



# HEALTH TECHNOLOGY MANAGEMENT IMPROVEMENT PROJECT

IMPACT REPORT | 2018-2021

December 2021





Photo Credit: THET.

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## ACKNOWLEDGEMENTS

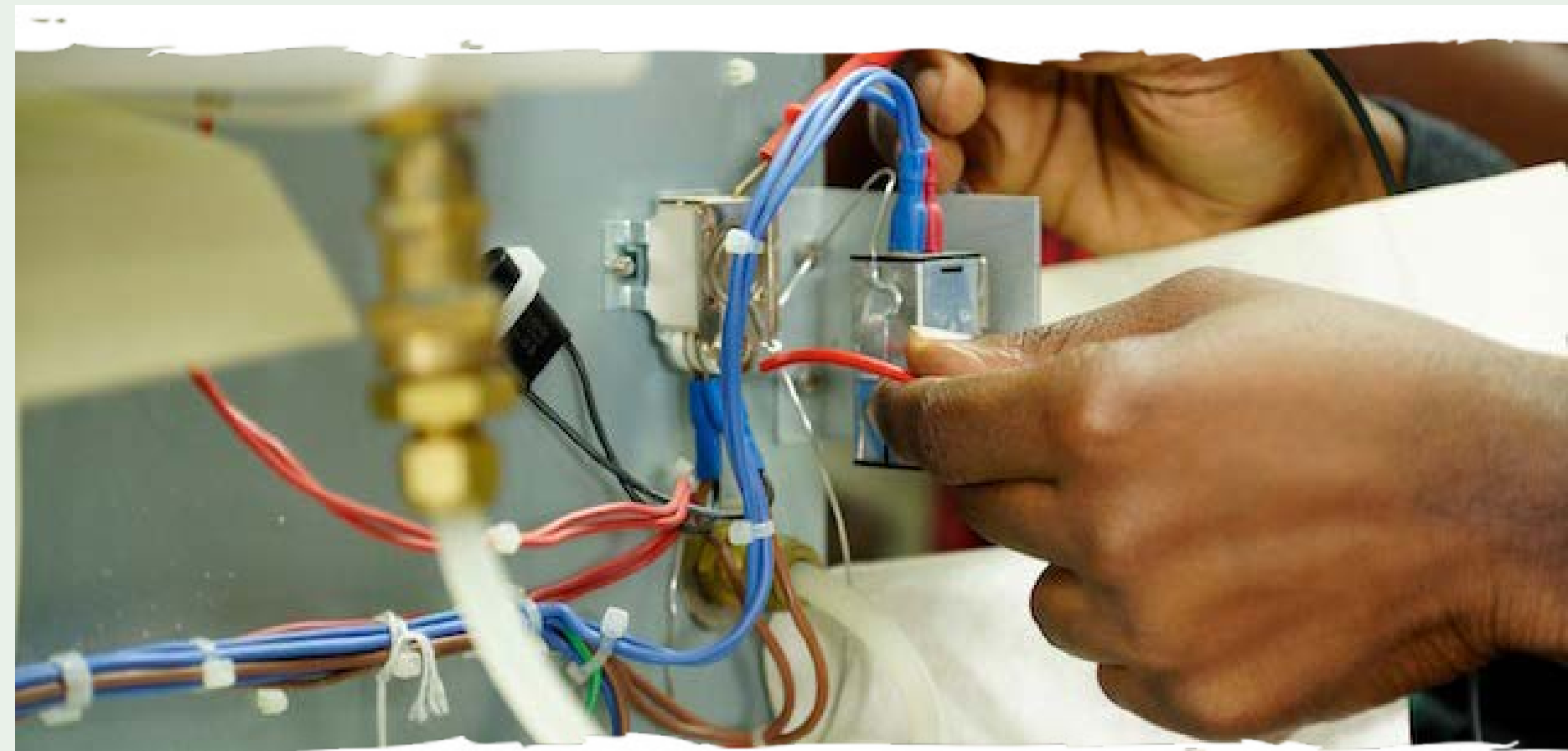
The Tropical Health and Education Trust would like to thank all partners who contributed to and made the HTMI Project a success. In particular, we would like to thank the Swedish International Development Agency (SIDA) for their funding support, and our key implementation partners, the Zambian Ministry of Health (MoH) and our lead consultant on the project, Dr Chris Mol. We would also like to thank all the Provincial and District authorities, and facilities that took part in the project. Finally, we would like to thank the hard work and dedication of each BMET who worked on the project and whose effort was the foundation of the project's success.

