Use of an Online Educational Module to Improve Physician Skills to Diagnose Vaginitis

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Abstract

Background: The availability of rapid laboratory diagnostic tests, coupled with physicians’ lack of confidence in their microscopy skills, may cause physician educators to teach microscopy less in residency training when diagnosing vaginitis and cervicitis.

Objective: We sought to evaluate the level of comfort of diagnosing vaginitis and cervicitis with microscopy and to determine whether an online educational module could improve diagnostic skills among our primary care residency clinic preceptors.

Methods: We created an online education module, aimed at assessing diagnostic microscopy skills and at improving knowledge about vaginitis and cervicitis. Preceptors were invited to complete the education module and a pre- and post-module survey to assess their knowledge and practice patterns.

Results: Of 33 eligible preceptors, 21 (63%) completed both pre- and post-surveys. Twenty preceptors (95%) found the teaching module helpful, and 76.2% reported desiring better training in microscopy. Preceptors’ knowledge scores improved significantly post-intervention (p = 0.0045). Preceptors who were female, who trained in Medicine-Pediatrics, and whose patient panels were predominantly female had higher scores.

Discussion: Our teaching module was well-received by preceptors, and preceptors’ testing scores improved significantly post-intervention. Online education modules may be an effective method to improve physicians’ office-based microscopy skills to diagnose vaginitis and cervicitis.

Keywords: Cervicitis; diagnostic microscopy; online education module; residency education; vaginitis

Introduction
Vaginitis and sexually transmitted infections are diagnoses that are frequently made in primary care settings. (Hainer 2011) Microscopy can be a valuable tool in the diagnosis of vaginitis and cervicitis when used properly, but not all clinicians are trained in or practice using this technique. (Ledger 2004) Newer molecular diagnostic tests are available and offer greater sensitivities and specificities than are possible with traditional microscopy. (Ledger 2004) The availability of these new tests coupled with healthcare providers’ lack of confidence in microscopy skills may lead to providers using the microscope less often to diagnosis vaginitis and STIs, which may, in turn, decrease the amount of teaching of microscopy in the outpatient setting in residency training. However, knowledge of microscopy and its proper use are still necessary for cost-effective, timely, and accurate point-of-care diagnosis and treatment in the outpatient setting.

Online course materials are increasingly used in medical education given the availability of technology and the time constraints of medical training and practice. (Lewis 2014) Online educational curricula have been used in residency programs and have effected successful gains in knowledge as well as high degrees of user satisfaction. (Burnette 2009; Feist 2013; Ferguson 2015; Lewis 2014; Swensson 2015) In addition, their use has been validated as an effective learning method. (Satterwhite 2014)

Our study sought to investigate attitudes towards office-based microscopy use in the diagnosis of vaginitis and cervicitis in the primary care setting within a large teaching hospital system and to evaluate whether an online educational module could be helpful in improving diagnostic skills.

Methods

Our study population consisted of attending physicians who precept at any of three primary care resident clinics at the Warren Alpert Medical School of Brown University. We invited all physician preceptors who have at least one dedicated half-day clinic per week at one of these three clinics to participate. This study was approved by the Lifespan Hospital System Institutional Review Board, and all participants provided informed consent prior to participating in the study. The dataset analyzed during the current study is available from the corresponding author on reasonable request.

We developed an online teaching module consisting of a brief PowerPoint presentation, accessible to participants via a password-protected site managed through the hospital system. The teaching module consisted of 36 slides, reviewing the presenting symptoms and signs, findings on microscopy, most sensitive diagnostic tests, and most appropriate treatment of common causes of vaginitis and cervicitis and proper techniques for vaginal and cervical sample collection. In order to use a microscope in the resident clinics, all preceptors must pass an online microscope competency test (MCT) managed by an independent company, Medtraining, at least annually since January 2011. The MCT contains five questions asking providers to identify components of a sample slide such as epithelial cells, clue cells, white blood cells, sperm, trichomonads, and yeast elements. We embedded a pre- and post-survey and a link to the MCT within our teaching module. Our survey collected demographic data such as gender, specialty, years in practice, percentage of patient panel that is female, responses addressing comfort with and frequency of microscope use, responses assessing the online module and its impact, and responses to questions evaluating knowledge of diagnostic testing methods for common causes of vaginitis and cervicitis. The latter consisted of four multiple choice questions: 1) What is the most sensitive test for diagnosing trichomonas?; 2) How do you collect a sample and order the test for gonorrhea and chlamydia screening?; 3) How do you order a DNA probe test for candida?; and 4) What is the most sensitive diagnostic test for gonorrhea?
We recruited clinic preceptors from December 2012 to March 2013. The investigators of the study and one pediatrician were excluded. For participants who had completed an MCT prior to our study, we defined their prior MCT scores as historical controls. Historical control scores were compared with MCT scores prior to and immediately after our training module using a paired student's t-test. If a participant had multiple historical control scores, the most recent score was used for analysis. Percentage of correct answers to the four knowledge questions on the pre- and post-surveys was also compared using a paired t-test, and data was stratified by demographics.

