

An Introduction to the Management of Labour and Delivery - A Simulation-Based Obstetrics Workshop for Medical Students

Problem Identification and General Needs Assessment

Problem Identification

Obstetrics is a high-risk specialty and the availability of skilled attendants to prevent, detect, and manage obstetrical complications is important to prevent maternal and fetal morbidity and mortality. Education, training and clinical experience is necessary for the various members of the multidisciplinary team, including the obstetrician, pediatrician, anesthesiologist and nursing personnel, to acquire the knowledge, skills, and attitudes to become safe practitioners and function well together.¹

Historically, medical education has followed a master-apprenticeship model (MAM), of "see one, do one, teach one," whereby novice doctors learn on the job while doing progressively more complex and central tasks, under the supervision of a master.^{2, 3} However, advances in educational theory, societal trends of litigation and increasing awareness of patient safety, and changing patterns of health care which include an emphasis on operating room efficiency, increasing morbidity of patients with more clinically complex problems, resulting in diminished teaching time, suggest that the MAM is no longer sufficient.⁴ Trends within undergraduate and postgraduate medical education and training, including shorter working hours, information overload, and increased specialization, also pose a challenge to this traditional model, as students gain less practical hands-on experience.^{5, 6}

How can we accommodate these competing interests and pressures?

Research in learning theory and adult education suggest alternate models. Fitts and Posner suggest that the acquisition of motor skills occurs in three stages: cognition, as the learner attempts to understand the task; integration, as the learner comprehends and performs mechanics; and automation, as the learner performs the task with speed, efficiency and precision.⁴ Ericsson describes the acquisition of expert performance through "deliberate practice," whereby the learner focuses on improvement of a particular task, involving the process of repetition and immediate feedback.⁷

Simulation presents itself as a logical solution to address these various needs and pressures, by providing a risk-free environment, in which learners can successfully master skills needed for clinical practice. "Simulation is a technique, not a technology, to replace or amplify real experiences with guided experiences, often immersive in nature, that evoke or replicate substantial aspects of the real world in a fully interactive fashion." The term "simulator" as used in health care, usually refers to a "device that presents a simulated patient (or part of a patient) and interacts appropriately with the actions taken by the simulation participant."⁸ Regardless of the modality, the simulator is only a teaching tool, which needs to be coupled with an effective curriculum and assessment of performance.⁹

The educational processes that underpin simulator training consist of "deliberate practice,"⁷ reflection, and feedback. As the first step, the task to be learned is identified, and training objectives are developed. Next, an appropriate training device is selected. The task is then demonstrated, and the learner is allowed time for rehearsal, aiming for sustained and deliberate practice, guided by specific and immediate feedback.¹⁰

Simulation training provides a safe and supportive environment for learners, in which they have "permission to fail," and to learn from their mistakes. Learners can then explore the limits of the task, rather than having to remain within the "zone of clinical safety." The task, or learning agenda, is set by the needs of the learner, not by the patient or actual clinical setting. Learners can focus on whole procedures or specific components, and be allowed time for rehearsal. Another advantage of simulation is that the performance of the learner can be assessed, for which purpose multiple tools of objective assessment have been developed.^{11,12}

Undergraduate medical students in Obstetrics and Gynecology do not currently participate in simulation-based education sessions. However, the Department of anesthesia has developed teaching sessions for students using the high-fidelity mannequins at the simulation center, and these sessions have been popular and successful.

Due to the sensitive and often emergency nature of obstetrics, students are often placed in an observational role rather than functioning as a full member of the medical team. Students rarely have the opportunity to think through a problem and manage an obstetrical case from start to finish without the intervention of residents or attending physicians. It is our belief that hands-on experience with "Noelle," the high-fidelity birthing simulator, in conjunction with small-group learning, will facilitate student learning of bread and butter obstetrics.

Current Approach

Currently, our students learn while on the ward and spend every Friday in didactic teaching sessions. Our post-graduate trainees attend the simulation center yearly, but the undergraduate students have not yet been exposed to the simulator. Some of the topics that would be discussed at the simulator are currently covered in didactic sessions (e.g., pre-eclampsia, dystocia).

