Point of Care Tampon (POCkeT) Colposcope for Cervical Cancer Screening

There is a critical global need for a see and treat paradigm for cervical cancer that is effective in low-resource communities. Guidelines established by the Alliance for the Prevention of Cervical Cancer (ACCP) on strategies for screening cervical cancer in resource-limited settings, have suggested visual inspection with acetic acid (VIA) followed by cryotherapy of VIA positive lesions, as the most viable strategy for reducing the mortality associated with cervical cancer in the low resource communities.

In the U.S., VIA with magnification (VIAM) is performed using a low power microscope, called the colposcope, in women who have already been screened and found to have positive Pap smears. Magnification (4-7X) is used to visualize subtle features on the cervix, which is exposed with the aid of a speculum. However, the cost of colposcopes (U.S. $10K-$20K) makes their use prohibitive in low resource settings (3, 4). Therefore, VIA is frequently performed with just a light source and the naked eye. Even with appropriate training, however, there can be large variations in accuracy due to the highly subjective nature of how the test is implemented, and variation in health worker experience. Furthermore, in East Africa, where the incidence of cervical cancer is highest, the health-worker-to-population ratio is one of the lowest globally (1:45,000) (5).

We have developed a novel transvaginal digital colposcope to address this need (Fig.1). It is inspired by the ubiquitous feminine hygiene product the tampon digital applicator and spy pen camera. An Android tablet or smartphone stores and transmit images. We envision that implementation of these kits by community health workers will allow for a large catchment of screening in traditionally underserved regions by task shifting and significantly, lowering training and equipment costs associated with traditional digital colposcopy. Similar to disposable cameras being returned to a photo development kiosk, these kits will be collected and processed at a centralized location. The high-resolution multimodal images will be downloaded and then hosted on a server for remote expert diagnosis.

To date, we have collected images from a total of 30 patients with the TVDC. Of these patients, 14 were biopsy-confirmed negative, 7 had CIN I, 2 had CIN II and 7 had CIN III. The TVDC is significantly less expensive (several hundreds of dollars) compared to a state of the art digital colposcope (tens of thousands of dollars) but comparable in image quality (Fig. 2) by virtue of the fact that it is placed inside the vagina, like a transvaginal ultrasound probe, at a much closer working distance than a traditional colposcope (30 mm instead of the standard 30 cm), thus bringing the benefits of colposcopy to low resource settings.

Collaboration - Please contact Marlee Krieger (msk22@duke.edu) and Jenna Mueller (jenna.mueller@duke.edu) for more information on how to with us to use this technology at your site.