



Biomedical Technology

Context

In many low-income countries around the world, more than 95 percent of medical equipment found in hospitals is imported. Unfortunately, much of it is out of service, but could be easily repaired at minimal cost by trained biomedical technology professionals.

A survey done in 52 African hospitals, however, revealed that medical device maintenance services in 85 percent of these facilities had trouble finding qualified engineers and technicians locally. Where resources exist, facilities may sign costly contracts with service technicians, but when those resources aren't available, much of that equipment lays idle.

Whether you look at diagnostic and treatment equipment, life support equipment, or medical laboratories, the same challenge exists across departments — a lack of in-house trained expertise to conduct preventive maintenance and repair.

As development partners look for more sustainable impact from programs they support, equipment management plays a crucial role — particularly in clinical settings.



In many low- and middle-income countries, donors procure millions of dollars of medical equipment. Without routine maintenance and repair, it can often malfunction or cease working altogether. The field of biomedical technology has largely been overlooked until recently. Many countries still lack a formal scheme of service for the profession, as well as local advocacy and regulatory bodies. As a result, training, financing, and in-service training for this crucial medical support cadre is extremely limited.

AIHA Response

In January 2013, AIHA initiated a partnership that applies our twinning model to engage multiple education institutions from the United States and Ethiopia in a concerted effort to rapidly train new biomedical engineers and equipment technicians, and to support the ongoing continuing education needs of existing biomedical technology professionals. This partnership represents the first PEPFAR-supported project to address biomedical technology in sub-Saharan Africa.

By linking Jimma University's Institute of Technology and Tegbare-id Polytechnic College with Rice University and Texas Children's Hospital, AIHA helped the Ethiopian partners build the capacity to produce biomedical engineers and technicians capable of meeting the country's burgeoning demands.

AIHA's Biomedical Technology Program

is helping countries meet the demands of today's technology-driven healthcare systems, particularly in the context of providing high quality HIV/AIDS-related diagnostic, treatment, and care services.



PEPFAR estimates that 37-48 percent of CD4, hematology, and microbiology lab equipment in Ethiopia is not working at any given time. This lack of functional biomedical equipment, including autoclaves, centrifuges, microscopes, and other basic diagnostic tools undermines the country's HIV response, resulting in delays in treatment and increased loss of patients in care.

Partners worked to strengthen pre-service biomedical engineering and equipment technician training programs at both the bachelor and diploma levels by updating curricula, trained faculty, and provided evidence-based learning resources. Partners also collaborated to expand the capacity of these cadres to manage and maintain critical medical equipment through the expansion of practical in-service training opportunities. Finally, they worked to establish standardized protocols and processes to ensure ongoing equipment maintenance at the healthcare facility level.

In 2016, this partnership progressed to a second phase with the addition of a third Ethiopian institution: the Addis Ababa Institute of Technology. AIHA shifted the main focus of the project to in-service training to build the capacity of biomedics and lab technicians in October 2017.

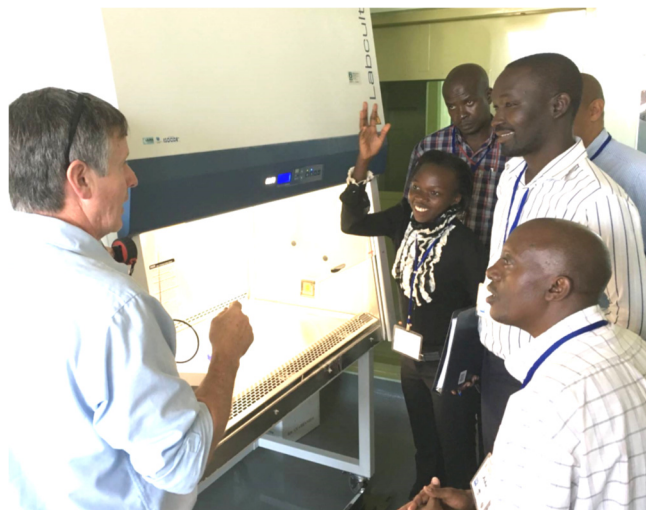
Based on the success of this groundbreaking partnership, AIHA subsequently launched four other PEPFAR-supported biomedical technology partnerships in Kenya, Tanzania, Uganda, and Zambia that are focusing on building capacity for in-service training focused largely on preventive maintenance and repair of laboratory equipment that directly

supports viral load testing in support of attaining the global 90-90-90 targets.

