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Research Article

A Virtual, Interactive Quiz-Show Curriculum is Associated with Increased Resident Knowledge in Reproductive Endocrinology and Infertility

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Abstract

Background: Subspecialty exposure is often limited during OB/GYN residency, and many perform poorly on the Reproductive Endocrinology and Infertility (REI) section of in-training examinations.

Objective: Given the increase in virtual learning along with evidence of quiz-show-based lectures improving learners' post-session knowledge, retention, and satisfaction, we assessed the impact of a virtual, interactive didactic on REI knowledge of OB/GYN residents.

Methods: Prospective cohort study surveying residents before and after introduction of a lecture utilizing a virtual game-show based format (similar to *Jeopardy*) that occurred once over a 1-hour period during the 2020 – 2021 academic year. The primary outcome was mean knowledge-based performance. Chi square/Fisher exact tests and two-sample t-tests/Wilcoxon rank-sum tests compared categorical and continuous variables, respectively.

Results: Of 10 eligible subjects, 9 (90%) completed the pre-lecture survey, while 3 (30%) completed the post-lecture survey. There were no differences among the pre- and post- groups with respect to age, gender, or ethnicity. The mean pre-lecture score was 38.9% ± 0.11%, while the post-lecture score was 73.3% ± 0.15% (p=0.001). A similar but non-significant finding was observed when stratified by training year. All noted higher satisfaction, more engagement, and increased learning compared to standard virtual lectures.

Conclusions: A virtual, game-based didactic is associated with improved REI knowledge. Residency programs should strongly consider this format of virtual learning.

Keywords: Education environment; e-Learning/computers; Instructional design; Medicine; Obstetrics and gynecology; Game-show didactic; Reproductive endocrinology and infertility

Introduction

While obstetricians and gynecologists are usually the first-line of workup and evaluation for a multitude of Reproductive Endocrine disorders and Infertility (REI) patient presentations, residents receive limited experience with core REI concepts during their training. Because REI subspecialty exposure is often limited to several weeks over the course of a four-year training program, many residents feel ill-equipped to tackle core REI concepts. This is further demonstrated through resident surveys suggesting low self-reported confidence in REI topics [1]. This reduction in self-reported confidence among residents extends beyond self-esteem, breaching competence as well. The annual in-training examinations given by The Council on Resident Education in Obstetrics and Gynecology (CREOG) demonstrate consistently poor resident performance on the REI section, where residents average 42%-67% correct answers. This indicates a need for improved methods of didactic instruction on REI concepts during residency [2,3]. Given the limited time constraints on busy trainees, didactic programming must therefore become innovative, efficient, and engaging. Research suggests that interactive learning improves knowledge retention and learner satisfaction in comparison to traditionally formal lectures. These alternative methods include problem-based learning, online modules, quiz game-format, role-playing, simulation, and peer-led instruction [2-7]. As millennials are emerging as the new learners entering medical school and residency training programs, didactic programming should meet their needs in order to effectively teach concepts in medicine. Having grown up fully immersed in the digital age, millennials represent a new class of adult learners that require adaptive and engaging instruction different than the standard modalities of past teaching, or instructor-focused, passive lectures. Because millennials think and process information differently than prior generations, their learning should change accordingly [8,9]. The impact of COVID-19 shifting toward virtual education platforms place a further strain on traditional teaching modalities, and residency programs are left with an opportunity to introduce and/or improve upon interactive e-learning into their didactic curricula [10-12]. One survey across 6 residency programs at a single academic institution noted increased perceived effectiveness of virtual lectures compared to in-person lectures [13]. Additional benefits of virtual learning include the ability to incorporate didactics from expert faculty at outside institutions, to include learners from

