Africa Storytelling Challenge Winners: In Philippa Ngaju Makobore's Words

Recognized for the noteworthy contributions she is making to advance scientific innovations throughout Africa and beyond, Makobore was named one of the five winners of the inaugural Champions of Science—Africa Storytelling Challenge. In the essay that follows, see how this pioneer is improving her community and inspiring the next generation to pursue scientific fields.

Children in Sub Sahara Africa continue to die from preventable causes. Most of these deaths stem from delays in accessing quality care from skilled clinicians and the dearth of appropriate and affordable medical devices that can be sustained in low resource settings. Improving the accuracy and safety of intravenous (IV) infusion therapy in particular is a neglected component of child health in humanitarian settings. Based on the FEAST trial over 10% of children admitted to hospitals in East Africa require immediate infusion of fluids and or IV medications. Approximately 67% of these children are under the age of five of whom 11-12% die, often within hours of admission. In Uganda 1 in 3 children seeking medical care in a health facility are in shock and require emergency intravenous therapy. To ensure the safe delivery of IV fluids and medication it is critical to control the rate of fluid flow and volume delivered to a patient over a given period of time based on prescribed requirements. In Sub Sahara African countries, the standard of care for IV therapy is manual delivery controlled by a clinician. With a scarcity of skilled clinicians, patient care and safety are compromised leading to complications associated with improper IV delivery methods.

Children require carefully controlled IV fluids and drugs to prevent over or under infusion to prevent serious adverse events associated with the delivery of these fluids that could quickly lead to mortality. My team of engineers and I from the Instrumentation Division at the Uganda Industrial Research Institute uncovered this unmet need when we visited the children's acute care ward and neonatal intensive care unit at Uganda's National Referral Hospital, Mulago in Kampala. We were struck by the overall lack of essential diagnostic and therapeutic devices for basic medical care of young children. Our public hospitals painted a picture of the stark reality of our failing healthcare sector which cannot provide basic quality care to the average Ugandan. Having had the opportunity and exposure of an international education in engineering I strongly felt that I had to give back to my community and my country through the skills I had acquired. To get a better idea of the gravity of the situation on the ground we expanded this assessment on clinical and medical equipment needs to 7 other hospitals in Northern, Eastern and Western Uganda.

The data collected showed that most infusion pumps and controllers are acquired through donor assistance and may not be the most appropriate for use in a low resource setting. Despite the intended goodwill of donors, important parameters such as calibration, voltage and frequency ratings, availability of mains power supply, ease of accessing spare parts and appropriate training are usually not taken into account.

Back in the lab, we brainstormed on a solution and came up with the Electronically Controlled Gravity Feed Infusion Set (ECGF), which automates the entire IV infusion therapy while providing accuracy and the minimum safety features in the event of over infusion, under infusion, unplugged or faulty sensors and air bubble detection. A user interface that requires minimal training prevents unnecessary medical errors and a hybrid charging bed implemented with both solar and AC mains improves utilization of the ECGF in rural health facilities that experience intermittent or sometimes no power supply. In addition to the provision of an appropriate and affordable medical technology, the public health impact of the ECGF is the alleviation of the clinician work burden associated with manual delivery of IV fluids or medication.

In January 2016, the ECGF won a 1st place innovation award from the Patient Safety Movement Foundation at the 4th Annual World Patient Safety, Science and Technology Summit in Dana Point, California for the device's potential to prevent unnecessary medical errors and improve access to affordable quality medical technology in any hospital globally. In 2017, the ECGF was awarded the 2nd Innovation Prize for Africa for its novelty and is to date undergoing clinical testing with the support of a seed grant from Grand Challenges Canada.

The ECGF has given confidence to innovators in Uganda as one of the first home grown innovations designed by Ugandan engineers to be piloted in patients following institutional review board approval. Broad dissemination of its design and development, testing and potential impact has given both public and private stakeholders in Uganda a fresh insight into the potential for medical technology developed within Uganda. It is important to tell stories of science to inspire future innovators and leaders, especially stories of African ingenuity that validate the importance of solving African problems with African solutions.

The content and views presented here are those of the individual Challenge participant.

About the Africa Storytelling Challenge

The inaugural Champions of Science—Africa Storytelling Challenge took place between May and August 2018. Open to all scientists doing innovative work in Africa, the contest drew more than 100 submissions. An independent selection committee of scientists, policymakers and science journalists reviewed the applications and selected the winners. Each winner will be awarded $5,000 and will have the opportunity to share their stories at the 2019 American Association for the Advancement of Science (AAAS) annual meeting in Washington, D.C.