Selected Program Results

- AIHA has trained nearly 1,000 biomedics in support of the third “90” across five project countries in Africa since 2012.
- Leveraging the success of our biomedical technology project in Ethiopia, AIHA launched a public-private partnership with GE Foundation to help scale up and complement project activities through a comprehensive year-long in-service training program for biomedical technicians and engineers. In 2017, the project graduated 20 biomedics and opened a Biomedical Center of Excellence at “All Africa Leprosy Rehabilitation and Training Center” (ALERT Center), which now serves as a benchmark training center for biomedical engineers and technicians.
- AIHA supported training and development of National Laboratory Equipment Calibration Certification and Training Centers in Kenya and Uganda, and continues to empower countries for international accreditation to attain ISO17025:2017.
- In collaboration with the Ethiopian Ministry of Health, AIHA and our partners developed a mentorship plan that includes experiential attachments at 10 government hospitals and five medical equipment dealers to promote the acquisition of hands-on practical skills for biomedical technology students.
- AIHA and our partners in Uganda developed training curricula for both non-automated and automated lab equipment that directly supports HIV and TB diagnosis and treatment, training 30 biomedics on non-automated equipment and identifying seven of those as master trainers, who have completed a training-of-trainers course to enable them to step down trainings in their respective regions.
- Also in Uganda, AIHA and our partners developed a refrigeration and air-conditioning training course to better support routine viral load testing, graduating 20 biomedics from the comprehensive two-week course and conducted the first GeneXpert training in East Africa, with 24 biomedics completing this initial two-phased course.
- Using a multi-step approach, AIHA and our partners in Kenya have been working to implement a sustainable in-service training program that includes short courses and distance-learning opportunities for biomedics, with a specific focus on preventive maintenance and repair skills for all levels of laboratory equipment since 2016, training 23 biomedics from target counties on non-automated equipment, six on refrigeration; and six as master trainers.
- In Tanzania, AIHA trained 47 biomedics and faculty on routine maintenance and repair of viral load machines.

- In 2017, four Ugandan biomedics completed a year-long, three-phase biosafety cabinet calibration and certification (BSCC) course. They have to date assessed more than 100 BSCs across the country, a function which was formally outsourced at high cost.
- In 2017, the Ministry of Health's National Public Health Laboratory (NPHL) in Kenya conducted a rapid response intervention to prepare 43 labs for accreditation. AIHA supported trained biomedics from our project sites to conduct the required equipment repairs and preventive maintenance at 24 of those labs across 14 counties, where biomedics worked on 385 pieces of equipment, a function that had previously been outsourced at great cost.
- At the National Equipment Calibration Center of Excellence AIHA helped establish in 2017, biomedics we trained have to date calibrated more than 800 pipettes, 300 thermometers, and 100 timers — a function that was previously outsourced or didn't happen at all. We are currently training the team as they work toward ISO17025:2017 accreditation.



In Uganda, most biomedical engineers, equipment technicians, and lab technicians lack many of the skills they need to effectively maintain and repair critical lab equipment. AIHA has been working with the Ministry of Health to address training needs in the country since 2015.

Twinning Partnerships in Biomedical Technology: The Value Added

AIHA's partnership model is demand-driven and highly flexible, relying on institution-to-institution partnerships and peer-to-peer relationships to benefit both sides. This allows host countries and partners to expand the scope of their efforts to better meet their unique needs and context. Our "partnership of partnerships" approach encourages robust sharing of knowledge and best practices. We routinely connect partners from one country with peers who are implementing similar programs in another country or even region to spark creative collaboration and innovative problem solving. For our biomedical technology partners, this has led to:

- Increased use of distance learning and other cost-effective training modalities;
- Increased country buy-in, ownership, and sustainability as a result of our needs-based and fit-for-purpose approach to health workforce development;
- Increased access to AIHA's robust Knowledge Management Program, which supports access to a broad range of evidence-based resources and communications technologies to facilitate improved learning and decision-making. This includes the establishment of Knowledge Management Centers (KMCs) at Jimma University and Tegbare-id for which AIHA provided software and training in how to access evidence-based resources. US partners supplemented these efforts, providing additional training and donating textbooks, software, and other learning resources;
- Increased cooperation with local healthcare institutions to better address the biomedical technology needs of these facilities, as well as ensure that educational and practical training meets real-life needs.



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