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other programs, and to record didactic sessions for later streaming. It is unclear if adoption of these alternative virtual teaching methods will be utilized longer-term. This study sought to assess the impact of a game-based didactic on Obstetrics and Gynecology (OB/GYN) resident learning in core principles of REI. Randomized studies have demonstrated improved post-session knowledge and significantly increased longer-term retention of knowledge with use of a 'Jeopardy game-based format' versus a conventional didactic lecture, along with increased satisfaction among participants [5,14]. Another study randomized third year medical students on their OB/GYN clerkship to instruction about ectopic pregnancy via standard lecture or educational Jeopardy game-based format and found no difference in pre- or post-test knowledge scores, but did note significantly improved satisfaction, enjoyment, and perceived retention of knowledge with the game-based format [15]. Other studies have also supported game-based didactics to improve physician satisfaction in continuing medical education courses with no negative impacts on knowledge scores [16]. Given these findings, we tested our hypothesis that a virtual, game-based didactic would improve resident knowledge scores in REI topics, assessed via pre- and post- survey quizzes.

Methods

This prospective cohort study implemented a survey of residents in OB/GYN before and after the introduction of a 1-hour lecture in REI utilizing a virtual game-show based format, similar to *Jeopardy*. Consent for the study was obtained electronically prior to the start of the lecture. The intervention was comprised of a 1-hour virtual lecture in core REI concepts and included multiple questions selected from a PowerPoint slide in the style of *Jeopardy*, where reliance on participation by residents is critical. One day prior to the scheduled intervention, all residents in the department of Obstetrics and Gynecology received an email containing the consent form and information sheet along with the link to complete the pre-lecture survey. Immediately following the lecture, a second email with the embedded post-lecture survey link was distributed to all residents to complete the post-intervention survey. Follow-up reminder emails were sent to subjects weekly for 3 consecutive weeks thereafter.

The study inclusion criteria included current residents in a single OB/GYN residency program at the time of the lecture. Subjects were excluded if they did not attend the entirety of the virtual didactic. The study lecture took place on the virtual platform, Cisco WebEx. Subjects who attended the lecture and completed all surveys were eligible to be entered into a lottery to win an electronic gift-card as incentive. Surveys and study data were implemented, collected and managed using REDcap tools (Research Electronic Data Capture) hosted at our institution (Oregon Health & Science University, Portland, OR) [17,18]. REDCap is a secure, web-based software platform designed to support data capture for research studies, providing 1) an intuitive interface for validated data capture; 2) audit trails for tracking data manipulation and export procedures; 3) automated export procedures for seamless data downloads to common statistical packages; and 4) procedures for data integration and interoperability with external sources. The intervention was comprised of a virtual, game-show-based lecture that occurred once over a 1-hour period during the 2020 – 2021 academic year. Content that was both reviewed in the virtual lecture and assessed in the knowledge-based portion of the survey covered various topics in REI, utilizing sources such as The American College of Obstetrics and Gynecology (ACOG) committee opinions and practice bulletins; Williams gynecology textbook; REI Prolog questions; Speroff's Clinical Gynecologic Endocrinology and Infertility textbook, and other commercially available validated question banks for learners in OB/GYN [19-21]. The de-identified pre- and post-test surveys (Supplemental material) were identical in nature and included questions in the following 3 sections: part (i) - demographic information; part (ii) – knowledge in REI concepts (10 multiple choice questions similar to ones utilized in validated question banks offered to residents commercially in preparation for their annual in-service exams administered by the Counsel on Resident Education in Obstetrics and Gynecology (CREOGs); and part (iii) – assessment of resident attitudes/confidence in handling REI topics in practice, assessment of current REI training in residency, and satisfaction with the lecture format. The residency rotation in REI at our institution is completed once during the first post-graduate year. The primary outcome of interest was mean knowledge-based performance on the knowledge section of the survey. Secondary outcomes included the aforementioned topics addressed in the third portion of the survey. Statistical analyses included Chi square or Fisher exact tests for categorical variables, while two-sample t-tests or Wilcoxon rank-sum tests were used to compare continuous variables. We planned to compare our secondary outcomes using one-way ANOVA tests. All statistical analyses were performed using GraphPad Prism version 8.0.0 for Windows, GraphPad Software, San Diego, California USA. This study received approval from the Institutional Review Board (Study ID 22377).

