

- Contribute to the growing body of research at the intersection of health policy, transnational philanthropy, good governance, and development.
- Improve utility (or value) of medical equipment, and subsequently enhance health benefits.
- Assure donors that medical equipment donations are indeed having a positive impact on healthcare.
- Findings from this study will be useful to policymakers in improving donation protocols to decrease waste and optimize health outcomes of target populations.

Applying the viability model will mean donors will have an obligation to provide information about the condition, uses, lifetime costs (for operating and disposing) of donated equipment, and end-users likewise will be obliged to disclose their capacity for utilizing said equipment. Were donors to incorporate accountability by fully disclosing risks and costs of ownership and disposal for available equipment, end-users could make requests for equipment that would optimally serve their purposes. End-user healthcare providers would

have sufficient information to make informed decisions on accepting or rejecting donations. End-users would also be responsible for selecting donations that are appropriate for their specific patient populations and settings.

## DEFINITION

The term “medical technologies” refers to laboratory tests, mechanical tools, electro-medical devices, and computer networks

Resource-limited settings are locations with severe shortages in human, technical, and financial resources

## ACKNOWLEDGEMENTS

This study is supported in part by the Leslie Dan Faculty of Pharmaceutical Sciences at the University of Toronto and the Dalla Lana Global Health Student Research Travel Award.

## REFERENCES

- [1] C. Petti, C. Polage, T. Quinn, A Ronald, and M. Sande, “Laboratory Medicine in Africa: A Barrier to Effective Health Care,” *Clinical Infectious Diseases*, vol. 42(3), pp. 377-382, 2006.
- [2] The World Health Organization (WHO) [website]. Global Forum to Improve Developing Country Access to Medical Devices. 2010a. Available at: [http://www.who.int/mediacentre/news/notes/2010/medical\\_devices\\_20100908/en/](http://www.who.int/mediacentre/news/notes/2010/medical_devices_20100908/en/).
- [3] The World Health Organization (WHO) [website]. Guidelines for Medicines Donations. 3rd Edition. WHO/EDM/PAR/99.4. Revised 2010. 2011a. Available at: [http://www.who.int/medicines/publications/med\\_donationsguide2011/en/](http://www.who.int/medicines/publications/med_donationsguide2011/en/)
- [4] The World Health Organization (WHO) [website]. Guidelines for Healthcare Equipment Donations. WHO/ARA/97.3. March 2000. Available at: [http://www.who.int/medical\\_devices/publications/en/Donation\\_Guidelines.pdf](http://www.who.int/medical_devices/publications/en/Donation_Guidelines.pdf).
- [5] Dzwonczyk R and Riha C. Medical Equipment Donations In Haiti: Flaws in the Donation Process. *Rev Panam Salud Publica* 2012; 31(4):345-348
- [6] K. Eisenhardt, “Building Theories From Case Study Research,” *Acad Mgt Rev*, vol. 14(4), pp. 532-550. 1989.
- [7] R. Yin, *Case Study Research : Design and Methods* Fifth Edition. 2014.
- [8] J. Rowley, “Using Case Studies in Research,” *Mgt Res News*, volume 25(1), pp. 16-27. 2002.