Ideal Approach

The aim of our project is to develop an undergraduate simulator curriculum in obstetrics, which complements didactic lectures, and serves as an introduction and transition from the classroom to the birthing unit.

Currently, at our centre, we conduct multidisciplinary clinical scenarios for the residents, in conjunction with the Department of Anesthesia, using the high-fidelity obstetrical mannequin, Noelle (Gaumard Scientific Company, Inc., Miami, Florida, USA). These scenarios have been well received by the residents in both disciplines. We now plan to introduce undergraduates into the simulation centre. Through the use of Noelle, medical students will be introduced to the course of normal labour and delivery, and be coached how to assist and perform a vaginal delivery, in a safe, supportive environment, which allows time for rehearsal of newly learned skills. The curriculum will also include modules for learning physical exam skills, basic surgical skills, and an introduction to patient safety and crisis resource management. The content of the curriculum will incorporate those educational objectives outlined in the Association of Professors of Gynecology and Obstetrics (APGO) Medical Student Educational Objectives 8th edition.¹³ The simulator curriculum will be integrated into the existing structure of the undergraduate curriculum, consisting of didactic lectures and clinical clerkship. We hope that this curriculum will aid the medical students to acquire the knowledge, skills and attitudes outlined in the APGO Educational Objectives, and to spark enthusiasm and engagement during their clinical rotation.

We plan to introduce the undergraduate simulator curriculum in September 2008, to coincide with the start of the academic year. The clinical clerkship in Obstetrics and Gynecology is six weeks in duration, with each group consisting of approximately 20 students. We will then be holding the undergraduate simulator laboratories every six weeks at the Ottawa Skills and Simulation Centre, currently located in the Loeb Health Research Institute. Our intention is for every Ob/Gyn clerkship student to spend a few hours of the first Friday of his/her Ob/Gyn rotation at the simulator center, learning the basics of the diagnosis and management of labour and delivery, and some common complications. Once the simulation sessions are running successfully, some of the didactic sessions could be altered to minimize overlap in topics.

Targeted Learners

All clerkship students at the University of Ottawa will participate in a simulation-based teaching session at the beginning of their Ob/Gyn clerkship.

Overall Goals of the Curriculum

The ultimate goal of the program is to expose the new clerkship students to the fundamentals of obstetrics in an interactive and hands-on manner, so as to maximize interest, knowledge retention, and skill development. The main points covered will be:

- Taking a history from a patient in the Obstetrical Assessment Unit (Triage)
- Physical exam of the obstetrical patient in labour
- Diagnosis of labour (i.e., definition of labour)
- Criteria to admit a patient to the case room
- Review of the pertinent investigations and history for preeclampsia
- Methods of augmentation of labour
- Options for analgesia in labour
- Interventions (e.g., scalp clip, ARM)
- Intrapartum fetal monitoring
- Technique of spontaneous vaginal delivery
- Second stage of labour management
- Indications for operative vaginal delivery
- Management of shoulder dystocia
- Indications for cesarean section
- Basic neonatal resuscitation

Goals and Objectives

Formally, the objectives of the session are as follows:

Students participating in this simulation session will be able to:

- A. Take a focused history from an obstetrical patient presenting in labour
- B. Perform a focused physical exam on an obstetrical patient in labour
- C. Synthesize the findings on history and physical so as to confirm or rule-out a diagnosis of labour
- D. Define labour, and all of its stages,

- E. Decide whether or not to admit a patient in labour to the case room
- F. Take a focused history from a patient with hypertension, related to the diagnosis of pre-eclampsia
- G. Perform a focused physical exam on a patient with suspected pre-eclampsia
- H. Order appropriate investigations for a patient with pre-eclampsia
- I. Describe the options available to augment labour (e.g., artificial rupture of the membranes, oxytocin infusion)
- J. Describe the non-pharmacologic and pharmacologic pain control options available to patients in labour and when they are appropriate (e.g., narcotics, nitrous oxide, epidural, massage, Jacuzzi, birthing ball)
- K. Demonstrate the technique of artificial rupture of membranes and placement of an internal fetal monitor
- L. Interpret the fetal heart rate monitor tracing, including baseline, variability, accelerations and decelerations
- M. Discuss the management of the second stage of labour
- N. Demonstrate the proper technique of spontaneous vaginal delivery and management of the third stage of labour
- O. Describe the indications and criteria for operative vaginal delivery, and be able to demonstrate the technique of forceps or vacuum delivery on a mannequin
- P. Demonstrate the maneuvers required to manage shoulder dystocia
- Q. Describe the indications for cesarean section

