



PARTNERSHIP FOR GLOBAL HEALTH TECHNOLOGIES

MAY 2016, ISSUE 2

OUR VISION

The Partnership for Global Health Technologies (PGHT) is a collaboration between medical students from the State University of Zanzibar (SUZA) and Boston University students from various backgrounds. PGHT aims to improve the quality of maternal care in Zanzibar by applying biomedical engineering principles within a public health context. PGHT takes an interdisciplinary approach to address the most pressing issues in healthcare delivery in Zanzibar.



The lab team is currently working to design an affordable and robust diagnostic to address pre-eclamptic renal and liver failure, with consideration of sociocultural factors and local limitations.



The public health team examines socio-ecological drivers of public health challenges to ensure adoptability and utilization of proposed technology and anticipate potential obstacles



The mathematical modeling team uses dynamic health system modeling to model patients' access to quality health commodities, identify bottlenecks and inequities that hinder the system's responsiveness, and build capacity of health delivery.

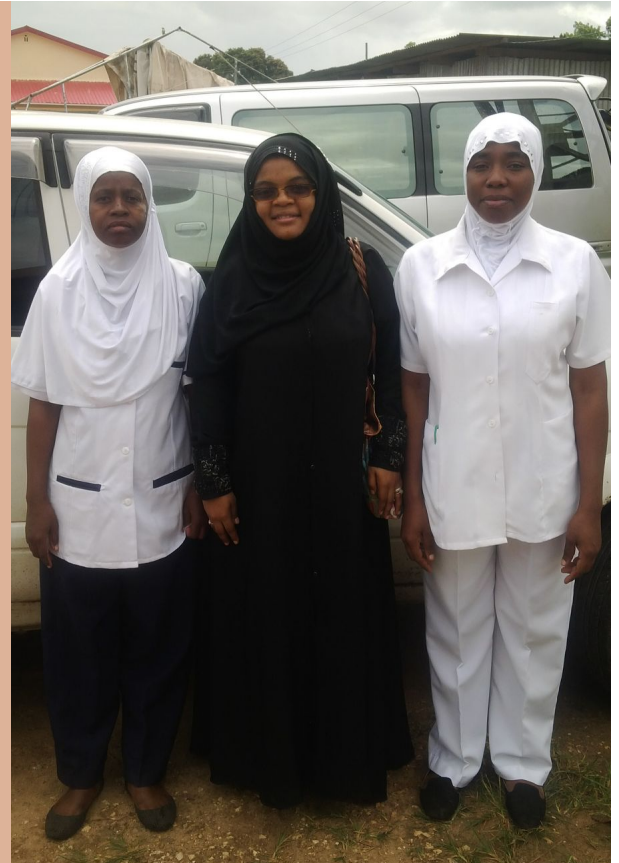


The quality control team is examining image processing techniques to distinguish between quality and defective malaria rapid diagnostic tests (RDTs) while providing a quantitative method to read RDT results that eliminates potential user bias.

MODELING PUBLIC HEALTH CHALLENGES



The public health survey focused on affordability, accessibility, and adoptability will be released in early June to health professionals in East Africa. To understand the landscape the diagnostic device will encounter in Zanzibar, the survey has a section focusing on manufacturing, procurement, and distribution of medical supplies, a section gathering information on the availability of testing in health facilities, and a section analyzing the adoptability potential of the new device. Data from survey responses will be used to revise the qualitative model that was created and presented at the ICSU Urban Health and Wellbeing Workshop in April. Additional data will aid in the development of a quantitative model of medical technology and therapeutic supply chains from manufacturer to consumer in Zanzibar, providing insight on the quality of access to medical technology for both healthcare centers from manufacturers as well as to patients from healthcare centers.



LAB RESEARCH



Hepatic cell injury elevates two aminotransferases, ALT and AST, in blood plasma prior to the appearance of clinical symptoms. Comparable elevations of both ALT and AST are highly characteristic of early stages of liver failure, and as such development of an assay that measures their concentration in blood plasma may be used to monitor organ function in pre-eclamptic women. Current lab work has focused on using amperometry to develop a quantitative assay for ALT via a coupled enzyme reaction that generates a current measurable by a handheld glucometer when the assay is implemented onto a paper based device with electrodes. In amperometry, charged species generate a current directly proportional to the amount of enzyme present when an electric potential is applied across the reacting sample. Because the reaction catalyzed by ALT does not produce any charged species that differ from the reactants, the reaction must be coupled to an oxidation or reduction reaction that generates ions or electrons. This will be achieved by reacting the product of the reactants with excess lactate dehydrogenase to generate hydrogen ions.





PLANNING FOR ZANZIBAR



While research continues this summer in Boston headquarters, six students from the PGHT team will travel to Zanzibar from July 10th through August 20th. PGHT is looking forward to the 2016 return trip that will focus on validating our device prototype to ensure the assay will function in local conditions, and confirm the device is easy for local health workers to use. This year students will also visit Pemba, which is more rural and has more challenges delivering quality healthcare than Unguja, to observe laboratory conditions and laboratory tests available to more rural populations. Regional and zonal medical stores will be visited in Zanzibar and on the mainland to better understand the medical device supply chain a finalized device would go through. Additionally, the team will meet with Ministry of Health Procurement to understand what quality control measures are being taken with malaria rapid diagnostic tests (RDTs) once the devices are in country. The team aims to use imaging processing techniques to distinguish between quality and defective RDTs.

