Using Simple Simulation to Teach Midwifery Skills

Utilisation de modèles de simulation simples pour enseigner les techniques de pratique sage-femme

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ABSTRACT

Simulation has become a vital part of health care education. Growing evidence supports its use to assist students in learning both basic and emergency skills. Expensive simulation models exist and some offer midwifery students excellent learning opportunities. However, many simulations can be highly effective and much more accessible to both students and instructors when handmade from ordinary household objects. Based on experience using simulation as part of the Ryerson Midwifery Education Program curriculum, we describe how to create simple models that can be used in the classroom, with preceptors in the clinical setting or by midwifery students independently. We also explain how we use household objects to augment commercial teaching models to make simulations more realistic.

KEYWORDS

simulation, midwifery education, clinical education

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RÉSUMÉ

La simulation est maintenant un aspect essentiel de la formation en soins de santé. De plus en plus de données en appuient l'utilisation afin d'aider les étudiants à apprendre tant les techniques de base que d'urgence. Il existe des modèles de simulation coûteux, dont certains offrent aux étudiantes en pratique sage-femme d'excellentes occasions d'apprentissage. Toutefois, bon nombre de modèles de simulation fabriqués à partir d'objets de tous les jours peuvent être extrêmement efficaces et beaucoup plus abordables, tant pour les étudiants que pour les instructeurs. Nous nous servons de notre expérience en ce qui concerne les modèles de simulation utilisés dans le cadre du programme de pratique sage-femme de Ryerson pour expliquer comment créer des modèles simples pouvant être utilisés en classe, par des précepteurs en milieu clinique ou, de façon autonome, par des étudiantes en pratique sage-femme. Nous expliquons également comment utiliser des objets de tous les jours pour compléter les modèles d'enseignement commerciaux et rendre les simulations plus réalistes.

MOTS CLÉS

simulation, formation en pratique sage-femme, formation clinique

Cet article a été évalué par des pairs.

INTRODUCTION

Clinical learning in health care settings can be challenging for students, teachers and the people they are caring for. Simulation has become a vital part of health care education, to better prepare students for "real life" encounters with clients/patients, to maintain and enhance performance of clinical skills and to assess students and practitioners. Simulation has been defined as use of a "physical object, device or environment where a task or series of tasks can be realistically or dynamically represented".[1] Many simulation models exist and are increasingly being used in both basic and continuing education programs in educational and health care institutions.[2] Several programs that use simulation for ongoing education have become standard in maternity care ALARM (Advances in Labour and Risk Management)[3], ALSO (Advanced Life Skills in Obstetrics,[4] MORE[OB] Managing Obstetric Risk Efficiently,[5] and the Canadian Association of Midwives Emergency Skills Program.[6] A wide variety of commercial models are now available from the simple plastic obstetric torso to "whole body" computer driven mannequins. Commercial simulators are increasing in complexity and function, making them expensive to purchase and often complicated to run. Some offer excellent learning opportunities for health care students, including midwives.

We have found that simple simulations can also be highly effective and much more accessible to both students and instructors in the field when handmade from ordinary objects found at home. Simulations of all kinds can help integrate knowledge and develop skills and confidence in a safe setting, which not only makes student involvement in care more respectful but is also fun for teachers and learners. When students make simple simulation models for themselves, the act of creating them can increase the learning. Our purpose in this article is to describe the value of simple simulation and the way in which we use it in our curriculum.

Simple models made from household objects can be used by midwifery students independently, in student study groups, or with their preceptors. They can be used in any setting. In the Ryerson Midwifery Education Program (MEP), we use them in the classroom and encourage students to make these practice tools at home and in their midwifery placements. Simple simulation tools are transportable to low resource settings. The inspiration for some of these tools came from working and teaching in remote settings. Household objects can also be used to augment commercial teaching models to make more effective simulations.

