Education Research:

Evaluating the use of podcasting for residents during EEG instruction

A pilot study

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ABSTRACT

Objective: Educational methods for residents are shifting toward greater learner independence aided by technological advances. A Web-based program using a podcast was created for resident EEG instruction, replacing conventional didactics. The EEG curriculum also consisted of EEG interpretations under the tutelage of a neurophysiologist. This pilot study aimed to objectively evaluate the effectiveness of the podcast as a new teaching tool.

Methods: A podcast for resident EEG instruction was implemented on the Web, replacing the traditional lecture. After Institutional Review Board approval, consent was obtained from the participating residents. Using 25-question evaluation tools, participants were assessed at baseline before any EEG instruction, and reassessed after podcasting and after 10 clinical EEG exposures. Each 25-item evaluation tool contained tracings used for clinical EEG interpretations. Scores after podcast training were also compared to scores after traditional didactic training from a previous study among anesthesiology trainees.

Results: Ten anesthesiology residents completed the study. The mean scores with standard deviations are 9.50 ± 2.92 at baseline, 13.40 ± 3.31 ($p = 0.034$) after the podcast, and 16.20 ± 1.87 ($p = 0.019$) after interpreting 10 EEGs. No differences were noted between the mean educational tool scores for those who underwent podcasting training compared to those who had undergone traditional didactic training.

Conclusion: In this pilot study, podcast training was as effective as the prior conventional lecture in meeting the curricular goals of increasing EEG knowledge after 10 EEG interpretations as measured by assessment tools. *Neurology*® 2011;77:e42-e44

GLOSSARY

CME = continuing medical education; **GME** = graduate medical education; **IT** = Information Technology; **UKy** = University of Kentucky.

Podcasting technology is attractive in graduate medical education (GME) because of its educational potential, low implementation cost, and positive user experiences.^{1,2} The current technology-savvy millennial generation of residents are a driving force for its growth.³ Podcasting enables faculty to easily provide supplemental didactics in a video podcast format. In this pilot study, podcasting was incorporated into an established EEG curriculum developed by a neurophysiologist and a neurointensivist at the University of Kentucky (UKy).^{4,5} The module was taught to anesthesiology residents, pulmonary critical care fellows, neurosurgery residents, and medical students during their neurocritical care rotation. This particular study was addressed to the anesthesiology residents. Conventional didactics were converted to a podcast including slides with lecturer audio, event videos during recordings, and EEG tracings. Topics included monitoring, physiologic basis, and clinical applications. The resident interpreted 10 EEGs with a neurophysiologist (1:1 or 1:2 faculty-to-resident ratio) and participated in video, continuous, and intraoperative EEG monitoring throughout the institution.

This study aimed to evaluate podcast effectiveness in meeting the curriculum goals of increasing EEG knowledge.

METHODS Standard protocol approvals, registrations, and participant consents. This prospective study was approved by the UKy Institutional Review Board and the GME Committee. Written consent was obtained from all participants.

The Information Technology (IT) team developed a kit allowing the lecturer to easily record lectures in the podcast format using a Macintosh computer. The training session required approximately 10 minutes. Two recorded lectures were then uploaded for processing to the Podcast Producer 2 (Apple Inc., Cupertino, CA) server. Then, Podcast Producer 2 automatically published the lectures to an iTunesU (Apple Inc, Cupertino, CA) location. The iTunesU online service is a repository for download purposes allowing residents to use a Web-based platform on a Mac, iPhone (both from Apple Inc., Cupertino, CA), and PC (Microsoft Corporation, Redmond, WA). The EEG podcast was created by 2 of the investigators; neither had prior formal computer training. Podcast processing by the IT team requires approximately 20 minutes. Total combined podcast production time for both faculties was less than 3 hours. The podcast content remained the same as the conventional monthly 2-hour didactics it replaces. From May 2009 to December 2009, all 10 anesthesiology residents on their first neurocritical care rotation consented to participate.

Resident participants took the baseline evaluation tool before any EEG instruction, viewed the podcast independently, and were reevaluated following the podcast. The curriculum remained unchanged during the study period. Another assessment followed after 10 EEG interpretations with the neurophysiologist.

Each of the 3 evaluation tools contained 25 multiple choice items developed by the investigators and included relevant EEG tracings. Although of similar content, each evaluation tool had unique questions designed to assess knowledge of EEG use and interpretation. The evaluation tools have previously been shown to be reliable using Cronbach α .⁵

Minimum sample size was calculated estimating the minimum detectable difference to be 5 points on the educational tool from a total of 25, the SD to be 3.000, with a power of 0.800 and an α value of 0.050. The estimated sample size was 7 with a total of 10 residents assessed.

An independent third party scored the evaluations using the number of correct answers as the evaluation score. The investigators were blinded to the individuals' results. Identical 25-question evaluation tools for baseline and after interpretations of 10 EEGs were used in a prior study with conventional didactics rather than podcasts.⁵ In that prior study, anesthesiology residents took evaluations at baseline before any EEG instruction (didactics or interpretation) and again after interpretation of 10 EEGs. Curriculum materials for both studies were the same with podcasting replacing conventional lectures for delivery. Using the same evaluation tools allowed *t* test individual group data comparison between the baseline and after interpretation of 10 EEG groups in the current podcast study vs the prior study using conventional didactics.

