

HOW THE THET PARTNERSHIP MODEL IS DIFFERENT; LOOKING BACK AT TWO YEARS OF MEDICAL EQUIPMENT PARTNERSHIPS IN FIVE AFRICAN COUNTRIES

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allowing them to be strategic and focus on sustainable outcomes.

Abstract

This article will describe the Health Partnership model and its application to the capacity building of medical equipment technicians. It will examine the current landscape relating to medical equipment in sub-Saharan Africa and introduce the objectives of the five Medical Equipment Partnership projects. The successes and challenges that the five partnerships have described are, in most cases, similar to one another and reflect the broader environment in which they are working. These include issues such as the low status of engineering within a hospital setting, procurement and donation practices and an appreciation of the importance of medical equipment management. The article will look at next steps and what the future may hold for medical equipment maintenance partnerships.

Functioning, available medical equipment is a huge challenge faced by health systems in Africa with studies suggesting that at least 40% [1] of medical equipment is out of service, with many studies citing 50-80% [2]. The availability of appropriately trained staff to manage, maintain and repair equipment is limited across sub-Saharan Africa [3]. The first global survey of Biomedical Engineering (BME) teaching units identified only 19 teaching units in sub-Saharan Africa [4]. Only half of these countries have a registered Professional Association of BMEs which are often under-resourced [5]. In low resource settings, the role of such bodies is particularly relevant to, for example, exchange experiences, expertise and materials and to advocate for the profession with the Ministry of Health.

Introduction to the Health Partnership Model

Health Partnerships or 'Links' are long-term, sustainable partnerships between health institutions in the UK and their counterparts in low and middle income countries. They work within the health system to provide discrete, tailored projects to address a specific need identified by the overseas partner. THET has over 25 years' commitment to global health and to developing the engagement of UK health professionals to work in partnership with counterparts overseas to deliver training and peer-to-peer support. THET currently enables some 150 Health Partnerships to access the financial and technical support necessary to deliver effective projects in increasingly diverse areas such as maternal mortality and child health, mental health, clinical practice development and medical equipment maintenance.

A Medical Equipment Partnership Programme was set up in 2012 to address problems with medical equipment provision and maintenance through the funding and support of five partnerships between health institutions in the UK and South Sudan, Zambia, Ghana, Uganda and Ethiopia. Led by biomedical engineers and medical physicists, the primary focus of these projects was to build equipment maintenance and management capacity and to ensure that equipment maintenance staff were more effectively engaged in equipment decision-making in their hospitals. Sustainability is key, and local sourcing, development of local procurement skills and creation of local budgets is becoming more important not least in the creation of a suitable working environment for biomedical and clinical staff but also in an effort to move away from aid dependence.

These 5 projects will all complete by January 2015 and this article will explore their successes and shared challenges.

Through partnerships, short and long-term UK volunteers work with their overseas colleagues to provide peer-to-peer support in the form of training, mentoring and advocacy. Most partnerships use a variety of visits overseas, concentrated learning placements in the UK and remote support and mentoring to deliver projects. Sustainability is a central pillar of Health Partnership principles. Partnerships are characterised by a long-term institutional commitment,

The Medical Equipment Partnerships and their results

GSTFT-Ndola Partnership

The partnership between Guy's & St Thomas' NHS Foundation Trust, Arthur Davison Children's Hospital and Ndola Central Hospital in Zambia was set up in 2009. The partnership works on paediatrics, maternal health, patient

safety and biomedical engineering. Volunteers from the biomedical engineering department at GSTFT work with colleagues at the two Ndola hospitals on the development of up-to-date policies and protocols and preventive maintenance of equipment. More in-depth training has been given to aspects of management such as procurement, funding and planning. The partnership activities include visits to Ndola and concentrated learning placements in the UK.

The grant has supported the development of a reference library for the technicians, the provision of limited essential test equipment and on-the-job training. The project included a team of two volunteer UK Biomedical Engineers delivering a three-day training course on troubleshooting and repair of anaesthetic equipment to an audience of 9, including 7 colleagues from 6 other hospitals in the region and the Heads of Biomedical Engineering at both hospitals are taking the lead to support colleagues and trainees across the Copperbelt Region. This is the second biggest province of Zambia, serving a population of 2,000,000. The Head of Ndola Hospital used to receive calls for support from the other hospitals at least once a month and that number has gone down to only one call in the past six months. An improvement in respect for and visibility of the both Heads of Biomedical Engineering has been reported as well.

The partnership has focused on improving the efficiency and cost-effectiveness of procurement procedures for spare parts but this has been challenging, as this demands systems level change of Zambia's supply chain and procurement policies.

Winchester-Yei Partnership

Hampshire Hospitals NHS Foundation Trust and Yei Civil hospital and the Martha primary health care clinic in South Sudan have been in partnership since 2010 working on clinical and engineering activities. The Medical Equipment grant complemented an existing project supported through the Health Partnership Scheme, which aimed to improve patient services.