This article is based on a series of clinical skills workshops for students at the Ryerson Midwifery Program. Sharing these tools with both academic and clinical teachers through the MEP Preceptor Workshops, the Association of Ontario Midwives (AOM) and Canadian Associations of Midwives conferences has led to exchange and creativity. Students and teachers at University of Quebec at Trois Rivières and at University of British Columbia have used and adapted these tools and shared their insights and innovations. Coming up with innovative and simple simulations seems to be a passion for many midwifery teachers and a tradition of both midwifery and medical history.

Canadian midwifery scholar Elaine Carty's work on the "King's Midwife" M. du Coudray reveals not only the importance of simulation in improving midwifery skills in 18th century France, but also the artistry of the models that midwife and teacher du Coudray developed.[7] Carty presents du Coudray as having invented the first obstetric simulator, however it appears that learning about birth with simulated models may be much more ancient; to scale leather models have been found in archaeological evidence of the prehistoric ancestors of the Siberian Mansai people.[8] Our experience in working with Canadian midwives shows this traditional midwifery art form is still in use today.

Potential Benefits of simulation

Simulation is currently looked to as an answer to some of the challenges in health care education because it promises to help meet the demand of training increased numbers of health care providers at a time when all professions face shortages of

clinical sites for hands on learning. Used at an introductory level, simulated opportunities for practicing skills can maximise competence before students attempt to develop skills in situations involving real clients/patients. During ongoing learning, simulation can also help consolidate and improve skills once students have had some exposure in practice. It can be invaluable to provide opportunities to students who have encountered challenges with hands on skills. At both levels, students have the opportunity to repeat the mechanics of procedures and get the skills "into their bodies". Simulation can incorporate role plays that ask students to integrate communication skills with clinical procedures. Increasingly, simulation is being used to foster a team learning approach and teach inter-professional collaboration.[9]

What is the evidence?

A growing literature documents initiatives and, increasingly, evidence for the effectiveness of simulation in health care. Societies and journals devoted to the promotion and evaluation of simulation in health care have an international audience.[10,11] Surveys of the extent of use of simulation by medical, midwifery and nursing students show extensive use but also document challenges related to integration into the curriculum, uptake by faculty and adequate resources to ensure high quality simulation experiences.[11-14]

There have been several systematic reviews focused on medical[15,16] midwifery[17]and nursing[14] learners documenting evidence that simulation improves confidence, skills, decision-making and test scores. What is less clear from the evidence is whether these benefits translate into improved clinical outcomes, patient safety and risk management. Much of the research is focused on simulated introductions to normal delivery,[18,19] emergency skill drills,[20,15]and teamwork.[15] In one study medical clerks participated more actively in labour and delivery placements if they had received simulation training about normal birth and showed more competence and confidence.[19] Merien's review found four RCTs and four cohort studies on simulation of obstetric emergencies.[15] Okuda's review looked at 113 articles on simulation in medical education generally and showed convincing evidence for overall improvements in knowledge, skills and confidence, but evidence for outcomes was restricted to laparoscopic surgery and emergency cardiac care.[16] Several authors argue the overall cost effectiveness of simulation although more research about impact on outcomes and patient safety is needed and the evidence about cost is anecdotal.[21]

The literature shows that educators have concerns about promoting simulation as a substitute for real life clinical experience in the context of shortage of placements, competition between health professionals and increasing limitations on student hours spent in placement. Most agree that simulation is complementary to but not a replacement for clinical experience. There is evidence that simulation can promote the most effective use of limited time in placements. Some programmes have restricted the number of clinical hours that can be simulated;[22] others use simulation as preparation for clinical hours.[23]

Why household objects?

Despite the potential benefits, many simulation models are expensive and require lab monitors and computer experts and are therefore not always readily available for teachers and students in busy clinical placements. Although medical schools and teaching hospitals are increasingly establishing simulation laboratories, Canadian midwifery students spend much of their education away from large institutions and access to sophisticated equipment may be limited. Constructing simulation models with household objects has the advantages of being inexpensive, highly accessible and easy to duplicate.

