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Normal Pregnancy Care and Physiology and Select Pregnancy Complications: A Flipped Classroom Case for the OB/GYN Clerkship

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Abstract

Introduction: This module teaches core knowledge and skills for undergraduate medical education in reproductive health, providing instruction in the management of normal and abnormal pregnancy and labor utilizing interactive small-group flipped classroom methods and case-based instruction. **Methods:** Advance preparation materials were provided before the education session. The 2-hour session was facilitated by clinical educators using a faculty guide. Using voluntary surveys, we collected data to measure satisfaction among obstetrics and gynecology clerkship students and facilitators following each education session. **Results:** Capturing six clerkships spanning 9 months, 116 students participated, and 64 students completed the satisfaction survey, with 97% agreeing that the session was helpful in applying knowledge and principles to common clinical scenarios. Most students (96%) self-reported that they achieved the session's learning objectives utilizing prework and interactive small-group teaching. Nine clinical instructors completed the survey; all agreed the provided materials allowed them to facilitate active learning, and the majority (89%) agreed they spent less time preparing to teach this curriculum compared to traditional didactics. **Discussion:** This interactive flipped classroom session meets clerkship learning objectives related to the management of pregnancy and labor using standardized materials. The curriculum reduced preparation time for clinical educators as well.

Keywords

Fetal Monitoring, Hypertensive Disorders of Pregnancy, Labor, Maternal Physiology, Prenatal Care, Third-Trimester Bleeding, Women's Health, Case-Based Learning, Flipped Classroom, OB/GYN, Maternal & Fetal Medicine, Pregnancy, Childbirth, & the Puerperium

Educational Objectives

By the end of this activity, learners will be able to:

1. Describe the rationale for elements of routine prenatal care.
2. Outline key changes in maternal physiology during pregnancy.
3. Outline the evaluation, differential diagnosis, and initial treatment for the clinical presentation of third-trimester bleeding.
4. Outline the evaluation, differential diagnosis, and initial treatment for the clinical presentation of hypertension in pregnancy.
5. Describe the stages of labor and fetal heart tracings.

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Introduction

The Association of Professors of Gynecology and Obstetrics (APGO) Medical Student Educational Objectives include knowledge of maternal physiology (objective 8), antepartum care (objective 10), intrapartum care (objective 11), hypertensive disorders in pregnancy (objective 18), and third-trimester bleeding (objective 23). These objectives are fundamental concepts for obstetrics and gynecology clerkship students, as physicians practicing a multitude of specialties will encounter pregnant patients and those who are experiencing a physiologic change or pathology of pregnancy. These APGO objectives guide curriculum development by defining fundamental knowledge, skills, and attitudes core to general medical practice.[1]

We developed this module as part of a larger project to revamp the obstetrics and gynecology clerkship curriculum from topic-centered, faculty-centered, passive learning lectures to dynamic problem-based learning sessions that would capitalize on small groups, flipped classroom principles, and active learning activities. These techniques in medical education have been shown to promote learner engagement and satisfaction and

help learners apply new knowledge.[2-5] One study evaluating a flipped classroom model in the obstetrics and gynecology clerkship reported high student satisfaction but no difference in subject exam scores.[5] Student satisfaction matters greatly given the way that medical schools evaluate clinical education and report curriculum outcomes to the Liaison Committee on Medical Education during the accreditation process.

A search of *MedEdPORTAL* using the terms *prenatal care, prenatal, pregnan*,* and *labor* did not reveal any similar topics delivered through the flipped classroom approach. Our educational module contains content that overlaps with preexisting modules on topics of pregnancy physiology, pathophysiology of pregnancy, and fetal monitoring.[6-19] Our module is distinct from these others in that it provides didactic knowledge about normal and abnormal pregnancy and labor management layered with deliberate practice in clinical reasoning and problem-solving. The module presented here combines education modalities of team based-learning, case-based learning, and didactic material to provide a standardized yet interactive session designed for third-year medical students. We evaluated student and faculty satisfaction using surveys following delivery of the module.

This module can stand on its own to teach students the basic provision of antepartum and intrapartum care and how to diagnose and manage select complications of pregnancy. In our clerkship teaching, we have incorporated this module as the second in a series of five obstetrics and gynecology modules we designed for third-year medical students. Our first module, "Evaluation and Management of Early Pregnancy,"[20] has been previously published in *MedEdPORTAL*.