## FOREWORDS



It brings me great pleasure to be celebrating the success of our Health Technology Management Improvement Project, which has done so much to strengthen and sustain health service delivery in Zambia. Appropriate Health Technology Management is an essential element to any resilient health system. I would like to single out two parties for particular praise: First of all, the biomedical engineers themselves. They are the pioneers, 30% of them women, working on the frontline to ensure the quality, availability, and safety of medical equipment in hospitals. I am full of respect for the work they are doing to ensure their colleagues can provide speedy diagnosis and treatment to all patients. Secondly, our partners at the Ministry of Health. The leadership they have shown, and the steps they have taken to prioritise the recruitment of these engineers, is a fundamental part of this project's success.

- Ben Simms, CEO, THET



In January 2015 I first arrived in Zambia, at the invitation of THET, to help set up the first Biomedical Engineering Technologist (BMET) Diploma course in the country. Now, seven years later, nearly every hospital in the country has employed a graduated BMET. Medical equipment is in much better condition with a positive impact on patient care. It has been a long road, with many good colleagues and BMETs that I have seen develop from school-leaving adolescents to BME professionals. We have come far. I'm glad I came along.

- Dr Chris Mol, Lead Project Consultant

# RESULTS AT A GLANCE



## PROJECT IMPACT



**123 BMETs** trained in Standard Operating Procedures



**54** hospitals in Luapula, Muchinga, Southern and Eastern Provinces



Equipment functionality improved from 75% to **95.6%** across provinces.



Over **30%** female participation in the project.

*'I have seen the response of a Biomedical Engineering Technologist, in two places Nakonde and Kawambwa. They are quick to respond, and they know their roles. If I have one in the district I don't think of "maintenance referrals" more like "patient referrals" and this has proved to be cost effective and enhances healthcare delivery on time. Since we use machines for most of our work, Biomedical Engineering Technologists are an integral stakeholder in a hospital.*

*Before there were frequent breakdowns that would be attended to after weeks or months but now with Biomedical Engineering Technologists on the ground the turnaround time for an equipment to be operational again is 1 or 2 days. (As an example), laboratory equipment... takes a month (or) even more for it to be worked on by the service engineers from vendors. Therefore, I wish Biomedical Engineering Technologists could be trained/sponsored in laboratory equipment maintenance. Another aspect is that of user training: I have seeing how they perfectly execute it; it is good and helps to extend the life span of Medical Equipment.'*

**Dr Chola Kaunda, Kawambwa District Hospital.**

# PROGRAMME OVERVIEW

The Health Technology Management Improvement Project (HTMI) was implemented by THET in Zambia between September 2018 and November 2021. The objective of the project was to improve the maintenance of medical equipment (ME) in hospitals in Southern, Eastern, Muchinga and Luapula Provinces of Zambia, in order to improve the availability of medical equipment for life-saving patient care.

The project utilised an innovative human resource focus – promoting the development of the Biomedical Engineering Technologist (BMET) as a new professionalised cadre of health worker in Zambia able to take on the role of change agent, and sustainably improve the way medical equipment management and maintenance is approached.

The project utilised advances already made by THET. Prior to 2018, THET had undertaken the development and implementation of the first Diploma in Biomedical Engineering Technology alongside the Technical Education, Vocational and Entrepreneurial Training Authority (TEVETA) and the Northern Technical College (NORTEC). THET assisted curriculum development, course development, teacher training, the procurement of equipment and tools, and workshop refurbishment. By 2017 NORTEC was producing graduates without further external assistance needed.

In the third year of the project, the Government of Zambia employed all BMETs within the project, as well as over 200 BMETs nationwide. THET diverted project savings towards extending the SOP course to all BMETs in the four provinces who were not initially part of the course, allowing us to increase the number of supported BMETs to 123, and to cover all BMETs in the provinces.

Some BMETs who had undertaken the SOP course in the first years of the project were also taken on as Assistant Mentors in the third year, giving them experience in undertaking a leadership role within the profession.

## Key Project Activities:

- BMETS were placed in facilities across the four provinces – totalling 54 over the three years of the project. Initially, they were employed by THET.
- Necessary tools and test equipment (such as electrical safety testers) were procured for each province or facility.
- Workshop space was identified and refurbished in each facility.
- The BMETs undertook a 10-month Standard Operating Procedure (SOP) course covering corrective maintenance, preventive maintenance, inventory keeping, user training, equipment acceptance and decommissioning, and reporting.
- BMETs provided information on the status of hospital equipment to hospital management to inform planning and procurement decisions.
- BMETs provided status and activity reports to THET, Provincial Health Offices, and the Ministry of Health on a monthly basis.
- A modest budget for spare parts was managed by THET, and spare parts for specific items were procured on a needs-basis throughout the project.
- Provincial Medical Equipment Officers were bought on to the project as mentors on the SOP course – providing integration with the Provincial Health Offices and ownership over the project outcomes.



