Improving Breast Ultrasound Interpretation in Uganda Using a Condensed Breast Imaging Reporting and Data System

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Rationale and Objectives: This study aimed to determine whether a 2-day educational course using a condensed Breast Imaging Reporting and Data System (condensed BI-RADS) improved the accuracy of Ugandan healthcare workers interpreting breast ultrasound.

Materials and Methods: The target audience of this intervention was Ugandan healthcare workers involved in performing, interpreting, or acting on the results of breast ultrasound. The educational course consisted of a pretest knowledge assessment, a series of lectures on breast imaging interpretation and standardized reporting using a condensed BI-RADS, and a posttest knowledge assessment. Participants interpreted 53 different ultrasound test cases by selecting the finding type, descriptors for masses, and recommendations. We compared the percent correct on the pretest and posttest based on occupation and training level.

Results: Sixty-one Ugandan healthcare workers participated in this study, including 13 radiologists, 13 other physicians, 12 technologists, and 23 midlevel providers. Most groups improved in identifying the finding type ($P < 0.05$). All occupations showed improved use of descriptive terms for the shape and internal echogenicity of masses ($P < 0.05$). Most groups showed significant improvement in recommendations for normal and benign findings with a corresponding reduction in biopsy recommendations.

Conclusions: Targeted breast ultrasound education using a condensed BI-RADS improved the interpretive performance of healthcare workers and was particularly successful in reducing the frequency of unnecessary biopsies for normal and benign findings. Multimodal educational efforts to improve accuracy and management of breast ultrasound findings may augment breast cancer early detection efforts in resource-limited settings.

Key Words: Breast ultrasound; capacity building; resource-limited countries; Uganda; interpretive performance; education; BI-RADS.

INTRODUCTION

I n Uganda, breast cancer is the second most common type of cancer in women, and its incidence has increased by 5.2% per year (1993–2007) (1–3). Lack of breast cancer awareness results in an average delay of 29 months in seeking care after self-detecting a breast lump (4). For this reason, greater

than 77–89% of women diagnosed with breast cancer have late-stage disease (stages III and IV) (5,6). Late-stage breast cancer is more difficult and expensive to treat and less likely gets cured (7,8). Directing resources and efforts to improve breast cancer outcomes requires increasing awareness and early detection efforts; however, this would result in inefficient resource utilization in regions with few resources to spare. Therefore, efforts must first establish a systematic approach to evaluate women presenting with self-detected breast lumps.

Currently in Uganda, women with breast symptoms most often present to their midlevel providers (midwives or clinical officers, comparable to physician assistants or nurse practitioners) at a community health center for a clinical breast examination and, if positive, referred to a hospital for a breast ultrasound or other evaluations. To supplement the 47 Ugandan radiologists interpreting medical imaging mostly in cities, many groups, including the Uganda Ministry of Health, have trained technologists (sonographers and radiographers) and midlevel providers to interpret basic ultrasound out in the community (9–11). Consequently, nonradiologists interpret 70% of the

imaging. In a country where most women live in rural settings, providing ultrasound at local community health centers for women who need higher level care at a referral hospital far away may represent a resource-appropriate strategy. It limits the number of women required to travel long distances from their families and reduces the amount of time trained staff at the referral hospitals have to spend evaluating women not needing higher level care. Although midlevel providers and technologists are capable of using basic ultrasound to triage these women, focused education is required to ensure high-quality care.

The American College of Radiology (ACR) Breast Imaging Reporting and Data System (BI-RADS) standardizes interpreting and reporting of breast ultrasound (12). Use of the BI-RADS system has improved communication among healthcare workers and increases accuracy of interpretation in the United States and other countries (13). Use of the BI-RADS system at Mulago Hospital, the main referral hospital in Uganda, and the Uganda Cancer Institute, the only cancer treatment center in Uganda, has been reported previously (14). However, that study demonstrated that BI-RADS is not consistently used even at these referral centers. Despite BI-RADS' strengths, the full lexicon and subtleties between the different terms can be challenging to use consistently, even among radiologists (15,16). Condensing BI-RADS to limit the number of terms available to inform management decisions may improve consistency in reporting and interpretive performance and facilitate breast ultrasound as a triage test among frontline healthcare workers (midlevel providers and technologists). Here we report improvement in the interpretive performance of breast ultrasound of four occupations (radiologists, other physicians, technologists, and midlevel providers) after a 2-day educational course using a condensed BI-RADS.

MATERIALS AND METHODS

Educational Course and Participants

A 2-day educational course on interpretation of breast imaging for healthcare workers was advertised widely in Uganda (July 2013) using posters, pamphlets, and oral invitations. Healthcare workers from the Uganda Cancer Institute, Mulago Hospital, and the Makerere University College of Health Sciences performing, interpreting, or acting on the interpretations of breast ultrasound reports were encouraged to attend. Participants received no monetary compensation; however, they received lunch, snacks, and a certificate of participation at the end of the course. Institutional review board approval was not necessary for this educational study because personal identifiers were stripped from the data before the analysis.

A multidisciplinary team of American and Ugandan physicians involved in breast cancer diagnosis and treatment designed and presented lectures during the 2-day educational course. The course consisted of a preimplementation knowledge assessment of breast imaging (pretest), 8 hours of lectures, and a post-implementation knowledge assessment of breast imaging (posttest). Half of the lectures focused on using the condensed BI-RADS, including identifying findings, characterizing masses using condensed BI-RADS terms, and appropriately managing the findings. These lectures were ultrasound image–enriched. The other half of the lectures focused on the importance of a multidisciplinary approach to detect and treat breast cancer, including an overview of the breast cancer problem in Uganda, standardized approach to evaluating symptomatic women as a multidisciplinary team, and surgical and oncological management of breast cancer in Uganda. Participants were asked to provide their occupation and, if appropriate, level of training (resident or attending). Based on responses, participants were assigned to one of the following occupations: radiologist, other physician, technologist, and midlevel provider. Because of differences in professional training and titles between the US and the Ugandan medical systems, a general midlevel provider group was used to include all nonphysicians involved in patient care (eg, clinical officers, physician assistants, nurse practitioners, nurses, and midwives).

The Pre-/Posttest Instrument

The test consisted of 53 different single-breast ultrasound images obtained from multiple US institutions. The images were selected from a larger set based on quality and difficulty, as determined by 12 residents and three breast imaging fellows at the University of Washington. Selected images included a larger portion of malignant lesions than would be seen in a real–world setting to improve statistical precision in analysis and to assure sufficient practice in identifying critical components of a malignancy. Because most Ugandan women are diagnosed with breast cancer after self-detecting a lump, all images represented palpable findings. Each image was projected sequentially onto a white screen for 30 seconds for the participants to interpret and record their answers on a standardized paper answer sheet (Fig 1).

Condensed BI-RADS System and Answer Sheet

We created a condensed BI-RADS answer sheet based on the condensed BI-RADS system modeled from the ACR BI-RADS and the condensed BI-RADS clinical sheets piloted at Mulago Hospital and the Uganda Cancer Institute. This standardized reporting system was created through collaboration with radiologists at Mulago Hospital and healthcare workers at the Uganda Cancer Institute after an audit of their breast ultrasound reports demonstrated a relatively high frequency of biopsy recommendations for benign and probably benign findings (14). The condensed BI-RADS emphasizes use of breast ultrasound as a triage test by nonradiologists and facilitates standardized reporting. The condensed BI-RADS consists of fewer choices for finding types, descriptors for masses, and recommendations. The goal of the condensed BI-RADS is to help unsupervised nonradiologists already using