RESULTS Ten anesthesiology residents completed the study: 7 men (age 28–40), 3 women (age 29–50), 4 PGY-2s, and 6 PGY-3s. The mean score (correct answers out of 25) increased from 9.50 ± 2.92 at baseline to 13.40 ± 3.31 ($p = 0.034$) after the podcast, and 16.20 ± 1.87 ($p = 0.019$) after interpreting 10 EEGs (table). The majority of participants increased scores compared to baseline after the

Table EEG evaluation results prior to intervention (baseline), after podcast session, and after 10 EEG interpretations

Subject	Baseline	After podcast session	After 10 EEG interpretations
1	9	15	16
2	13	9	18
3	13	14	16
4	8	17	17
5	8	15	16
6	14	11	18
7	8	8	13
8	6	12	14
9	6	15	15
10	10	18	19
Mean $\pm$ SD	9.50 ± 2.92	13.40 ± 3.31^a	16.20 ± 1.87^b

^a Different from baseline (one-way repeated-measures analysis of variance followed by Student-Newman-Keuls post hoc test, $p = 0.034$).

^b Different from podcast session (one-way repeated-measures analysis of variance followed by Student-Newman-Keuls post hoc test, $p = 0.019$).

podcast. A normality test was performed using the Kolmogorov-Smirnov test for assessment of a normally distributed population and passed ($p = 0.219$). An equal variance test was performed by checking the variability about the group means and passed ($p > 0.99$). The mean scores did not differ from a previous study⁵ in which baseline score was 8.00 ± 2.51 ($p = 0.266$) and after interpreting 10 EEG score was 15.12 ± 3.00 ($p = 0.365$).

DISCUSSION Despite podcasting becoming more widely used in medical education, published literature about podcasting in GME is sparse. Published articles focus on technical aspects, podcast topics review, and students' podcasting experiences.^{1,6} Podcasts replaced a nursing curriculum's traditional lectures with students satisfied with the podcast experience and no significant difference on examination performance compared to traditional lectures.¹

Our study suggests that podcasting might replace conventional didactics in this EEG curriculum. The score increases from baseline to after interpretation of 10 EEGs were comparable in the podcast group and the conventional didactic group. Two participants' scores (nos. 2 and 6 in the table) decreased after the podcast and one participant's score (no. 7) remained unchanged. Both pre- and post-podcast evaluations were different to eliminate the "practice effect" of using the same tool for retesting over a short time. Possible explanations for the lack of podcast score improvement in these individuals include podcasting

being ineffective for an individual's learning style, unavailability of immediate questions and answers, and technological unfamiliarity navigating the lecture.⁷ The latter might be crucial in a very first podcasting experience. Another contributor could be a higher evaluation tool difficulty despite content similarity.

Technical support was provided for viewing issues. A feedback survey after the podcasting experience might provide reasons for the lower performances and would require linkage to specific performance. The participants listened to the podcast in one sitting. Spending more time than allowed with the one sitting on particular podcast sections might have improved the scores.

All participants had significant score improvements after the combination of podcast implementation and 10 EEG interpretations. The neurophysiologist reinforces key concepts during EEG interpretations. With minimal time investment, the podcast freed faculty from a significant monthly time requirement to provide traditional didactics.

This model of podcast creation is reachable for most departments using basic equipment and software with IT expertise. Podcast production was relatively simple to learn even for the technologically naive faculty.

Podcasting can probably be as effective as the lecture that it replaces. However, there are little objective data demonstrating this and little research into what aspects of podcasting promote or hinder learning. This pilot study is the first step in podcasting research to objectively document its effectiveness as a GME teaching tool. A study limitation is its small sample size. Continuation of this project with more participants will provide stronger evidence to assess the impact of podcasting within this particular EEG curriculum. There is the need to delineate the benefits and limitations of podcasting as an effective teaching method especially as its use increases. The podcast used in this study could be helpful to provide background for neurology residents during their initial EEG exposure. A multi-institution study would be warranted and very worthwhile. Finding interested program directors would be an outstanding next step. Several major journals have adopted this technology for their continuing medical education (CME) courses.^{8,9} *Neurology*[®] uses podcasting in its

Web site to highlight current articles and offer related CME credits.¹⁰

The implementation of podcasting in this pilot study provided preliminary evidence that podcasting may be an effective educational method in achieving EEG curriculum goals and it might effectively replace conventional didactics. This relatively simple and low cost Web-based teaching tool provided valuable supplemental learning materials.

AUTHOR CONTRIBUTIONS

Dr. Bensalem-Owen: study design, podcast material, evaluation tools, EEG interpretation. Dr. Chau: study design, evaluation tools, statistical analysis. Mr. Sardam: podcast development and implementation, information technology expertise. Dr. Fahy: study design, podcast material, evaluation tools, statistical analysis.

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