Dr Chris Mol teaching BMETs, Zambia.  
Photo Credit: THET.

# WHAT HAS BEEN ACHIEVED?

## Equipment Uptime

The key indicator of the project was Equipment Uptime. This is a measure of the percentage of equipment able to perform its function within a given time-period. The project measured equipment uptime on a monthly basis across all participating hospitals, as soon as the BMETs had completed medical equipment inventories (their first task within the SOP course). The first month's calculation acted as baseline, and the last month as the achieved result.

On average, facilities across the provinces improved from 75% uptime to 95.6% uptime. Baseline measurements ranged from as low as 56% to as high as 85%. End line results reached as high as 99% in some instances.

This represents a large increase in the availability of equipment for life-saving care, and in the retained value of assets within the Zambian health system. Facility managers and clinical leads have been unanimous for the praise of the work of BMETs and the improvements they have bought to clinical practice.

## BMETs - A Professional Workforce

The combination of relevant pre-service training and the introduction of Standard Operating Procedures and clear job descriptions; has led to the development of a professionalized workforce focused on Health Technology Management, and medical equipment maintenance. The focus on equipment uptime, preventive maintenance and user training switches the focus for the first time in Zambia to managing equipment to ensure it remains functional, rather than 'fire-fighting'. On average, the amount of Corrective Maintenance actions (fixing broken equipment) per month decreased by over 75% over the SOP course.

Secondly, the project increased the visibility of BMETs within health facilities. The utility of their monthly reporting, and the value they can bring

to planning and procurement decisions was recognized by hospital authorities. This allowed BMETs to add value by producing recommended equipment specifications, or providing recommendation on equipment replacement of spare part procurement.

## Sustainability and Local Ownership

The project worked hard to ensure the sustainability of the gains made during its implementation. Key to this was the continued employment of BMETs after the end of the project. The value that BMETs bring to the health service and health facilities was recognized in the third year of the project, when the Government of Zambia employed a large number of BMETs across the country via a grant from the Global Fund. This is expected to result in long-term employment. By the end of the project, 98 BMETs in total were employed within the four provinces.

At Provincial level, Provincial Health Directors and Provincial Medical Equipment Officers (PMEOs) were bought into the project implementation. PMEOs in particular were trained in the SOPs and bought on as mentors to the BMETs. This introduced a new aspect to their roles around leadership in service delivery improvement.

The project provided proof of concept for the implementation of SOPs at facility level. This is a scalable and replicable model that can be applied at a national level. Training institutions delivering the Diploma in Biomedical Engineering Technology have adapted course content to specifically prepare graduates to implement the SOPs as professionals.

## Health System Resilience

The functioning of an effective health service depends on the availability of medical equipment for the appropriate diagnosis, treatment and care of patients. The resilience of a health service, to continue functioning despite shocks such as pandemics or natural disasters, requires the ongoing and predictable availability and functioning of its key infrastructure. The project has shown that BMETs are an essential piece of this puzzle. When shocks occur, such as the COVID-19 pandemic, clinicians need to be able to rely on technology to provide the requisite diagnosis, patient monitoring and (for instance) the provision of oxygen to patients. Well trained BMETs, appropriately provisioned with tools and spare parts is the best way to ensure the challenge is met.

## Championing Female Engineers

The project was able to make an impact on gender inclusion through the prioritization of female BMETs. Biomedical Engineering and the wider Engineering field are still very male-dominated. Within the project, the recruitment of female BMETs was prioritized, and over 30% of those who underwent the SOP course were female. This represents a large percentage increase on the representation of females in the profession as a whole.

Of the total number of BMETs employed by the MoH in the four provinces, 19% were female. This builds on work previously by NORTEC, ensuring all female applicants who passed the entrance exam were given a place on the course – resulting in 20-25% females on each intake.

Anecdotally, we are aware that the inclusion of female BMETs on the course, and their success, has done a lot to alter attitudes towards female engineers within facility and provincial authorities.