We find that the process of constructing the models is part of the value of simple handmade simulation tools. A significant part of the learning is in the process of understanding how the model is made. Students and teachers in our workshops have the opportunity to be involved in creating and improving our simulation models. One of the principles in the literature of simulation is that the models used should

be as simple as possible, depending on the skill, the level of the student and the context in which it is applied. There is evidence that simple simulations may be less distracting than some of the high tech approaches.[8]

Simple simulations are appealing in terms of cost effectiveness. At Louisville Medical School, household objects were used to conduct eight simultaneous one hour abdominal surgeries for 150 students at a cost of less than $300, using plastic storage bins and fabric.[21] A full body birth mannequin costs about $60,000, whereas teachers and students can make the simulations we describe for no cost or little cost. Simple simulation, depending on the format, may require time investment on the part of faculty especially for initial development and set up.

Simulation and Sensitivity

Simulation uses tools that represent parts of women's and babies' bodies. Using commercial obstetrical torsos, dolls and pelves can be seen as objectifying, even demeaning to women and babies. In our workshops, we always take a moment to acknowledge the wholeness and integrity of women and babies and that our goal is to learn skills that will help us to care for them with respect and dignity. We tend to integrate torsos/pelves and dolls whenever possible into a scenario, as if they are part of the demonstrator's body, e.g. being held by an actor sitting on a birth stool and acting out the second stage of labour, rather than as disembodied body parts. During role-plays, we try as much as possible to use simulation tools in a way that integrates respectful communication. However simulation also offers an opportunity for students to focus solely on what their hands are doing, without having to struggle with the social awkwardness and ethics of practicing on a real person, in a way that is not possible or appropriate in a real clinical situation. One of our preceptor workshop participants expressed the importance of this type of opportunity clearly in feedback to us. She sees practicing skills in advance of performing them on women and babies as the definition of respect and sensitivity, not only to our clients but also to students themselves.

> *We are being respectful to women by obtaining a level of competency in our clinical skills through simulation instead of learning basic skills in front of a client. When students have a basic level of competency they can then focus on interactions with client and higher learning. Clients' confidence and trust in students can be undermined at times when clients think students appear to be uncomfortable with her skills and equipment.*
>
> Nicole Bennett, RM

Figure 1. **Socks and Dolls:** Using socks and dolls, students can create cervical models to practice assessing cervical effacement and dilation.

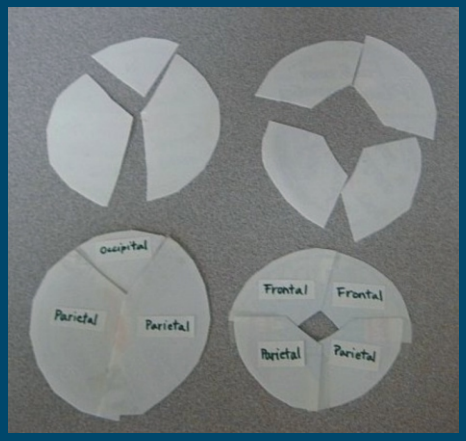
Figure 2. **Play-doh and plasticine cervix:** Using Play-doh and plasticine, we can simulate different cervix such as a closed, dimpled and dilated cervix as seen in this picture.

This perspective is echoed by those concerned about the ethics of health care education and patient experience. Calling simulation based education "an ethical imperative", Ziv et al.[9] argue that simulation is best practice both in healthcare and education. Not only does simulation promote best care, it avoids approaches that can side-step or even overtly violate patient autonomy. The opportunity to learn from mistakes in a low risk environment benefits all involved in health care and creates a culture of openness and focus on safety.[9,24] In a controlled environment, skills can be taught according to best practice guidelines. Research also supports simulated evaluation of both students and practitioners as best practice.[9, 16]

Figure 3. **Jar lids:** A complete collection of jar lids that simulates 1 to 10 cm dilation of the cervix.

Figure 4. **Intact Membranes:** We used a single layer of plastic wrap to simulate tight membranes over the doll's head at full dilation. We used an inflated balloon and a sock to simulate bulging membranes and a thinning cervix.

Figure 5. **Fetal Skull:** Fetal skull landmarks and fontanelle constructed by using yogurt container lids.