Results

Of 10 eligible subjects, 9 (90%) completed the pre-lecture survey while 3 (30%) completed the post-lecture survey. There were no differences among the pre- and post- groups with respect to age, gender, ethnicity, or year in training (Table 1). Our primary outcome, mean knowledge score, was 38.9 ± 0.11% pre-intervention, while the post-lecture score was 73.3 ± 0.15% (p=0.001). A similar but non-significant finding was observed when stratified by year in training (Table 2). Secondary outcomes utilized 5-point Likert scales regarding statements on residents' self-perceived confidence to handle REI-related topics clinically, their training in REI, and the lecture format. Due to lower-than anticipated post-test recruitment, data for these survey sections was utilized from the pre-test recruitment with a total of 8 respondents, and is presented using descriptive statistics.

The first section assessed resident self-report on attitudes and confidence in handling REI topics in clinical practice (Figure 1). Interestingly, 87% agreed with the statement that REI is challenging. At least half of those who responded disagree with the statement that

Table 1: Demographic information of survey respondents.

	Pre-test Survey (N=9)	Post-test Survey (N=3)	p-value
Year in training, N (%)			
- PGY-1	3 (33.3)	0	
- PGY-2	3 (33.3)	1 (33.3)	0.446
- PGY-3	1 (11.1)	0	
- PGY-4	2 (22.2)	2 (66.7)	
Gender, N (%)			
- Cisgender	8 (88.9)	2 (66.7)	0.455
- Feminine/Woman/Girl	1 (11.1)	1 (33.3)	
Age, years[a]	30.78 ± 1.86	31.33 ± 1.52	0.326
Ethnicity, N (%)			
- Asian	1 (11.1)	0	
- Hispanic or Latino	1 (11.1)	0	0.721
- White	6 (66.7)	3 (100)	
- Other	1 (11.1)	0	

[a]Data expressed as mean ± standard deviation (SD)

Table 2: Assessment of OB/GYN Residents' Knowledge in Core Concepts in REI.

	Pre-test (N=9)	Post-test (N=3)	P-value
Score Overall[a]	38.9 ± 0.11	73.3 ± 0.15	0.001
Score by Year in Training			
- PGY-1[a]	46.7 ± 0.06	n/a	n/a
- PGY-2[b]	30.0 (20.0 – 40.0)	70.0 (70.0 – 70.0)	0.500
- PGY-3[a]	30.3	n/a	n/a
- PGY-4[b]	45.0 (40.0 – 50.0)	75.0 (60.0 – 90.0)	0.333

[a]Data expressed as mean ± SD
[b]Data expressed as median (IQR)

they feel prepared to handle REI topics on exams administered by either CREOG or the American Board of Obstetrics & Gynecology (ABOG) (Figure 1). The second section assessed attitudes toward resident training in REI (Figure 2). Overall, results indicate that a minority of residents would like more REI surgical experience and less time spent in clinics of in vitro fertilization. The majority did not want the rotation changed to another year in training, nor did they feel it should be a longer rotation. The third section assessed attitudes toward the lecture format (Figure 1). Overall, residents prefer in-person lectures to virtual ones and prefer game-based didactics to standard lectures. The majority of residents found the virtual, game-based didactic more engaging than a standard virtual lecture. All 100% of respondents noted higher satisfaction, more engagement, and increased learning, as compared to standard virtual lectures.

Discussion

To our knowledge, this is the first study to assess the impact of a virtual lecture in the style of *Jeopardy* on OB/GYN residents' knowledge in core REI topics. Additionally, this is the first study to demonstrate improvement in resident knowledge following a virtual, interactive lecture during the COVID-19 pandemic. We demonstrate that this intervention effectively increased mean knowledge, as assessed through our pre- and post-lecture test with an improvement from 38.9% to 73.3% correct answers. We also demonstrate that the lecture was well-received and preferred to a standard, virtual lecture. There are several limitations. This study was conducted within a single department at a single institution. Additionally, because of a lower-than anticipated post-test recruitment, there is potential for both internal and external validity of the study to be impacted, thus limiting the study's generalizability. Furthermore, a planned post-test to assess long-term retention of REI-related topics was sent to all residents at 7 weeks following the lecture, however, we were unable to recruit participants, and therefore do not have data to assess this metric.

