

There were no differences between the participants' perceptions of privacy ($p=0.62$), embarrassment ($p=0.17$), physical discomfort ($p=1.0$), or pain ($p=0.36$) between the tampon and clinician-collected methods. However, more women reported feeling "very well cared for" during the clinician-collected method, compared to the tampon-collection ($p < 0.01$). Most women ($n = 261$; 80.3%) were willing to collect the tampon at home and bring the specimen with them into the clinic. In our study population, 146 (44.9%) women were familiar with using tampons. About half of the women (182; 56%) reported that carrying the tampon for an hour was "very easy," while 62 (19.1%) reported some difficulty with using the tampon.

Interpretation: Slightly more women preferred a clinician-collected swab compared to a self-collected tampon in our study population. While there were no differences in relation to privacy, pain, or discomfort, the clinician-collected method allowed women to feel better cared for, which might have driven the observed difference in preference. Therefore, tampon-collected specimens could be a viable alternative for those patients who do not wish to undergo a pelvic examination or who prefer home-collection as a means for cervical cancer screening.

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Brief quality improvement interventions are effective in changing mid-level provider prescribing behavior in a developing country context

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Background: Quality improvement processes are important globally. There is a paucity of effectiveness trials of quality improvement processes in primary care settings in developing countries. Our aim in this study was to assess the effectiveness of brief educational interventions for improving diagnosis and management of common conditions, particularly in the area of antibiotic prescribing practices. We hypothesized that brief educational sessions would be effective at improving provider quality for common outpatient illnesses.

Methods: We conducted a multi-site, pre-post effectiveness study of staged interventions among outpatient mid-level providers at two peri-urban medical facilities in Kenya. Study participants included accredited Clinical Officers employed at the sites. We deployed three educational interventions on the management of urinary tract infection (UTI) to both sites in a non-randomized fashion. First, a clinical practice guideline was introduced via a formal educational session. Second, investigators facilitated peer-to-peer chart review to provide feedback on guideline adherence. Third, recently published locally relevant antibiotic resistance data was reviewed with providers in an educational session. Charts of female patients between the ages of 14–49 who were given a diagnosis of UTI were audited before and after each intervention. These charts were scored using a binary scale on a series of five quality metrics. Auditors used strict chart extraction tools, but were not blinded to the stage of intervention. The primary outcome was the change in provider prescribing behavior on the antibiotic prescription quality metric. The secondary outcome was a composite score of all five metrics. Fisher's exact test was used to compare performance on the primary outcome for the pre- and post-intervention stages. A two-tailed Student's *t*-test was used to compare the composite quality scores. Approval for this study was granted by the Kijabe Hospital Ethics Committee.

Findings: Pre-intervention charts were reviewed in a combined analysis across both sites ($N = 147$). Recommended prescribing

practices were followed in 19% of charts reviewed prior to any educational intervention. The mean quality metric composite score during this period was 2.140 ($SD = 0.87$) on a five-point scale. 143 charts were reviewed in the post-intervention period ($N = 143$). Recommended prescribing practices were followed in 41% of charts following the intervention (Fisher's exact test = 0.000039, $N = 290$, $p < 0.001$). The mean quality metric composite score during this period increased to 2.72 ($SD = 1.07$), ($t(290) = 4.949$, $p < 0.001$).

Interpretation: The results of the first phase of this quality improvement effectiveness study suggest that brief educational interventions are effective in changing provider prescribing behavior and improving quality across multiple metrics. This study provides a foundation to implement additional quality improvement interventions in outpatient community practices in low- and middle-income countries.

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A point-of-care device for the rapid diagnosis of tuberculosis

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Program/Project Purpose: Despite being a largely curable disease, tuberculosis infected 8.6 million people and killed 1.3 million in 2012. These grim statistics are largely due to low detection rates—approximately 60% of suspected TB cases go undiagnosed and untreated because there is no fast and accurate way to detect TB. We aim to develop a simple-to-use, inexpensive, and rapid point-of-care TB diagnostic for use in low-resource settings where TB is most prevalent.

Structure/Method/Design: For years, TB diagnostics has remained surprisingly stagnant. Recently, a new option became commercially available: a lateral flow assay that functions like a home pregnancy test. The test—Determine™ TB LAM Ag test (Alere Inc.)—diagnoses TB by detecting lipoarabinomannan (LAM), a cell wall glycolipid of *Mycobacterium tuberculosis* that is shed into the urine of persons with active TB. Although initially promising, numerous clinical evaluations have convincingly demonstrated that the test's sensitivity is too low to accurately diagnose the general TB population. The problem is likely that urinary LAM concentrations are naturally present at levels too low to be immunodetectable. Some studies, however, suggest that a 10-fold increase in LAM concentration could dramatically improve its immunodetectability. We developed a method to pre-concentrate LAM without sophisticated laboratory equipment (e.g., centrifuge) to enhance its downstream immunodetection. Our technology can be easily translated to a battery-powered, point-of-care platform and readily integrated with a test like Determine™ to leverage the diagnostic's simplicity and commercial availability. To pre-concentrate LAM, we applied localized heat to a paper-based device to enhance urine evaporation and LAM concentration. We proved the feasibility of this strategy by concentrating bromophenol blue (BPB) in water and LAM in water or urine using a commercial resistive heater (as the localized heat source) heated to 220°C with a benchtop power supply. BPB and LAM were quantified via spectrophotometry and immunoblotting, respectively.

Outcomes & Evaluation: Initial tests to concentrate BPB in water by heating the paper strip for 10 minutes resulted in a 19-fold concentration of BPB (19.2 ± 3.5 ; $n=3$). Concentrating LAM in water for 10 minutes resulted in a 21-fold increase in LAM (21.4 ± 1.5 ; $n=3$). The comparable degree of concentration of BPB and LAM in