Educational Strategies

Workshop Schedule

Four sessions will be held during the academic year, at the beginning of each clerkship block of Obstetrics and Gynecology. The sessions will be held on a day during the first week, Friday from 8 a.m. until 6 p.m., and the students will be divided into groups such that 10-12 students will each be at the simulator for 2-2.5 hours:

8:00-10:30
10:30-13:00
13:00-15:30
15:30-18:00

As this workshop was implemented as part of a study to assess the effectiveness of a simulation-based curriculum on learning during the obstetrics curriculum,¹⁴ students were initially asked to arrive 15 minutes early to perform a pre-test, and spend the last 15 minutes of the session completing the post-test.

Teaching Methods

The session will begin with introductory remarks about the goal and objectives of the session. The students will complete their pre-test and then come into the simulation room and take their seats around the manikin, Noelle. Noelle will be preloaded with a baby and dilated to 2-3 cm. The case will then be presented to the students:

"A 25 year old woman presents to the OAU stating that she thinks she is in labour. Take a focused history from this patient."

The students will ask questions in a round-table format, and will be answered by the manikin. The relevance of each question will be discussed, and clinical ramifications explored.

Patient History (to be provided as asked by the students)

- She is gravida 1, para 0, 40 weeks plus 3 days
- No medical problems, no medications, and no allergies
- Uneventful pregnancy, no GDM, no HTN, normal ultrasounds
- No bleeding, no ROM, fetal movement present
- Contracting q 4-5 minutes x 30 seconds over last 2 hours
- Lives 15 minutes from the hospital
- She was examined in Dr. Posner's office yesterday and was 1 cm dilated; he was unable to strip the membranes

What is the next step in the evaluation of the patient to decide on whether she should be admitted to a case room?

Elements of the physical exam relevant to the obstetrical patient should be overviewed. Students should be given the opportunity to examine her and decide on her dilatation (2 cm). Students are asked whether they feel that she should be admitted, and discussion ensues. Topics for consideration could include patient vitals, how far patient lives from the hospital, patient anxiety, fetal well-being, etc.

Instructor should review FHR interpretation with students, including samples of abnormal tracings and their possible etiology (e.g., placental insufficiency, cord compression)

Physical Exam

- 2 cm dilated
- FHR reactive/normal tracing

Patient is sent walking and returns for examination in two hours.

Students are given a second opportunity to examine Noelle, who is now 3-4 cm and contracting q 3-4 minutes x 45-60 seconds.

Should Noelle be admitted now?

Students should arrive at the decision that the patient should be admitted.

Noelle's nurse comments that her BP is 130/90. Is this pre-eclampsia or anxiety?

Students should be given the opportunity to ask Noelle questions relevant to the diagnosis of pre-eclampsia.

History Findings

- No headache
- No scotoma or other changes in vision
- No epigastric or RUQ pain
- Normal swelling

What signs of pre-eclampsia may be noted on a physical exam? What laboratory investigations should be ordered for the hypertensive pregnant patient?

Physical Exam

- Normal swelling
- Normal reflexes

Laboratory Investigations

- Urine dip normal
- Blood work is normal

When should we exam the patient again?

Instructor should discuss the frequency of patient examinations.

Noelle asks the students, "What can you give me for the pain?!?!?!?"

Ask the students about the various non-pharmacologic and pharmacologic pain control options available to patients in labour and when they are indicated (e.g., narcotics, nitrous oxide, epidural, massage, Jacuzzi, birthing ball). The instructor may wish to extend the conversation to include alternative birthing positions and locations, and the legal restrictions placed on obstetricians working in hospitals if relevant.

Noelle opts to have an epidural, but it is then noted that her labour progress has slowed. What options might you consider to augment her labour if she fails to progress?