**Results**

Of 33 eligible physicians, 24 completed the pre-survey, and 21 completed the post-survey. Sixteen of the 21 preceptors who completed both surveys also had previous MCT test data for comparison. Of the 21 physicians who completed both the pre- and post-surveys, 14 (67%) were trained in Internal Medicine, and seven (33%) were trained in Medicine-Pediatrics. Thirteen were female (62%), and five (24%) had additional subspecialty training. Many participants (57%) reported working at a separate outpatient site in addition to the resident clinics, primarily in another university-affiliated practice. Over half (52%) reported being in practice for greater than ten years, 19% for six to ten years, and 29% for three to five years. All but two participants (90%) reported having microscope access in the office for at least three years, but only 24% endorsed using the microscope at least monthly, and only 14% at least weekly. Fifty-two percent of preceptors reported a patient population that is at least 50% female, and 19% reported a patient population that is predominantly female.

Of the 21 preceptors who completed both pre- and post-surveys, 16 had historical control MCT scores, the most recent of which was compared with pre- and post-intervention scores. Post-module MCT scores were slightly higher than pre-module MCT scores (Figure 1a), but this difference was not statistically significant (p=0.58). Pre-module MCT scores were significantly higher than historical control scores (p=0.02).

Scores on the four knowledge questions did improve significantly post-intervention (p = 0.0045), indicating that preceptors gained knowledge from the teaching module (Figure 1b). Female preceptors, those trained in Medicine-Pediatrics, and those whose patient panels were predominantly female scored higher on the pre-survey knowledge questions (Table). Frequency of microscopy use correlated with baseline knowledge question scores; preceptors who frequently used the microscope had the highest baseline scores. Fifty percent of preceptors had improvement in their scores after completing the educational module, and no participants had lower scores.

Twenty of the 21 preceptors (95%) who completed the post-survey indicated that they found the training module helpful, and the majority of preceptors (76.2%) indicated that they wished that they had better training in microscopy. When asked about barriers to microscope use, one-third felt that time was the major factor limiting their routine use, and 19% did not have a microscope at their primary practice.

**Discussion**

Overall, our module was well-received by participants. Preceptors felt that the teaching module was helpful and expressed an interest in obtaining more training in microscopy skills for the diagnosis of vaginitis. We observed a trend of increase in MCT scores post-intervention, but this increase was not statistically significant. We did, however, find a statistically significant increase in scores on our general knowledge questions post-intervention, suggesting effectiveness of our teaching module in improving diagnostic skills in vaginitis and cervicitis among our preceptors.
Of the 16 preceptors who had historical control MCT scores, their pre-module MCT scores were significantly higher than their historical control scores, which may be secondary to response bias: preceptors, knowing that their scores would be evaluated as part of our study, may have wanted to perform better on the current MCT compared to prior MCTs.

Our study was limited by several factors. The small population size restricted the power to detect a difference with our intervention, especially within the subanalyses. To maximize completion rates by providers, we kept our survey brief and chose four questions to assess their knowledge base. However, these four questions may not adequately assess preceptors’ breadth of knowledge at baseline or that obtained from our educational module. Furthermore, they were not externally validated, which limits the interpretation of our results. In addition, participants were not restricted from using other resources when taking either the MCT or our knowledge assessment survey. However, this was consistent across pre- and post- tests and represents real life practice, in which resources are available.