The UK engineers worked with the sole technician at Yei to repair essential equipment. This included the local and international procurement of spare parts. The team were able to put donated equipment from the USA into service by supplying transformers. By the end of the project, an estimated 50% of equipment was operational, compared to 30% in November 2012. Service manuals have been made available and an inventory has been created. At least three patients a day benefit from training related to the repair of oxygen concentrators in maternity, paediatrics and medicine wards. Anecdotal evidence suggested that the availability of functioning medical equipment had a positive effect on the behaviour of health workers; for example, a functional vital signs machine meant an anaesthetic officer was able to implement the WHO Surgical Safety Checklist for the first time.

The Winchester-Yei project takes places in a post-conflict context, which has an inevitable effect on the infrastructure

and human resources available. This has led to involving electrical and plumbing engineers in the project to create a safe and healthy environment for patients and health workers.

Sheffield-Mekelle Partnership

The clinical engineering department at Sheffield Teaching Hospitals NHS Foundation Trust with Sheffield Health Action Resource for Ethiopia (SHARE) have been working with two hospitals in Mekelle, Ethiopia to train maintenance staff at both hospitals to develop and maintain an up-to-date inventory and a preventive maintenance plan.

Sheffield Teaching Hospitals have donated a large amount of test equipment and tools to support the biomedical engineering workshop. The UK volunteers trained both technicians and users to promote care and maintenance of equipment. For example, a Clinical Trainer from Sheffield accompanied UK engineers to support the delivery of user training combined with maintenance training on surgical equipment. In total 158 health workers have been trained through this project.

Engaging with hospital management and improving institutional support to the biomedical engineering department has been a key area of focus for the project. A new hospital director at Ayder Referral Hospital is driven to set up a fully functional Medical Equipment Maintenance group, which will provide significant support to the project. The employment of 3 staff with a specific BMET title is a direct result of that.

Ugandan Maternal and Newborn Hub

The partnership between Countess of Chester NHS Foundation Trust and Kisiizi Hospital, Uganda is leading on a project run in collaboration with the Uganda Maternal & Newborn Hub. 'The Hub' is a consortium of seven Health Partnerships between the UK and Uganda and two health centres. The project aims to improve the equipment repair and maintenance capacity of the health institutions with a particular focus on the maternal and neonatal wards and departments.

Robert Ssekitoleko is a long-term biomedical engineering volunteer leading on the project in Uganda. He has worked with the participating health institutions to develop inventories and to establish the technicians' training needs. Based on this needs assessment, one lead technician from each institution undertook an intensive two-week training with Biomedical Engineering Diploma students at Kyambogo University, in collaboration with Amalthea Trust.

The Deputy Executive Director for Mulago Hospital (largest state owned hospital in Uganda) has taken a specific interest in the project, commenting that "the biomedical engineering project is delivering tangible results with many doctors, nurses and midwives opening up to the system". Through a combination of the project and the Commonwealth Fellowship Scheme, five technicians undertook vital

structured training and placements in Hub partner hospitals across the UK.

Tools have been provided to the workshops and various hospitals are gradually changing their ways of managing equipment. For example, the deputy director of Mulago Hospital is insisting that all equipment entering the hospital go through her and the technicians before being delivered to the wards. In Mbale, hospital cabinets of spares such as fuses, have been created, avoiding time consuming procurement processes for small items. Kisiizi Hospital now has a dedicated Biomedical Engineering workshop following advice from the Hub Biomedical Engineer Volunteer. At least 40 health workers have been trained through the project, and many more benefited from the interaction with the Hub Biomedical Engineer.

PaRTner Collaboration

Staff from University College London and Royal Berkshire Hospital are working in partnership with the two cancer centres of Ghana: Korle Bu Teaching Hospital and Komfo Anokye Teaching Hospital. The project aims to prepare the cancer centres for the arrival of Ghana's first linear accelerators in a public hospital. Before the project there were no personnel trained to use and maintain linear accelerators in any public hospital in Ghana.

Although delay in the arrival and installation of the radiotherapy equipment has stalled progress, close collaboration between the Ghana and UK partners and the supplier has solved various issues that had contributed towards the delays. This collaboration is leading to ways to distribute educational and training material as well. To date, the 31 staff who have received intensive training on radiotherapy principles in the UK and in Ghana have passed on this training to their colleagues in the cancer centres' teams. Teaching materials and training have been provided to prepare radiotherapy workers for upgrades in service delivery and equipment. An audit of dosimetry equipment and protocols in Ghana has taken place. PCs have been acquired and an IT company is offering support for correct use of the software and creating the required level of connectivity with the UK for radiotherapy training and planning. The UK team has collected a large quantity of essential radiotherapy equipment from ten UK hospital departments for donation to Ghana.