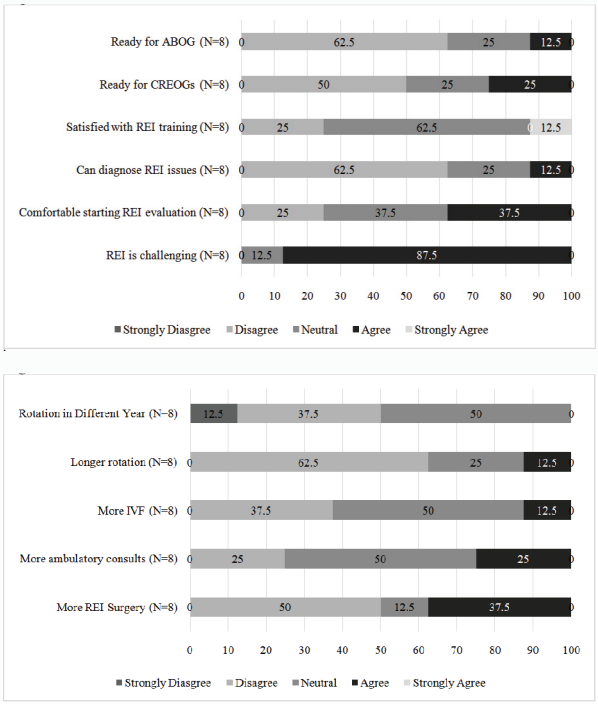

Figure 2a and B: Response rates of OB/GYN residents to various statements regarding their 2a) self-assessment of clinical competence in handling REI-related topics; and 2b) attitudes toward their REI training during residency. CREOG: Council on resident education in obstetrics & gynecology; ABOG: American Board of Obstetrics & Gynecology

While the secondary outcomes sought to assess residents' attitudes on various topics ranging from their confidence to master REI topics to their opinions on the lecture format, we were not adequately powered to detect meaningful differences pre- and post-lecture, ultimately yielding descriptive statistics from the overall cohort across one survey time-point. We were able through this study to demonstrate effective post-lecture knowledge improvement in REI concepts with the use of a virtual, game-based didactic. While residents still prefer in-person to virtual lectures, we demonstrate that the use of a *Jeopardy*-style virtual didactic is effective at increasing both learner knowledge in REI concepts as well as perceived engagement. Future studies should be conducted to assess the impact of interactive, virtual learning on trainees at other stages in training as well as in other medical specialties to prove efficacy and engagement.

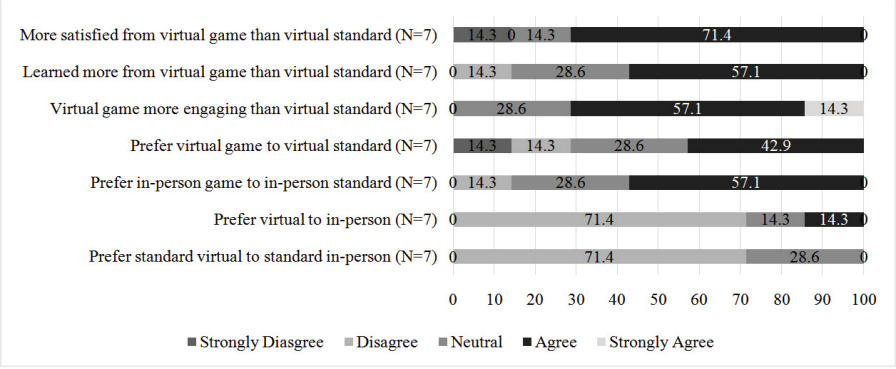

Figure 1: Response rates of OB/GYN residents to various statements regarding attitudes toward the lecture format. Data presented as %.

Conclusion

Given that alternative virtual teaching methods are becoming more utilized across residency programs and in medical education, our study highlights a unique format of didactic in the setting of the COVID-19 pandemic that was well received. This model adapts to both the learners' need for interactive education and the external forces shaping our didactic formatting. We strongly consider residency programs to utilize this educational model to increase learner satisfaction, engagement, and knowledge.

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