Additional research with larger sample sizes and more validated evaluation methods could further elucidate the role of such an online module in improving skills in office-based microscopy in the diagnosis of vaginitis and cervicitis. Furthermore, a study involving primary care residents directly would more fully evaluate the role of online training modules in resident education. Microscopy can be a valuable tool in office diagnostics, especially in resource-limited settings, in which more sensitive laboratory methods may not be available. Additionally, point-of-care testing can allow for more immediate treatment decisions and limit the use of additional, often expensive, laboratory testing, and this may become even more relevant with the current trajectory of healthcare spending in this country. Resident education is directly affected by the knowledge base and proficiency of trainees’ teachers, and therefore it is vital to maintain a level of competence in microscopy in order to teach these skills. Online modules could potentially play a vital role in educating both preceptors and residents in microscopy skills and about available methods for the diagnosis of vaginitis and cervicitis, especially amid the increasing emphasis on high-value care in outpatient medicine.

Figure 1a and 1b
1a: Microscope Competency Test Scores by Attempt

1b: Diagnostic Knowledge Question Scores for the 21 participants with complete data

Table 1


### Diagnostic Knowledge Questions and Microscope Competency Test Scores by Gender, Specialty, and Frequency of Microscope Use

| Group                  | N  | Diagnostic Knowledge Questions (% Correct) | MedTraining Microscope Competency Test (% Correct) |
|------------------------|----|-------------------------------------------|--------------------------------------------------|
|                        |    | Pre-Module | Post-Module | Change in score | Initial Attempt | Pre-Module | Post-Module |
| Gender                 |    |            |             |                |                |            |             |
| Female                 | 13 | 56.8       | 79.5        | 22.7            | 78.2           | 89.1       | 90.9        |
| Male                   | 8  | 40.0       | 85.0        | 45.0            | 80.0           | 92.0       | 96.0        |
| Specialty              |    |            |             |                |                |            |             |
| Internal Medicine      | 7  | 42.5       | 85.0        | 42.5            | 72.0           | 88.0       | 90.0        |
| Medicine-Pediatrics    | 14 | 66.7       | 75.0        | 8.3             | 90.0           | 93.3       | 96.7        |
| Frequency of Microscope Use |          |            |             |                |                |            |             |
| Never                  | 3  | 62.5       | 100.0       | 37.5            | 60.0           | 90.0       | 70.0        |
| Rarely (<1x/month)     | 10 | 50.0       | 87.5        | 37.5            | 76.7           | 86.7       | 96.7        |
| Sometimes (1-3x/month) | 5  | 40.0       | 65.0        | 25.0            | 80.0           | 92.0       | 92.0        |
| Often (>4x/month)      | 3  | 66.7       | 83.3        | 16.7            | 93.3           | 93.3       | 100.0       |

### Take Home Messages

- Resident education is directly affected by the knowledge base and proficiency of trainees' teachers; physicians' lack of confidence in their microscopy skills may cause physician educators to teach microscopy less in residency training when diagnosing vaginitis and cervicitis.
- Online course materials are increasingly used in medical education given the availability of technology and the time constraints of medical training and practice.
- We created an online education module for our clinic preceptors, aimed at assessing diagnostic microscopy skills and at improving knowledge about vaginitis and cervicitis.
- Overall, preceptors found our teaching module helpful, expressed an interest in obtaining more training in microscopy skills for the diagnosis of vaginitis, and had an improvement in their diagnostic knowledge testing scores post-intervention.
- Online education modules may be an effective method to improve physicians' office-based microscopy skills to diagnose vaginitis and cervicitis.

### Notes On Contributors
Dr. Tong is an Assistant Professor in the Department of Medicine at the Warren Alpert Medical School of Brown University in Providence, Rhode Island. She is a primary care physician in women's health; her research and clinical interests are in medical education and women’s health.

Dr. Epstein is a physician boarded in Internal Medicine and Pediatrics. She is currently completing a combined adult and pediatric Infectious Diseases Fellowship in the Division of Infectious Diseases and Pediatric Infectious Diseases at Boston Medical Center, Boston, Massachusetts.

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Appendices

Declarations

The author has declared that there are no conflicts of interest.

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