Socks, Dolls and the Cervix

Vaginal examination can be challenging to learn and requires both skill and sensitivity. Simulation can make the invisible "visible", and benefits both tactile and visual learners. It is difficult for students to know what to feel for when they first begin to conduct vaginal examinations on women. Using socks and dolls, students can create cervical models to practice assessing cervical effacement and dilation (Figure 1). Old socks are cut into tubes that can be pulled over a doll's head. Making different sized openings in the toe of the sock and pulling a sock to different diameters around the doll's head creates different dilations. Socks of various thicknesses create different effacements. An anterior, posterior or off-to- the-side cervical os can also be simulated by adjusting the placement of the sock opening. Students can make the simulation more realistic if they can practice with cervical models made from socks and dolls in combination with a pelvic model or torso. In our introductory workshop on vaginal examination we set up a series of stations around the perimeter of the classroom, moving from a torso set up with a closed and uneffaced cervix and a high presenting part through stations going from 1-10 cm of dilation with examples of both the primiparous and multiparous os and intact and ruptured membranes. We made a cervical model that worked for practicing stretch and sweeps on a long uneffaced sock cervix and intact membranes of saran wrap on a doll's head. We have also used sock cervices in an advanced workshop as part of making stations for learning prostaglandin gel insertion, foley catheter induction and application of fetal scalp electrodes.

Play-doh, Plasticine and the Cervix

Play-doh and plasticine moulded on a doll's head creates models for different cervical effacements and dilations (Figure 2).This can serve as an excellent model for learning to identify an anterior lip of cervix, when used in a pelvic model or mannequin. In our workshop students play a guessing game in pairs with one student creating a cervix for the other to assess and vice versa. Using simulation can demystify challenging skills. Making the process fun can help students feel more confident about learning. Hands on practice with models helps students establish dexterity and routines in a situation

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that is more relaxed that when dealing with a woman in a prenatal visit or in labour.

Jar Lids and Cervical Dilation

This simple tool has been used by many teachers and students. Jar lids with diameters from one to ten centimetres can be used to learn cervical dilation assessment. Jar lids provide both visualization and hands on practice for students, are inexpensive and easy to collect. Jar lids that are labelled on the front help create a pattern of recognition from students' fingers to their brains. Jar lids that are labelled on the back are used as self assessment tools. Students in their first placements often find it useful to carry a set of labelled jar lids with them to clinic and births (Figure 3).

Balloons, Saran Wraps and Fetal Membranes

A layer of saran wrap pulled over a balloon and attached to a doll's head simulates the two layers of fetal membranes. In our workshop, we pulled the two layers tightly over the doll's head using elastic or tape around the doll's neck to secure the "membranes". The balloon can be filled with more or less air to simulate degrees of bulging membranes. (Figure 4). Saran wrap placed directly on a doll's head simulates tight membranes which are difficult to assess and rupture. Using lubricating gel make the membranes feel slippery under gloved fingers. This model can be used with a sock cervix and/or with pelvis or obstetrical torso. It provides an excellent set up to practice amniotomy.

Plastic lids and Fetal Skulls Landmarks

Using plastic lids, we created three-dimensional touch diagrams of fetal skull landmarks (Figure 5). Students learn how the fetal skull bones overlap in occipital anterior and occipital posterior positions. When students are creating and labelling the diagrams in our workshops, they apply the knowledge from texts to hands on learning. The exercise of making the models appeals to different teaching and learning styles. Students report that once they have drawn and constructed the model, the anatomy makes much more sense and the information is retained at a very different level than simply through reading. Learning touch skills for identifying fetal skull landmarks with this model is much more accessible than trying to learn during a vaginal exam with a woman coping with active labour, particularly because many midwifery clients chose to labour without epidural analgesia. Like the jar lids, students report that this simple and inexpensive tool can be taken to births to aid learning in actual clinical situations i.e. "to help figure out what I have just felt". Students are reminded to visualize what the model represents and name the anatomy and physiology both as they create the model and as they use it to practice.

