OpenMRS Ebola Case Study

Fighting Ebola with Open Source Collaboration

The enormity and severity of the West African Ebola epidemic that began in 2014 is hard to fathom. Over 10,000 people died with hundreds of thousands deeply affected by loss. In treating any medical condition, information is needed to provide adequate care, but when it's an epidemic so severe, so dangerous and so fast-moving, it's required more than ever.

Ebola creates enormous barriers for patient care. It's communicability means those who directly treat patients within the "Red Zone" must take extreme precautions. The lack of knowledge about who is infected and what constitutes effective treatment — not to mention the swift and severe toll it takes on the human body — makes caring for those affected extremely difficult. One critical, yet perhaps surprising, need during the crisis was an electronic medical record system.

The Need for Actionable Data

An electronic medical record system and the data it captures is crucial for giving patients the best care and also understanding, and therefore better treating, the disease in the future. Without an EMR, clinicians can't access key data like lab tests, drug regimens, allergies and drug reactions. And since Ebola is an emerging disease not yet well understood, documenting treatment and outcomes is critical. Data and the insights that can be surmised is our only hope of effectively solving this deadly puzzle.

Not only is Ebola extremely difficult to treat, but it also presents key challenges in medical information collection and management. The virus can live on hard surfaces, so notes or drug prescriptions cannot be taken out the Ebola treatment center. This compromises safe prescribing and dispensing of drugs, which is crucial for survival. We've all seen pictures of the protective, non-breathable suits worn by care-providers that take twenty minutes to put on and another twenty to remove. Originally clinicians within the treatment centers would have to travel to a fence and shout the information to someone on the outside who would record it — hardly an effective process — but one that also prevented the clinicians from having readable access to what had been done, reactions of the patients to previous care or other key information about their medical history. With Ebola, for instance, monitoring vital signs and hydration levels can hold the keys to effective treatment.

Obviously in an epidemic like Ebola, timely response is crucial. How could the dispersed global health IT community band together to solve the enormous information challenges presented by this disease? With difficulties including the cumbersome suits, the lack of conventional paper-based reporting needs, the extreme communicability of the virus — all within already resource-poor environments where electricity, computer networking and other basics were not present or reliable — the urgency and challenges were acute.

A Rapid Response

Luckily an open medical record platform already existed. In 2015, Save the Children International identified the need for medical data collection in the Ebola treatment centers and knew that there was already an open source platform they could use: OpenMRS. After contact with the project, OpenMRS quickly called upon experienced medical informatics people to volunteer and create proof-of-concepts which included UI mockups, analyzing clinical forms and extending our shared data dictionary. OpenMRS provided the needed structure so those volunteers could come together through hackathons and the already existing online community. Most importantly OpenMRS leadership connected Save the Children with a service provider, ThoughtWorks, who put together a dedicated team to move from proof of concepts to a production application. ThoughtWorks had been very active in the OpenMRS community so they could get up and running quickly.

"Having an open community where experts, volunteers and our team could come together quickly was absolutely essential," said Darius Jazayeri, Global Health Technical Principal, ThoughtWorks. "Having an open platform but also an open community where bonds could be established is such a valuable part of the global health equity puzzle, especially in crises like Ebola."

Ultimately, volunteers and staff from ThoughtWorks, Save the Children International, the London School of Hygiene and Tropical Medicine, the University of Leeds, Elsevier, and the OpenMRS community – and led from Kerry town, Sierra Leone and Kampala, Uganda, with contributions from teams spanning Brazil, China, Canada, Australia, the USA, and the UK – built an innovative EMR using OpenMRS 2.1, a modular open-source electronic medical record platform used in more than 60 low- and middle-income countries. The shared research

and development present in the open source system — over 12 years of active development — allowed an urgent response to Ebola to quickly take flight.

The OpenMRS-based system runs on laptops in the Green Zone and waterproof sterilizable Android tablets in the Red Zone, with different User Interfaces (UIs) for each. The Red Zone UI is designed for use while wearing the protective suits. Typing must be minimal, so the UI is touch-based with high- contrast color schemes, large buttons for gloved hands, and large text since the suits interfere with vision. Speed is of the essence since the suits are not breathable and get extremely hot, very quickly in the tropical climate. The Green Zone UI presents detailed information that clinicians can review in a less-constrained environment. The project used core OpenMRS concepts, data structures and functional modules, and added Ebola-specific core concepts to simplify decision support and reporting across Ebola treatment sites. For this project, streamlining what was required in the field was crucial without limiting the usefulness of the data by those outside of the crisis zone.

The OpenMRS-based Ebola EMR supports such functions as patient registration, bed allocation, recording of vital signs and symptoms, ordering and administration of medications and IV fluids, laboratory results, clinical notes, discharge of patients, and data export for analysis. Tablets and laptops communicate securely with a server on a local wireless network, which, together with uninterruptible power supplies, means the system can continue running even when power or external network connections go down. This level of reliability allows for the replacement of paper-based systems even in settings with poor infrastructure. The data can also be easily backed up.

The team worked with clinicians and staff in the field to design a system that could work for their needs. It was deployed in the Kerry Town Ebola Treatment

Center outside of Freetown in Sierra Leone. Clinical users gave extensive feedback on their experiences with the system and how to improve it allowing rapid cycles of design, development and testing.

Open Source in Action

The OpenMRS platform was in fact used as the basis of two different tablet based ebola EMR systems developed independently, one by the Thoughtworks/Save the Children coalition and one by Google and Doctors Without Borders — "Project Buendia." The OpenMRS CIEL concept dictionary team also provided a valuable resource by curating a terminology dictionary that both systems shared — this would never have happened without building on OpenMRS as a common platform. As Wired Magazine says in an article about the Google tablet based Buendia, "[This project] could also provide a path to all sorts of other new technologies for fighting disease and illness in developing countries. If tech is open source, you see, you can not only use it for free, but modify it. One technology is just a starting point for another." In the challenge of Ebola, OpenMRS provided not only a code base, but an open umbrella and way of working for global health projects.

Also because many of these projects are using a similar foundation, interoperability between them is enhanced. As more and more countries and communities base their EMRs on OpenMRS, the network effect of shared data and systems grows. OpenMRS already supports interoperability with the District Health Information System (DHIS2) widely deployed in LMICs including countries in West Africa, as well as with mHealth applications, laboratory information systems, and logistics systems like Udon.

Readiness For the Future

Public health officials know that it's when, not if, the next epidemic strikes. Whether it's Ebola or others that require intensive care, such as a current outbreak of yellow fever in Africa, the projects created out of the collaboration between OpenMRS, Thoughtworks and Save the Children will help the world be prepared for the next one. The work that was done collectively on these systems stays in the open source project ready to become the foundation of the next solution — without direct cost.

Supporting open source platforms that can be quickly customized to respond to crises like the Ebola outbreak is crucial. Instead of siloed projects that may effectively address one need, but are not open for all to use, we must demand open source be the foundation of our global health IT infrastructure. With further refinements of the OpenMRS Ebola tools we could deploy EMR systems to disease outbreaks in days rather weeks. Our lives may indeed one day depend on it.

Please consider supporting or joining OpenMRS, the most deployed open source platform in health IT.