A novel approach to improve clinical decision support and make possible real-time epidemiology for infectious disease outbreaks using mobile technology

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Introduction. Technology is making possible new approaches to overcome old public health challenges. Conventional epidemiologic approaches are often limited because the transmission of devastating diseases like cholera outpaces current paper based techniques. Cellular networks are now ubiquitous and offer opportunities for novel high-yield interventions.

Approach. Our research strategy requires two phases. In phase one, we are asking how might we develop a mobile technology platform to provide improved clinical decision support and make possible real-time epidemiology to rapidly identify actionable public health interventions. We are using cholera outbreaks in Bangladesh as a model system to explore current clinical and epidemiologic approaches to outbreak response. We are then developing solutions to the problems we discover using a process called human centered design. Phase two of the project merges the solutions developed at the clinic level with larger community based networks of first responders (e.g. community healthcare workers and pharmacists). This abstract focuses on phase one.

Development. Based on opportunities discovered during the preliminary studies, we have designed and built a toolkit for forty dollar smartphones manufactured in Bangladesh that has two primary modalities coined the Rehydration Calculator and Outbreak Responder. The Rehydration Calculator provides rapid decision support to rehydrate patients with life-threatening dehydration from diarrheal disease. The calculator provides recommendations for fluids and medications based on WHO guidelines. The Outbreak Responder is for outbreak response teams or hospitals with high diarrheal disease caseloads. It gathers demographic and clinical data and provides a concise assessment and plan with a safety checklist. Clinical information includes vaccination status which allows for crowd-mapping vaccine efficacy. GIS data include the place of treatment and the patient's residence gathered via a touchscreen map. Follow-up instructions and a call back number are sent directly to the patient's cell phone via text message. A web-based interface receives the data in a secure manner and provides interactive real-time data visualization.

Next steps. The prototype will be evaluated and iterated in three stages: small design sessions with standardized cases, a controlled pilot study, and a cluster randomized controlled trial. We look forward to exploring partnerships to test and implement these tools globally for the betterment of patients and to improve our fundamental understanding of infectious diseases like cholera. We also seek support and dialogue on scaling the project to other epidemic infections, including emerging outbreaks like Ebola.