The fetal skull landmark model is made as follows: for an occipital anterior presentation, a 'Y' shape that represents the sagittal and lambdoidal sutures is drawn on a plastic lid. Then the lid is cut along

Figure 6. **Cord prolapse:** We simulated cord prolapse by using the yarn umbilical cord and a doll, set up inside a mannequin.

Figure 7. **Cord presentation:** Using a combination of yarn cord, plastic wrap and socks, we can simulate cord presentation.

Figure 8. **Vasa Previa:.** A urinary catheter, saran wrap and a sock can be used to simulate vasa previa.

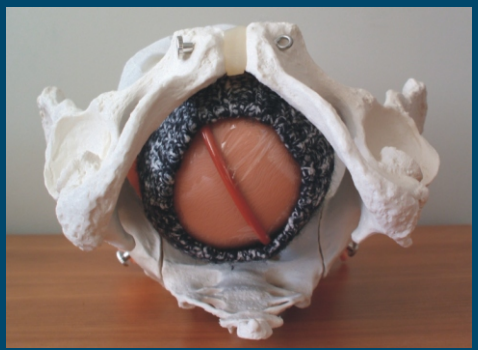


Figure 9. **Cord clamping**: Students can easily set up various nuchal cord situations for practice using inexpensive yarn cord to simulate clamping and cutting of a tight umbilical cord.

Figure 10. **Yarn Cord for Cord Blood Draw**: A urinary catheter woven into the yarn cord allows students to practice techniques for drawing cord blood.

the lines to create three pieces to be put together to create a model that simulates the overlap of fetal skull bones felt during a vaginal examination. For a deflexed occipital posterior presentation a diamond shape that marks the anterior fontanelle and the frontal, coronal and sagittal sutures is drawn on a second lid. After cutting along the marked lines, the pieces are put together with the anterior parietal bones overlapping the posterior and the parietal overlapping the frontal and occipital bones. Students label the fetal skull bones on both models. In our workshops, students rotate the models into different positions such as left occipital anterior and right occipital transverse. They can work in pairs and with closed eyes feel the model in various positions, set up and assessed by their partner.

Yarn Cords and Cord Presentation and Cord Prolapse

Simply twisting strands of yarn of three different colours and looping the twisted length back on itself makes an inexpensive yarn umbilical cord. We simulate cord prolapse (Figure 6) by using the yarn umbilical cord and a doll, set up inside a mannequin. For cord presentation (Figure 7) we added plastic wrap and a balloon for intact membranes. To simulate vasa previa we used a urinary catheter under plastic wrap (Figure 8). We were also able to create models using the yarn cord along with a doll, and pelvis or obstetrical torso for students to learn about checking for nuchal cord, un-looping a nuchal cord from around the fetal neck, performing the somersault manoeuvre, clamping and cutting a tight umbilical cord during the birth process (Figure 9). Yarn cords can also be used to make a simulation for drawing cord blood. Using a urinary catheter filled with red fluid and woven into the yarn cord can make the simulation even more realistic. (Figure 10)

Labelling the Pelvis and the Doll

Students can review their knowledge of anatomy and physiology and the mechanism of labour while labelling a pelvis. An old toy doll head can be labelled to show diameters and fetal skull landmarks. This exercise reinforces the use of appropriate terminology and helps students learn the correct spelling of relevant terms. Labels attached with Velcro can be removed and re-attached, allowing students to use the pelvis repeatedly to test their knowledge. The labelled pelvis and dolls make excellent teaching aids in the classroom (Figure 11).

Enhancing Commercial Simulation Models

Students and teachers can use handmade simulation tools in

combination with commercial simulation teaching aids. We set up stations to practice sterile technique during vaginal exams when membranes are ruptured, using a doll with a sock cervix inside a mannequin and instructions to the student to choose the right equipment and perform the procedure using sterile technique. Using a thick sock or play dough to make an anterior lip and a doll and torso, we ask students to practice assessing an anterior lip and moving it over the fetal skull (Figure 12).

