

Randomized Trial of Smartphone-Based Evaluation for an Obstetrics and Gynecology Clerkship

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OBJECTIVE: We hypothesized that compared to paper evaluations, a smartphone-based quick response (QR) evaluation tool would improve timeliness of feedback, enhance efficacy of giving and receiving feedback, and be as easy to use.

DESIGN: We performed a randomized controlled trial of student and instructor experience with two evaluation tools in the OB/GYN clerkship at University of Washington School of Medicine (UWSOM). Sites were randomized to the QR or paper tool; students at QR sites received individualized QR codes at the beginning of the clerkship. Instructors and students completed postintervention surveys regarding the evaluation tool and associated feedback. We compared responses between groups using chi-squared tests.

SETTING: Participating clerkship sites included primary, tertiary, private practice and institutional settings affiliated with the University of Washington in the Washington, Wyoming, Alaska, Montana and Idaho region.

PARTICIPANTS: Of the 29 OB/GYN UWSOM clerkship sites, 18 agreed to participate and were randomized. Of 29 eligible instructors, 25 (86%) completed the survey, with

$n = 18$ using QR and $n = 7$ using paper. Of 161 eligible students, 102 (63%) completed the survey, with $n = 54$ using QR and $n = 48$ using paper.

RESULTS: Compared to those using paper evaluations, instructors using QR evaluations were significantly more likely to agree that the evaluation tool was easy to understand (100% QR vs 43% paper, $p = 0.002$), the tool was effective in providing feedback (78% QR vs 29% paper, $p = 0.002$), and they felt comfortable approaching students with the tool (89% QR vs 43% paper, $p = 0.002$). Compared to those using paper evaluations, students using QR evaluations were less likely to agree the tool was effective in eliciting feedback (QR 43% vs paper 55%, $p = 0.042$).

CONCLUSION: Instructors found QR evaluations superior to paper evaluations for providing feedback to medical students, whereas students found QR evaluations less effective for feedback. (J Surg Ed ■■■■■. © 2017 Association of Program Directors in Surgery. Published by Elsevier Inc. All rights reserved.)

KEY WORDS: medical education, feedback, evaluation, smartphone technology

COMPETENCIES: Patient Care, Medical Knowledge, Practice-Based Learning and Improvement, Interpersonal and Communication Skills

INTRODUCTION

It is well established that formative feedback is crucial to medical student education.¹⁻³ It helps to improve clinical knowledge and technical skills, identify strengths and weaknesses, establish expectations, and track progress. The importance of feedback is underscored by the Liaison Committee on Medical Education (LCME), which lists feedback as 1 of the 12 standards for accreditation and

Ethics approval and consent to participate: This study was approved by the University of Washington Human Subjects Division Institutional Review Board.

Availability of data and material: The datasets used or analyzed during the current study are available from the corresponding author on reasonable request.

Competing interest: The authors declare that they have no competing interests.

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Authors' contributions: All authors contributed to the study design. A.S.F. and K.E.D. were responsible for instructor recruitment, whereas N.C.S. was responsible for student recruitment. N.C.S., M.A.S., A.S.F., and K.E.D. analyzed and interpreted the data. N.C.S. was the major contributor in writing the article. All authors read and approved the final article.

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mandates that medical schools assess all students and provide them with formal formative feedback.⁴

Despite its universally acknowledged importance, medical student feedback remains suboptimal, with several studies reporting that it is untimely, of poor quality, or even nonexistent. Hiller et al.⁵ reported a mean of 8.5 days between a medical student's clinical shift and completion of the associated evaluation, with some evaluations completed as late as 59 days later. De et al. found that most medical students did not feel that they received sufficient feedback during the General Surgery clerkship at a single university-affiliated program.⁶ Similarly, Al-Mously et al.⁷ found that over 50% of medical students reported rarely receiving feedback from instructors during their clinical clerkships; among students who did, over 60% of them described the quality of feedback as poor or fair.

To be effective, student feedback must be specific, immediate, corrective, task-oriented, and dialog-eliciting.⁸ One potential barrier to the provision of effective feedback is the format in which feedback is provided. In its current state, most procedural feedback is elicited via completion of paper evaluation forms. These paper forms present logistical challenges for students who may not physically have the evaluation form at the time of the procedure, may not remember to elicit feedback, or may not be able to return the paper form to the clerkship office. This multistep process contains several opportunities for error, which can contribute to suboptimal feedback. The inconvenience of this method is highlighted in one study that reported that students often submit multiple procedural evaluation forms at a single time point remote from the time at which the procedures were actually completed.⁹ When presented with options for evaluation, students actually prefer online methods to paper methods, as noted in a prior qualitative study investigating medical student experience with evaluations.¹⁰

This preference for online methods creates an opportunity for improvement of medical student feedback via the use of mobile technologies, such as smartphones. The past decade has been defined by a marked increase in the popularity of smartphones, with these devices becoming ubiquitous in the medical field.¹¹ Mooney et al.¹² describe the development of an iPad-based application for multiple uses in medical education, including assessment of a student's practical skills by an instructor; however, their report did not address student or instructor experiences or outcomes with the mobile application. With the potential for immediate feedback in an easy-to-use format, these applications provide a promising new venue for medical student evaluation. We, therefore, designed this study to evaluate the difference between traditional paper-based evaluations and new smartphone-based evaluations for feedback in medical student education, assessing both the student and the instructor perspectives. We hypothesized that compared to paper evaluations, quick response (QR)

evaluations would improve timeliness of feedback, would enhance efficacy of giving and receiving feedback, and would be as easy to use.

MATERIALS AND METHODS

We performed a randomized controlled trial comparing paper-based to smartphone-based evaluations of third-year medical student performance amongst the students themselves as well as their instructors in the Obstetrics and Gynecology (OB/GYN) clerkship at the University of Washington School of Medicine (UWSOM) during the 2014 to 2015 academic year. The UWSOM has a regional medical education program wherein students train in various sites across Washington, Wyoming, Alaska, Montana, and Idaho (known as the WWAMI region), in an effort to expose students to a wide variety of clinical experiences and to encourage them to practice in underserved areas across the Northwest United States. For the 6-week long OB/GYN clerkship, there were 29 sites within the WWAMI region, staffed by instructors, including attending physicians, resident physicians, and other healthcare providers in rural, urban, private, and academic settings.

To determine participation, we contacted the designated clerkship director at all 29 sites via telephone or electronic mail to provide information about the study. Once clerkship site directors provided written consent to participate in the study, sites were cluster-randomized to using traditional paper evaluations or new smartphone evaluations. We elected to perform cluster rather than individual randomization to avoid contamination across individual instructors. Randomization was accomplished via a random number generated list.

At each site where the clerkship director provided consent, individual instructor participation and consent were elicited via both electronic and postal mail requests. Individual student participation and consent were elicited via electronic mail requests. In an effort to maximize response rate, all participants were entered into a lottery to win 1 of 12 Amazon.com gift cards worth \$50.00 each. This study was approved by the University of Washington Human Subjects Division.

Each student was required to have 3 evaluation forms completed during their OB/GYN clerkship by an instructor: (1) breast examination evaluation, (2) pelvic examination evaluation, and (3) general mid-clerkship evaluation. These have historically been completed using paper forms. For the purposes of this study, we created smartphone-based evaluations containing the same questions as the traditional paper evaluations. Students at sites randomized to paper evaluations used the traditional paper forms. At sites randomized to smartphone-based evaluations, each student received a personal QR code (Fig. 1) at the beginning of the clerkship, in both electronic and paper form. Instructors and students were instructed to download a free smartphone

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