Instructor should lead a discussion on the methods for augmenting labour, including the rupture of membranes and oxytocin administration. Students may be shown the technique for artificial rupture of membranes and have the opportunity to practice hand movements on a balloon in the pelvis. Instructor should demonstrate the technique for the placements of an internal monitor, with the instrument passed around for students to examine.

Noelle is fully dilated. When should she start pushing?

Students should be lead through a discussion on the management of the second stage of labour, including indications for operative vaginal delivery. If possible, it is helpful to have a sample of forceps and/or vacuum to pass around for students to look at.

After two hours of pushing, you are called to the delivery.

From start to finish, the steps of a spontaneous vaginal delivery are reviewed, from the time you arrive in the room.

- Put on gloves
- Set-up tray
- +/- support perineum
- Control the head
- Watch for restitution
- Check for cord
- Deliver anterior shoulder
- Deliver posterior shoulder
- Baby onto bed or onto mom
- Clamp and cut cord
- Cord samples
- Place green towel on mom
- Support uterus and apply gentle traction on cord
- Deliver placenta
- Administer oxytocin (or with anterior shoulder)
- Check placenta
- Check lacerations
- Repair lacerations (+/- local anesthetic)
- Check uterine fundus one last time
- Clean up

Once the instructor has demonstrated the steps to a vaginal delivery, students should be given the opportunity to practice. It is helpful if the instructor is able to provide one-on-one guidance for each student as they practice. After the students have had sufficient time to practice, the instructor may discuss shoulder dystocia and its management techniques (e.g., McRobert's, Corkscrew, Post Arm). If time permits, the demonstration of an operative vaginal delivery could be performed. Briefly, the indications for cesarean section should be overviewed.

Finally, time permitting, the basic steps to neonatal resuscitation could be discussed, demonstrated, and practiced by the students.

- Warm
- Dry
- Suction
- Free-flow oxygen
- CPAP/ Positive pressure ventilation prn
- Intubate prn

Materials Necessary for Workshop

Noelle® (Gaumard) or SimMom™ (Limbs & Things) simulator (or reasonable facsimile), loaded with baby Tablet PCs for Noelle or your delivery simulator
Monitors for mom and fetal monitor for fetus
Chairs for students in simulation room
Gloves
Ventouse
Forceps
ARM hook
Internal monitor (scalp clip)
Stool for McRobert's maneuver
Baby blankets
White board and dry markers (instructor preference)
Delivery tray used in your institution
Standard board with cervical dilation for comparison

In the absence of a hi-fidelity birthing mannequin, this workshop could be run with a part-task trainer birthing pelvis (such as "Chilbirth Simulator" by Gaumard or PROMPT by Limbs & Things) and a standardized patient. Please see *Modifying the Workshop* in the Instructor Guide file.

Evaluation

The effectiveness of the session will be evaluated using the comparison of the pre- and post-tests. The students' attitudes towards the session will be evaluated using the standard evaluation form used by the Faculty of Medicine.

Recommendations to the Instructor

The success of this workshop as a teaching tool during the third year Obstetrics and Gynecology rotation has led to its continued use in subsequent years at the University of Ottawa. The following are recommendations based on student feedback that the developers feel warrant consideration in future delivery of this workshop, and in the development and implementation of future simulation workshops. Additionally provided is positive feedback from students about aspects of the simulation that they felt were effective teaching tools. We would encourage instructors to include their own measure of student feedback following the workshop, whether formal or informal, to determine whether the simulation had met/not met student expectations, its strengths, and how it could be improved in the future. Lastly, we have included a list of topics that instructors may choose to incorporate into their workshop, as either simulation or didactic points, as time allows.

Areas for Improvement

Development of a handout or summary

- Many students identified that having a handout provided at the end of the workshop, whether in powerpoint or as a word document, would have been valuable. Students indicated that the set-up of the simulation (i.e., no desks) did not facilitate individual note-taking (nor was this expected by the instructor) and felt that having something to take away

from the workshop would have been a valuable tool to reinforce and consolidate their recent learning, hence this was created.