We have made very simple but highly effective stations for teaching artificial rupture of membranes (ARM), catheterization and episiotomy. For ARM, students attach a water balloon on a doll's head, use a sock to represent a cervix and then place the doll in a torso. The student then goes through the procedure of rupturing membranes using an amnihook (Figure 13). Simple catheterization models are made by making a hole in a kitchen sponge and pulling a balloon through the hole. The balloon makes a urethral opening on one side of the sponge and the bladder on the other. Placing the sponge inside a mannequin again allows the student to practice the procedure and feel confident and ready for her first clinical opportunity to insert a urethral catheter. Similarly, an episiotomy model can be made with a sock on a doll's head placed in a mannequin that has had the commercial perineum removed. Some preceptors have told us that a tensor bandage works even better to mimic the tightness of the perineum. Students set up the station with birth instruments and practice all of the steps of episiotomy (Figure 14).

Role plays and Immersive Simulation

Students can use simulated models on their own to focus on a challenging clinical skill or can integrate the models into role play activities which involve decision making, a series of clinical actions and communication to parents and other care providers. Both approaches have advantages, but what has been called "immersive simulation"[10] can be particularly important for students at an advanced level where integrating clinical actions with decision making and team work in acute situations are crucial. Role play is an established part of emergency skills drills and assessment using OSCEs (Objective Structured Clinical Examinations). At an intermediate level in the MEP we use "self serve" or practice OSCEs in which students can independently walk through simulated situations guided by a set of instructions. They can be assessed with a skills checklist by another student or by

Figure 11 A and B. **Pelvis and Doll** : The exercise of labelling the pelvis and doll's head requires students to review their anatomy.

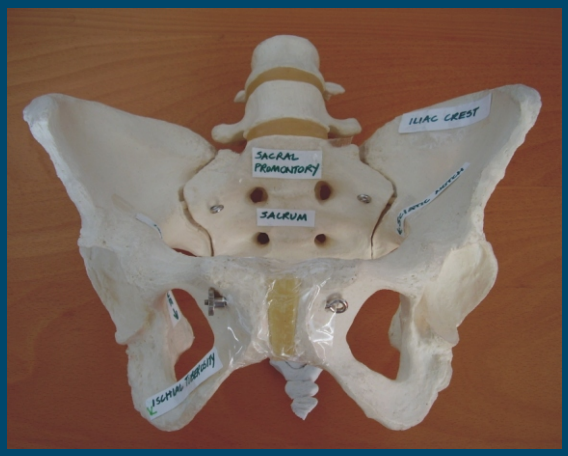
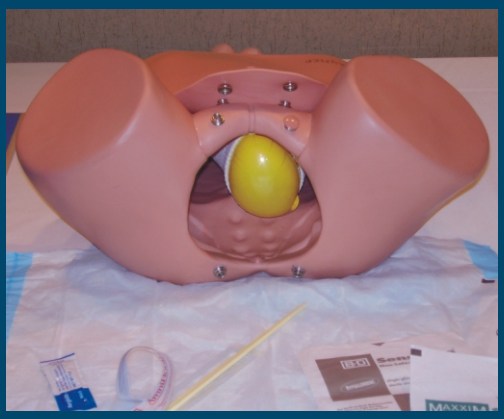


Figure 12. **Anterior lip:** Using a thick sock or Play-doh with a doll and mannequin, we ask students to practice assessing an anterior lip and moving it over the fetal skull.

faculty. Students report that being able to "figure out for themselves" how to perform the skill also gives them confidence prior to being observed and evaluated by preceptors and faculty. The benefits of role play simulations include being able to stop the events, correct and repeat as needed.

Figure 13 A and B. **ARM**: An inflated balloon place in front of a doll's head, secured by tape can be used for students to practice their ARM skills. For added effect, the balloon can be prefilled with water.



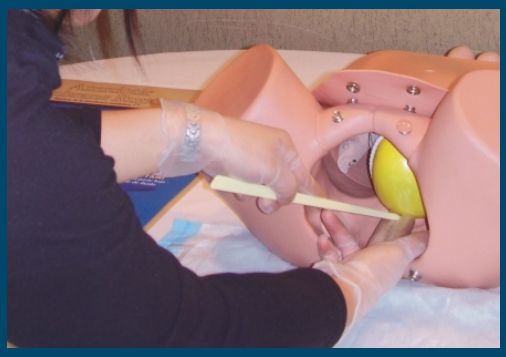


Figure 14 A and B. **Catheterization**: The opening of the balloon fitted through a pre-cut hole in a sponge represents the urethra. Once the sponge with the balloon is secured inside the obstetrical torso, student can practice their catheterization skills.