*On behalf of all BMETs who participated in HTML project it's no secret that we sincerely acknowledge your tireless efforts you have made and still making towards our profession. There was no better way of rewarding you other than giving our outmost in the delivery of quality public service to the project's successful completion, the numbers can testify to that.*

*Individually I feel totally a different being after the SOP program, it has raised my confidence levels, given me the courage to handle bigger problems, lifted my working spirit and exposed me to higher management.*

*My target now is at least 99.9% of ME uptime looking forward from a baseline of 95% of ME uptime.*

*Thank you for everything and wish you great things life has to offer, fighting for recognition is now a story of the past, our presence is felt it's time to work.*

### Luwaya Gift

BMET, Mwami Adventist Hospital, Zambia



Luwaya Gift, BMET, Mwami Adventist Hospital, Zambia

## LESSONS LEARNT

Crucially, we found that achieving over 95% uptime requires relatively little investment in time and resources in comparison to the potential benefits in clinical outcomes, and that sustaining this figure requires slight changes in the approach to facility and service management.

The key ingredient in achieving this impact is a Technologist workforce, appropriately trained in equipment repair, maintenance and management. Understanding of processes and management interventions (as described in the SOPs) gives the work that BMETs do a clear structure and purpose; and allows them to take on their role more confidently. They reduce the incidence of BMETs simply 'fire-fighting' broken equipment and encourage proactivity in ensuring uptime.

The vast majority of repair cases in hospitals can be accomplished with locally available parts and tools. However, a modest budget for spare parts at facility level greatly reduces the time equipment may wait to be repaired. If possible, it's recommended that spare parts

are budgeted for whenever equipment is procured. The provision of adequate workshop space and tools is crucial to facilitating the improvements that BMETs can bring.

Developing a community of practice amongst BMETs via mentorship, joint learning exercises and communications technology (e.g. WhatsApp groups) helps to encourage BMETs, and provide a forum for improvement, information exchange, and assistance with uncommon troubleshooting issues.

The advantages that BMETs bring to facilities and districts are immediately apparent to management and health workers. The work that BMETs did was unanimously praised. The problem they were solving was widely known and understood. For this reason, the work of BMETs received a high level of backing from management. Instituting monthly reporting also greatly increased the attention paid to Health Technology Management by facilities, and helped to encourage further improvements.



Patricia Kulumula, BMET, Zambia.  
Photo Credi: THET

## EVALUATION REPORT FINDINGS | BRASYS - 2021

This evaluation was based on the Organization for Economic Cooperation and Development (OECD) evaluation criteria: relevance, coherence, effectiveness, efficiency, impact and sustainability. This approach ensured an evidence-based understanding of the HTM-I project, allowing for the development of insightful findings on the evaluation themes, reliable conclusions, and targeted recommendations.

The project was well implemented, fully achieving most of the assessment criteria.

- *The design of the project, its objectives and expected results were relevant and responsive to the needs of participating health facilities, the health system, the current RMNCAHN services context and other cooperating partners who have made huge ME investments.*
- *The project was coherent, very unique and filled a critical gap, being literally the only partner supporting ME improvements. The interventions were well integrated into the health system across the levels of the health system from national all the way to facility level. The project was also well aligned with the interventions of other partners as it supported improvements in managing all ME in facilities, a number of which were donated by these partners.*
- *The project was effective with solid performance across all its results areas. The project increased ME uptime significantly across all project locations.*
- *The project was largely efficient. It had a lower budget consumption in its second year due to Covid-19 restrictions, and sharp currency fluctuations. The funding size of the project was optimal and sufficient to complete activities per the program design.*
- *The project delivered impact in the short-term, and is expected to be impactful in the long-term if certain conditions are maintained. Key informant's reports indicate that the improved ME uptime has had a direct effect on patient care as more patients now have access to functional ME for both clinical and diagnostic services. The impact will however only be sustained if BMETs are retained in the health system.*
- *The project is poised to be sustainable with so many key sustainability precursors already in place including its scalable and replicable model, well defined and tested SOP, implementation through government personnel and local experts, defined procurement and budgeting standards at facility level and a high level of awareness and value recognition among key stakeholders including MoH, cooperating partners and donors.*

The evaluation team makes the following recommendations toward utilizing the findings from this project: Financial commitment to hire BMETs by MoH, formal adoption of the SOP as MoH guidance, continued SOP training through local institutions (NORTEC and Evelyn Hone College), scale up of the project to other provinces, embedding ME end user trainings into pre-service training of other clinical cadres and finally routine ME budgeting as a standard across all levels of the health system especially the inclusion of spare parts.

*Excerpt taken from Independent Evaluation Report.*



### ABOUT THET

Today, one billion people will never see a qualified health worker in their lives. For over thirty years, THET has been working to change this by supporting health workers both in the UK and overseas to improve patient care through targeted training programmes. We work with diverse partners to build a world where everybody, everywhere has access to affordable and quality healthcare.

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