- Other relevant information could be included in this handout, including a list of learning objective, management algorithms specific to the learning centre, drug formulary information, recent publication in obstetrics, and OSCE tips

Timing of the workshop in the curriculum

- Some students that began their 12-week Surgery and Obstetrics/Gynecology block with surgery expressed concerns that the workshop came too early, as it took place on the first academic day in the block. Similarly, some students that began the 12-week block in the labour and delivery component of Obstetrics and Gynecology indicated that it would have been more beneficial to have the workshop prior to their time on the labour and delivery floor. Given the current clerkship curriculum at the University of Ottawa, it is impossible to change the timing of the workshop to address these concerns, however it may be helpful for others to consider the timing of the workshop such that the maximum number of students benefit.

Including tips/pointers on patient communication

- In addition to teaching the students specific techniques, the instructor should take care to share what they say to patients during a particular exam or vaginal delivery. This could be accomplished by having the instructor demonstrate a technique on the manikin as if they were performing the technique on a human patient. Similarly, students could be briefed on phrases that should not be used in front of the patient (e.g., "fetal distress") and how to explain medical issues (e.g., pre-eclampsia, risks of epidural analgesic) in lay terms.

Strengths of the Workshop

Use of pre- and post-testing

- While pre- and post-testing was not done for the benefit of the students (rather it was to measure the effectiveness of the simulation as a teaching tool), many students indicated that this type of evaluation served to focus their attention on aspects of the workshop that were of importance and highlighted their own knowledge gaps. Instructors might consider the benefit of including such testing in their own workshop. Some students indicated that would have liked to go over the answers to the questions at the conclusion of the workshop, or have an answer sheet provided.

General comments on learning through simulation

- The feedback from the students on the simulation was overwhelmingly positive. They found the workshop to be very interactive and engaging. We have found that an effective way of encouraging equal student participation, especially in the situation where one student is dominating the discussion, is pose a general question (e.g., "what is a question you could like to ask Noelle related to her current hypertension?") and ask students one by one, moving along a row.

- Students indicated that a case-centred approach that had a logical flow (e.g., from presentation at triage to delivery) to teaching learning objectives extremely effective and facilitated retention much more than didactic lecture alone.
- Having two demonstrators present facilitated a smooth presentation of simulation and didactic elements of the workshop. We believe that this is an area that we will attempt to build up on the future and include more real-life examples of learning moments.
- Students also appreciated that instructors highlighted the clinical skills expected of a medical student. While many techniques were discussed in the workshop, we suggest that it be made clear to the students which ones they should be able to perform (e.g., cervical dilation) and which ones are currently beyond their scope of learning (e.g., operative vaginal delivery). We believe that this serves two purposes. One, it allows students to triage information by importance, and as a result, may reduce any anxiety they may have about their obstetrics rotation. Secondly, it enables students to better gauge their hospital learning. It is well-known among medical students that certain preceptors are more (or less) liberal in allowing students clinical opportunities. By giving students a sense of which clinical skills are inappropriate for them to practice at the clerkship level, they should be more comfortable in declining such opportunities. Similarly, students that have been afforded less occasions for clinical practice will recognize this and hopefully take measures to rectify it.
- The students appreciated the opportunity to be shown and then practice examinations techniques (e.g., assessing dilation) on a manikin rather than a patient for the first time. We would like to stress the value in ensuring that every student has the opportunity to practice using the manikin at each new "patient development." While the tendency may be to only some of the students practice each time, or to rush through the last couple of students, or to say "Is there anyone else that really wants to practice technique X?", the feedback from students was very clear that they appreciated the instructors' efforts to ensure that everyone was able to practice. Instructors should be aware that not all students will feel comfortable taking the initiative and saying, "Yes, I would like to practice" if the instructor is appearing rushed or bored. We feel the best way to avoid this situation is to make it clear from the beginning of the workshop that every student will have the opportunity to practice every technique.

Expanding on the Workshop

- Assessing other components of cervical change in addition to dilation (e.g., effacement, station, position)
- Induction of labour\cervical ripening (e.g., methods, indications)
- Determining baby's position (Leopold's maneuvers, head position using fontanelles)
- Non-surgical management of fetal malpresentation (e.g., manual rotation, maternal positioning, breech delivery)

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