Methods

Educational Context

We conducted an original faculty training for all faculty involved in education to orient them to the principles of active learning and the flipped classroom. This training lasted for 1 hour and served the primary purpose of supporting the initial large-scale transition of our student curriculum from passive, didactic lectures to standardized flipped classroom small groups with active learning. Facilitators were oriented to active learning benefits with a review of the literature.[2-5] We provided an overview of the five-module curriculum in which this module was embedded, reviewed examples of slides to be delivered, and went over how to use the facilitator's guide to promote student engagement and provide learning points beyond the text on the slides. Throughout the review of the session slides and facilitator guide, faculty were oriented to several examples of active learning techniques, including role-play counseling, case-based problem-solving, and teaching other group members. Thereafter, dozens of new faculty facilitators were introduced through a brief verbal orientation with the clerkship director during onboarding but principally through the provided faculty guide, which offered didactic information to be shared with students during the session and prompts for active learning techniques.

We assigned prework to students before the session and focused not on didactics but on application of new knowledge during the small group, consistent with a flipped classroom model. Active learning principles were exemplified in this module when students were prompted to respond to questions or solve problems using new learned knowledge and skills such as enumerating important history to be elicited from a patient with a given complaint and refining a differential diagnosis based on provided laboratory information and their interpretation of electronic fetal monitoring.

In our curriculum, groups of six to eight students per faculty facilitator met for approximately 2 hours in a classroom equipped with a computer with a communicating projector and PowerPoint capabilities to complete the session. Facilitators were board-certified/board-eligible faculty in the department of obstetrics and gynecology; all received the standardized faculty guide.

Advanced preparation materials for this session included the American College of Obstetricians and Gynecologists (ACOG) practice bulletin on gestational hypertension and pre-eclampsia[21] and book chapters on antepartum care, maternal physiology, third-trimester bleeding, and abnormal labor and intrapartum fetal surveillance.[22-25] Because students voiced a desire for multimedia resources, we began to offer alternatives to some readings, as noted in Appendix A.

Virtual Adaptation

Of the six clerkship rotations used for data collection, we conducted two virtually due to public health concerns. Virtual sessions were delivered through Microsoft Teams, Blackboard, or Zoom. When analyzed separately, satisfaction rates were comparable; thus, we present combined data below and include additional data in Table 1.

Description of Flipped Classroom Case

We provided students with assigned prework prior to their group session (Appendix A). During the session, each facilitator used provided slides (Appendix B) and the faculty guide (Appendix C) to conduct the session. The session included didactic information as well as exercises prompting students to apply new knowledge to clinical reasoning tasks and patient counseling. The faculty

Table 1. Students' Assessment of Sessions ($N = 64$)

Prompt[a]	No. (%) Agreeing or Strongly Agreeing	
	In Person ($N = 41$)	Virtual ($N = 23$)
The assigned prework gave me the background knowledge needed to participate in activities during this session.	41 (100)	22 (96)
The session was interactive.	40 (98)	21 (91)
The format of this session will help me apply what I learned to patient care.	41 (100)	21 (91)
This session helped me understand the rationale for routine elements of prenatal care.	41 (100)	22 (96)
This session helped me understand the key changes in maternal physiology during pregnancy.	40 (98)	22 (96)
After this session, I feel more comfortable evaluating and managing a patient with third-trimester bleeding.	40 (98)	20 (87)
After this session, I feel more comfortable evaluating and managing a patient with hypertension in pregnancy.	40 (98)	21 (91)
This session helped me understand the stages of labor and fetal monitoring.	40 (98)	22 (96)

[a]Rated on a 5-point scale (1 = *strongly disagree,* 5 = *strongly agree*).

guide prompted facilitators to incorporate interactive exercises and provided clinical and basic science highlights for instructors (Appendix C).[21-31]

Assessment

This module included an optional self-assessment opportunity in the form of an online quiz embedded in the slide presentation (Appendix D). Students accessed the self-assessment in real time on Kahoot! using their phones, tablets, or computers. We did not record or analyze the optional quizzes. The effectiveness of this module was measured by surveys accessible to all students at the end of each session through a QR code. Students were encouraged to complete the survey, but participation was voluntary. Faculty facilitators received a direct email after their first time leading each session (Appendices E and F, respectively). Student surveys assessed multiple domains of the module, including perceived value of prework materials, the degree of interactivity of the session activities, and student perception of the module's ability to both achieve its stated learning objectives and help them apply new knowledge. Faculty surveys measured the facilitators' perception of how well the module incorporated interactive learning, reduced their preparation time for teaching, and increased their confidence in teaching broad specialty concepts to medical students. Data from virtual and in-person sessions were recorded separately and reported in aggregate because they were not statistically different.

