

to detect TB at an early stage in patients. Current diagnostic tests, including sputum sample microscopy and the Mantoux skin test, are very slow and characterized by many false-positive results. Thus, a rapid point-of-care diagnostic for TB remains an unresolved challenge.

**Methods:** Nucleic acid amplification tests (NAATs) have shown great promise in quickly detecting genes of interest with high specificity and sensitivity. This study employs the combination of a drop-based microfluidics platform and isothermal DNA amplification to create a breakthrough technology that enables the detection of TB bacteria from the bloodstream or sputum. Advantages of drop-based microfluidics include reduced sample size and reagent consumption, short processing times, and enhanced sensitivity. In our device, TB DNA is rapidly encapsulated in microfluidic drops (water-in-oil emulsions), amplified using loop-mediated isothermal amplification (LAMP), and detected via fluorescent signal.

**Findings:** The method allows for all steps, including emulsification with a pipette, amplification at a single temperature, and quantitative-detection from a reservoir, to be done on-chip in less than 1 hour. Imaging and quantification of fluorescent drops (indicating the presence of TB DNA) can be achieved by a simple color camera.

**Interpretation:** Such a microfluidic technique would allow for rapid TB diagnosis to be done directly from the blood/sputum in resource-poor locations of the developing world.

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### The development of a novel local area network based EMR utilizing handheld devices to serve resource-limited clinics

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**Program/Project purpose:** Our project describes a practical electronic medical record (EMR) for global use in areas lacking Internet access or significant informational technology (IT) experience. We seek to provide better clinical communication, improved patient safety, and more coordinated and efficient patient care while maintaining patient privacy at resource-limited locations. We designed and beta-tested our new EMR at a remote clinic site with the above challenges. Our system provides an economical, practical, secure, and mobile EMR system useful for a myriad of global health settings.

**Structure/Method/Design:** We pair a low-cost, commercially available wireless router/hard drive combo with unique software to create a dynamic system not requiring Internet access during encounters. Our portable EMR utilizes an Apple Airport Time Capsule that serves as a wireless hard drive and full-featured Wi-Fi base station. The Time Capsule generates a secure local area network allowing multiple on-site providers to sync with the server and access the chart in real time. Dynamic portable document format (PDF) templates are organized within the iOS application “PDF Expert” providing an individual patient record. The patient PDF template outlines the encounter using free text, check boxes,

and drop down selections that may be customized depending on clinic context. The resulting system allows health providers to share and analyze secure and confidential health information with local stakeholders including hospitals, governmental agencies, or patients themselves.

**Outcome & Evaluation:** We beta-tested our EMR in the spring of 2015 at a remote health post in the Andes to better understand the individual challenges and aspects of the EMR. The system efficiently managed and securely stored tablet-generated simulated “patient encounters” on the Airport Time Capsule server. The EMR simulation demonstrated a promising model to enhance clinic flow, patient documentation, and medical record communication with local health officials.

**Going Forward:** While no one template could meet every system’s needs in documentation, ours may be easily adapted for site nuances or research data collection applications. Limitations include tablet and phone connectivity only for iOS devices. Our system offers a technically viable EMR solution in resource-limited settings with potential applications for global health service and research.

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### Adoption of information and communication technologies for early detection of breast and cervical cancers in low- and middle-income countries

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**Purpose:** In response to the growing burden of breast and cervical cancers, low- and middle-income countries (LMICs) are beginning to implement national cancer prevention programs. We reviewed the literature on information and communication technology (ICT) applications in the prevention of breast and cervical cancers in LMICs in order to examine their potential to enhance cancer prevention efforts.

**Methods:** Ten databases of peer-reviewed and grey literature were searched using an automated strategy for English language articles on the use of mHealth and teleoncology in breast and cervical cancer prevention (screening and early detection) that were published between 2005 and 2015. Articles that described the rationale for using these ICTs and/or implementation experiences (successes, challenges and outcomes) were reviewed. Bibliographies of articles that matched the eligibility criteria were reviewed to identify additional relevant references.

**Results:** Out of the initial 285 citations that were identified, eight met the inclusion criteria. Of these, four used primary data, two were reviews and two were commentaries. Articles described the potential for mHealth and teleoncology to address both demand and supply side challenges to cancer prevention such as awareness, access, and cost in LMICs. However, there was a dearth of evidence to support these hypotheses.