Simulation and Documentation

Simulated situations can also integrate or focus on documentation.[25,26] Documentation is an area that midwifery students identify as a learning need throughout their placements and can be difficult to learn in an acute clinical situation that requires multi-tasking. Students should be encouraged to integrate communication and documentation exercises when practicing independently with simulation models. We use some of the commercial vaginal exam "boxes" at stations, made more realistic using a written labour scenario that asks the student to guess what the dilation will be given the external signs, and then document her findings after her assessment.

Learning Through Mistakes, Avoiding Mistakes

In advanced workshops on vaginal exams we focus on "Common Mistakes, Tips and Tricks", using models to show common pitfalls, for example, how a very effaced cervix can be mistaken for bulging membranes or how a very posterior os can be missed (Figure 15). We have constructed a "layered cervix" where a student can mistakenly assess dilation as 6 cm because they have not clearly identified the 2 cm os, by sewing a thicker sock over a thinner sock. (Figure 16 C) Providing students the opportunity to "make mistakes without any risk to the patient, themselves or other team members"[27] is a benefit of simulated practice. Students often find it easier to accept feedback and correct errors in a lower stress simulation environment rather than in the midst of clinical care. Alternately, clinical teachers can find it reassuring to follow up a clinical misstep with a student by walking through a simulation allowing the student to demonstrate that feedback has been integrated and understood. Simulation can also provide the opportunity to learn from the mistakes and the tips passed on by an experienced practitioner as a more visceral adjunct to the clinical storytelling that students and clinical teachers often use for learning. Some argue that this more effective transfer of knowledge from expert to novice works to "shorten the learning curve".[23,27]

Fostering Student Autonomy and a Culture of Practice

Learning most clinical skills requires repetition to establish dexterity to do what one 17th century obstetrician Sir Richard Manningham, called "forming your hands for practice".[1] There is often not enough time in either the classroom or clinical setting for the repetition and review that students need. In addition, some emergency skills are rarely used and students rely on simulation and

constant practice to learn and maintain skills. We tell students that classroom simulation is an opportunity not to perfect skills but to introduce and expose them to tools which they are expected to use for ongoing self study and practice. Students can feel empowered by having tools which can assist them to independently rehearse skills until a level of competence has been reached. This approach fosters responsibility and a proactive approach to "life-long" learning.

Creativity and Play

In our experience, using household objects to create simple simulations for clinical learning is popular with students and highly ranked in course and faculty evaluations. Other clinical researchers report similar findings. Authors call the Louisville Medical School use of plastic storage bins and fabric to conduct simulated abdominal surgery "a tremendous success" with students "genuinely engaged and excited".[21] We find that the atmosphere of creativity and playfulness peaks student interest and gets them actively involved in their own learning. We hope that using simulation in this way role models resourcefulness and a "you can do it" kind of spirit which is important to nurture in midwives.

CONCLUSION

Simulation with simple objects is fun for students and teachers. It builds knowledge and confidence in skills that some students find intimidating to learn. A more tactile approach to learning can benefit many students and address diverse learning styles. We have found simple simulation a very useful way to introduce and consolidate hands on skills and to integrate communication and documentation with clinical actions. We are always trying to build our set of tools, and we welcome correspondence about innovative ideas.

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Figure 14 B.

Figure 15. **Episiotomy:** A tight fitting sock around a doll's head simulates a tight perineal and students can then practice their episiotomy skills.

Figure 16 A, B and C. **Common Mistakes and Tips for Vaginal Examination.** Students can use socks and dolls to make models for situations that can lead to mistaken assessments e.g. a very posterior cervix, a very thin off centre cervix, a layered cervix.

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