An important collaboration has been formed with an oncology centre in Sudan, which, due to the facilities available, has the potential to form a base for radiotherapy training for East and West Africa and the Middle East

What have we learned?

The Medical Equipment Grant Programme offers an opportunity to draw together similarities and lessons learnt across the five projects.

Health Partnership projects, including Medical Equipment Partnership projects, should be based on a needs assessment which is led and owned by the overseas partner. This approach ensures projects are appropriate and relevant to the context and address needs that are specific to the institutions involved in the partnership. For example, an assessment of the engineering capacity undertaken by the GSTFT-Ndola Partnership identified the need for a new workshop at ADCH whereas NCH needed more test equipment. Likewise, the Ugandan Hub project is working across several sites and has needed to tailor support to each of them. Some of the hospitals have functional inventories but others needed support to develop inventories.

Health Partnerships are unique in the way in which they are able to offer peer-to-peer support. As the UK volunteers are practising, highly skilled, Biomedical Engineers in the UK, they are able to share their own experiences and reduce professional isolation of the partnering Biomedical Engineering partners, for example the PaRTner Project offers the opportunity for remote support, continuing the relationship between face-to-face visits. Partnerships are strengthening relationships within the countries in which they work. For example, both the Ugandan Hub project as the GSTFT-Ndola project regularly brings together technicians from the seven different hospitals, providing them with the opportunity to share and learn from their colleagues.

The Medical Equipment Partnerships demonstrated great flexibility in their implementation, which meant they could deal with challenges more effectively and respond to needs as they emerged. A key challenge faced by all projects was the low status of the biomedical engineering departments within the hospital structure. This challenge was faced particularly when partnerships were attempting to address more structural change for example in establishing medical equipment maintenance systems or management groups or addressing procurement. There has, however, been some anecdotal progress in the perceived low status of the departments. For example, Lupiya Kampengele, Head of Biomedical Engineering at Ndola Central Hospital said that the visit by the UK partner has "helped our image as a department improve and many sections in the hospital appreciate us". Work by the partnerships to strengthen maintenance and management systems has increased the awareness around the function of technicians in the hospitals.

Although working within an institution provides opportunities to deliver a small, highly focussed project, the institution is circumscribed by the wider health system. The GSTFT-Ndola Partnership, for example, has tried to improve the efficiency and effectiveness of the procurement of spare parts; however, ministerial guidance on international procurement has presented a significant challenge, for example spare parts can only be purchased via a Zambia-based supplier, and with only one supplier in the country there is no cost or quality control, nor an alternative. Addressing ministerial guidance is beyond the scope of an institutional partnership although some advocacy activities could be possible.

Up to 80% of medical equipment in many Sub-Saharan African countries is donated or funded by foreign sources [6] and 70-90% of donated equipment is never operationalised [7]. This has been a challenge for many of the projects and can threaten to undermine progress towards building medical equipment maintenance capacity. Small-scale actions can be taken to improve the donated equipment during visits to the overseas partnership. For example, Winchester-Yei was able to provide spare parts to operationalise donated equipment which had never been functional in the hospital including a diesel generator. To prevent inappropriate donations THET has recently produced '[Making it Work](#)', a toolkit for medical equipment donation to low resource settings.

Although many of the challenges faced by Health Partnerships are connected to the delivery of the project, barriers to UK volunteering have an effect on the capacity of the UK partner to engage in this project. Although there has been progress in the support available for international volunteering over the last decade, more work is needed [8]. THET is working with the Department of Health on new guidance to the service to legitimise volunteering and working; with practitioners and employers on quality and impact of partnership working; and with stakeholders across the health system to strengthen the evidence base to illustrate how volunteering benefits everyone.

Next steps

Based on the positive experience with the Medical Equipment Partnerships and the lessons learnt over the past two years, THET plans to expand this type of partnership in the future. This could mean both the opportunity for continuing support for the current partnerships and expanding the number of Health Partnerships that tackle biomedical engineering needs. The focus on medical equipment maintenance is important as many partnerships with a clinical-only focus struggle with the lack of functioning medical equipment.

THET has identified three focal themes in order to maximise the potential for Health Partnerships interventions to have a sustainable and institution-wide impact. These themes are: medical equipment, patient safety and leadership & management. The themes will inform THET's activities over the coming years, for example the [annual conference](#) and [resource development](#).

A recent survey of Health Partnerships conducted by THET showed that 85% of respondents (n=56) had confronted medical equipment challenges in their project work. 73% of those had donated equipment in the past. This demonstrates the potential scale of medical equipment donation and engagement in medical equipment by partnerships, which do not explicitly target maintenance capacity. To ensure proper medical equipment donations, THET will promote the donation toolkit at every opportunity. Promotion of the toolkit will be complemented by efforts to encourage all partnerships - not just Medical Equipment Partnerships - to consider ways

in which biomedical engineering departments should be consulted and involved in capacity building projects.

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