



PARTNERSHIP FOR GLOBAL HEALTH TECHNOLOGIES



JUNE 2017, ISSUE 6

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. PGHT aims to improve the quality of health care in Zanzibar by applying biomedical engineering principles within a public health context. We use 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-eclampsic liver failure. This semester, they focused on testing and validating their assay in the lab.



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. Following submission of our first manuscript on the project, the modeling team is now focusing on modeling how access to material and human resources at Mnazi Mmoja Hospital impacts maternal morbidity and mortality.



The quality control team is examining image processing techniques to distinguish between quality and defective malaria rapid diagnostic tests (RDTs) . This semester, they began using Python to develop techniques for image recognition.

MATERNAL HEALTH & LIVER FUNCTION MONITORING



The liver function diagnostic team is excited to move forward with feedback received from the Rice360 Design Competition and refine our assay to work under physiological conditions. We are currently investigating the usability of glutamate dehydrogenase (GLDH) as an oxidoreductase alternative. The assay development subgroup will validate spectrophotometrically the GLDH and LDH coupled-assays to determine which enzyme is better suited for our device. Our instrumentation subgroup is moving forward with quantifying our reaction on potentiostats and commercially available glucometers. After calibrating the machines, we will test the sensitivity of these machines to varying concentrations of ALT and move forward accordingly.

The team is additionally in the process of characterizing the AST reaction and aims to use these findings to optimize the rate at which this reaction proceeds. This research will lead to further insight on how to best integrate both ALT and AST assay into one device. Ultimately, the addition of this AST assay will allow for a more precise liver diagnosis.



RICE 360^o GLOBAL HEALTH CHALLENGE

On March 24, four PGHT students, Nappassorn Lerdsuwichai, Helen Lindsay, Devika Nadkarni, and Sarem Rashid attended the RICE 360 Institute design competition at in Houston, TX.

The challenge called for solutions to pressing Global health challenges. After an initial application process, 20 teams were selected to compete. The students gave a presentation about the ALT rapid diagnostic blood test for liver function in preeclampsia patients.

The design competition provided a great opportunity for our team to present our project. One key piece of feedback we received was to look into methods of amperometric measurement other than a glucometer, which may be cheaper or more effective. We have begun to apply this idea and other feedback in the lab, and are looking forward to the next steps





MODELING ACCESS TO HEALTH CARE



Our goal to devise a model that will allow administrators at the Mnazi Moja Hospital to identify what impact human and material resources are having on maternal mortality and in turn identify possible bottlenecks. This quarter we have made tremendous progress on the model, after many a brainstorming session the team has been able to lay down a solid framework and algorithm for the model, as shown below. This framework has now been built on and a large chunk of the model has been programmed. The program is written in Java and looks to take advantage of object orientated programming. This summer we are looking forward to hitting the ground running and start collecting data that will be essential to testing the model.

Middle of Test Strip



Distorted



Grayscale



ROI selection



Isolated ROI



QUALITY CONTROL OF MALARIA RAPID DIAGNOSTIC TESTS



In utilizing microscopy to evaluate features of interest on the malaria rapid diagnostic tests (mRDTs), the Quality Control (QC) group is moving forward on selecting a camera that can take high-quality images of various components of the mRDTs in Tanzania for data collection. Currently, the group is conducting experiments to observe defects that can potentially occur on any mRDT due to either manufacturing or upon sample testing related causes. This will allow the team to determine the uniqueness of a mRDT image when a particular defect occurs. These observations will ultimately be taken into account when developing a data analytic algorithm for mRDT quality control, along with the images collected from mRDTs used in the Tanzanian mainland and Zanzibar.

COLLABORATOR VOICE

“A growing number of deliveries in health care facilities and a fertility rate over 5 for women in Zanzibar result in Zanzibari women regularly finding themselves within the walls of the island archipelago's hospitals' obstetric wards. Modelling the aspects of patient care at department level has the potential to help us reveal its weaknesses while being able to quantify those. It will augment valid and robust feedback to the policy makers. This multi-university collaboration combines all our strengths, from clinical to technical, in order to support local improvement of quality maternal health care. We are very excited for this summer, when we will extend our collaboration from e-mail and Skype mode to actually being in the field together, in Zanzibar. ”

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MESSAGE FROM THE DIRECTOR

Dear Friends of the Program,

Our students, working closely with our collaborators from all across the world, continue to make tremendous progress on their projects. In the last quarter, we have made significant progress in all of our major thrusts. Our mathematical model to analyze the challenges in access to care, at the facility and system level, continues to provide us with new insights. Partnering with colleagues on the ground, our model is simultaneously able to capture the complexities of providing care and the challenges of limited resources at the hospital. During the upcoming summer trip, we will be working closely with officials at the hospital and the ministry of health to collect further data to improve the model, and strategize how to implement the results at the facility and district level for improved resource utilization and better health outcomes.

We have also established a new collaboration with colleagues at The Muhimbili University of Health and Allied Sciences (MUHAS) in Dar-es-Salam to systematically evaluate the quality of malarial RDTs in the country. This summer, our students will work closely with students and staff at MUHAS to develop new algorithms for testing RDT quality in the country. Finally, the work on developing new technologies for liver and kidney testing continues to move forward and the summer students will work closely with patients, caregivers and physicians in Zanzibar to further optimize their technology.

Our work in improving maternal health, especially of vulnerable mothers, through integrated technology and policy is just beginning. The work is not easy and the challenges are significant, but every day, I am inspired by the intelligence, commitment and passion of our students who bring new energy and new optimism to our work. I hope that you will continue to provide us with your input, insight and support as we continue to make progress in our effort towards a healthier, safer and more equitable world.

Thank you!

Yours,

Muhammad

MUHAMMAD H. ZAMAN

HOWARD HUGHES MEDICAL INSTITUTE PROFESSOR

Generously Supported By:



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