Results

Students

Among 116 students attending the education session during our evaluation period, 64 responded to the survey assessing satisfaction, a response rate of 55%. Table 1 reports student satisfaction. Satisfaction was very high with the assigned prework, the interactive nature of the module, and the session's utility in helping students apply learned principles to patient care. Regarding discrete learning objectives, 94%-98% of students agreed the module was successful in achieving each of the five learning objectives. A chi-square test found no statistically significant difference in the rates of student satisfaction of those who participated in virtual sessions versus in person (5% level of significance; Table 1).

Clinical Instructors

Nine out of 15 instructors who facilitated an educational session (60%) completed the survey during our evaluation period. Table 2 outlines faculty satisfaction. All clinical educators (100%) agreed the session faculty guide facilitated active learning. Most (89%) agreed the guide reduced their preparation time compared to traditional didactic lectures and reported increased confidence in teaching the topics included in the sessions (Table 2).

Discussion

The module presented here gives students the opportunity to apply knowledge and concepts in the management of pregnancy and labor and supports clinical educators in facilitating an interactive session. Furthermore, facilitators agreed that this format with a faculty guide reduced their preparation time. The nature of clinical patient care provides students with a breadth of encounters during their clerkship, but clerkship leaders cannot guarantee every student will encounter every foundational concept. Constraints on clinical teaching time continue to expand with documentation requirements, compliance modules, reproductive health care restrictions, and so on. This module helps clerkship leaders ensure that each student receives certain didactic and applied learning related to caring for the pregnant patient. Students and facilitators agree the design fosters interactivity.

Traditionally, faculty in our department and many across the country were assigned passive didactic lecture topics based on their expertise, research, or subspecialty area. Our data suggest that providing the faculty guide with this module allows

Table 2. Clinical Instructors' Assessment of Sessions ($N = 9$)

Prompt[a]	No. (%) Agreeing or Strongly Agreeing
The faculty guide for this session helped me facilitate active learning.	9 (100)
I spent less time preparing for this session than preparing for a traditional didactic lecture.	8 (89)
The information included in the faculty guide helped increase my confidence in teaching subjects outside of my area of expertise.	8 (89)

[a]Rated on a 5-point scale (1 = *strongly disagree*, 5 = *strongly agree*).

faculty members with a wide variety of expertise and specialty knowledge to feel confident facilitating the session. Though we evaluated and typically conducted the session in small groups of six to eight students, we occasionally combined two groups of students when a facilitator was not available. The materials can also be used with larger groups of students.

The equivalent student satisfaction between virtual and in-person sessions suggests that the module can be adapted for different learning environments, if necessary. The cohort of session facilitators was not large enough to perform statistical analysis, but facilitators did comment on a preference for in-person sessions due to difficulty gauging student engagement virtually.

The online multiple-choice self-assessment that we incorporated through Kahoot! can be viewed as optional and can be adapted for settings without this technology by using low-fidelity tools like laminated cards that students can raise to indicate a, b, c, or d.

We acknowledge the limitations of our assessment of this module. Namely, our respondents were a convenience sample of students and facilitators, which may have biased the results toward being more positive. Though student survey scores were high, the response rates were 55% for students and 60% for faculty, and the survey was optional. Furthermore, our data support student self-perception about the module's utility in meeting learning objectives, but we did not measure impact of the module on objective measures frequently used in clerkships, such as the NBME shelf exam, USMLE Step 2 CK scores, or clinical assessments such as OSCEs. These represent possible future directions for this work.

A notable challenge to be addressed when implementing this type of module is the pace of new medical knowledge. It is imperative that someone periodically review and update the content as knowledge evolves. For example, after our first iteration, ACOG changed recommendations on the gestational duration at which group B streptococcus screening is performed. Furthermore, as new faculty joined, we oriented them to the education principles and the faculty guide. While small-group settings and active learning offer advantages, they may be experienced differently by historically marginalized students. With this in mind, we no longer incorporate student performance assessments from this setting into their clerkship grade.

In summary, implementing this module garnered positive reviews from students and faculty facilitators. The module responds to a call for more active learning techniques in medical education and to growing demands on the time of clinical educators at academic hospitals. It accomplishes these things without sacrificing the ability to provide standardized and interactive education and meet specified learning objectives for all clerkship students.

Appendices

A. Student Prework.docx

B. Normal Pregnancy Care.pptx

C. Facilitator Guide.docx

D. Optional Student Quiz with Answers.docx

E. Clinical Instructor Survey.docx

F. Student Survey.docx

All appendices are peer reviewed as integral parts of the Original Publication.

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