STUDENT VOICES



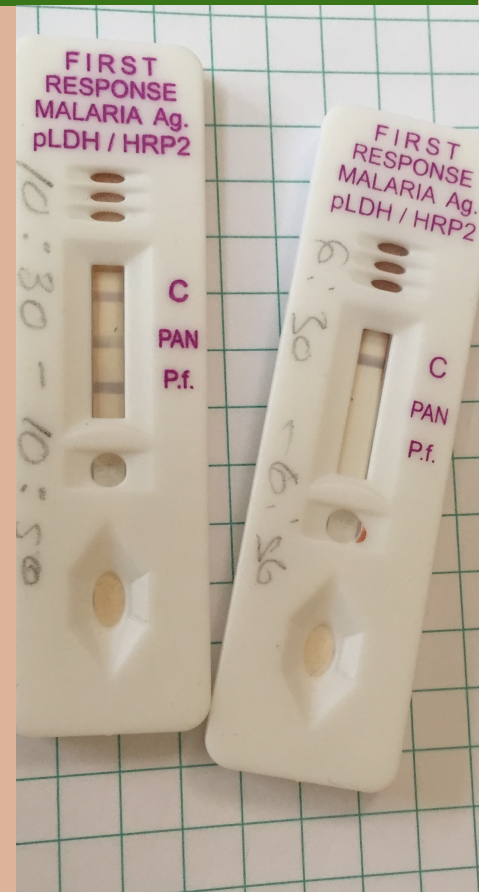
"It is rare that one gets to be involved in global health field work as an undergraduate, and having the opportunity to go to Zanzibar this summer will be a great way to learn about the factors that affect access to healthcare in different cultures, and how gaps in access may be bridged by the development of technology. This program has given me hands on experience in lab work, public health research, and global health outreach - I can't wait to see what else we can accomplish."
Devika Nadkarni, B.A. Chemistry



"I learned about global health in application and how to impact the specific population in Zanzibar through extensive research and collaboration. This is a complex and dynamic project, and I hope to continue addressing these health concerns with compatible technology."
Grace Kim, B.A. Neuroscience



"There are so many moving parts essential to undertaking such a unique, multidisciplinary program. While lab work is important, work outside the lab also determines the overall success of our goals. By understanding culture and the overall health climate in Zanzibar, an appropriate technology can be implemented that can hopefully pave the road for future solutions in the developing world."
Hoda Yehia, B.A. Biology



Maya Saint Germain
B.S. Computer
Engineering

Harshit Harpaldas
B.S. Biomedical
Engineering

Grace Kim
B.A. Neuroscience

Jared Lawson
B.S. Mechanical
Engineering

Napassorn
Lerdsudwichai
B.S. Biomedical
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Devika Nadkarni
B.A. Chemistry

Sarem Rashid
B.S. Biomedical
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Hoda Yehia
B.S. Health Science

Sandesh Gourkar
M.Eng Biomedical
Engineering

Sara Gravelyn
M.Eng Biomedical
Engineering

Adedayo Jobi-Odeneye
MPH

PUBLICATIONS AND PRESENTATIONS

Engineering, Global Health, and Inclusive Innovation: Focus on Partnership, System Strengthening, and Local Impact for SDGs

Katie Clifford, Muhammad H. Zaman
Global Health Action, Volume 9 (2016)

Access to Health Commodities in Zanzibar: Dynamic Systems Modeling to Improve Health System Logistics in East African Urban Settings

2016 ISCU Workshop: Modeling Urban Health and Wellbeing, Xiamen, China

Maternal Health to Train Engineering Students in Global Health

Ishrat Bano, Muhammad H. Zaman
2016 Annual CUGH Global Health Conference, San Francisco, CA



MESSAGE FROM THE DIRECTOR

I am pleased to share the second quarterly newsletter with you.

The student team, in the past quarter, has made tremendous progress in all areas and have developed new tools and new understanding by using interdisciplinary approaches from engineering, physical and biological sciences and public health. On one hand, the students are working in the lab and developing new hand-held tests for pre-eclampsia, and on the other, they are also focusing on strengthening the existing system by improving quality of care that exists within the system. The new addition of mathematical modeling to analyze public health challenges, and in particular access to quality care, is bringing technology, awareness and socio-economic factors into a single framework that will impact policy. On the education front, we are working with instructors in the sophomore, junior and senior year to expose our engineering students to multi-dimensional complexity of healthcare in resource limited settings. And at the freshmen level, we have developed and offered a new course called "Biomedical Environments: BME in Resource Rich and Resource Limited Settings" that is creating awareness about the power as well as limits of engineering in solving global development problems and how we need to use an integrated, multi-disciplinary approach to tackle the grand challenges of our time.

I hope that you all will share your feedback, ideas and suggestions as we march on our journey to become better thinkers and socially conscious engineers, scientists and scholars who are eager and anxious to make the world a better place.

Yours,
Muhammad H. Zaman
Howard Hughes Medical Institute Professor

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