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Shoulder Dystocia
Using Simulation to Train Providers and Teams

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Shoulder dystocia is an obstetric emergency that requires immediate recognition and a well-coordinated response. This response must include effective application of the maneuvers proven to relieve the impaction of the fetal shoulder and timely hand-off of the newborn to the neonatology team. The rare frequency of shoulder dystocia, coupled with patient safety concerns and the medico-legal environment, limits the opportunity of providers to learn and practice the management of shoulder dystocia. Training, especially simulation-based training, has been demonstrated to improve the management of shoulder dystocia. This article presents a review of the literature that supports simulation training for shoulder dystocia and provides guidance on creating and implementing shoulder dystocia training. **Key words:** *force monitoring*, *obstetric emergency*, *shoulder dystocia*, *simulation*, *team*, *training*

SHOULDER DYSTOCIA is an obstetric emergency in which one of the fetal shoulders becomes impacted against the pelvic bones, thus requiring additional maneuvers to achieve delivery. It is estimated that shoulder dystocia complicates an estimated 0.6% to 1.4% of deliveries.[1] While shoulder dystocia is a relatively infrequent event, it has potentially devastating consequences including paralysis of the neonate's arm, asphyxia, and, rarely, neonatal death.

While shoulder dystocia occurs suddenly and is usually resolved in the course of a few minutes, it is a complex emergency involving multiple providers. In addition to individual skills and competencies, a quick and coordinated team response is critical to effect delivery of the fetus affected by shoulder dystocia prior to fetal hypoxic injury or death. Furthermore, this response must be executed in a manner that minimizes the risk of injury to the fetus and the mother.

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The ability to provide hands-on training during obstetric emergencies such as shoulder dystocia is limited by various factors. Shoulder dystocia is a relatively infrequent event that develops quickly and must be addressed immediately. Such events do not lend themselves to assembling a group of learners, even if the goal is to bring them to the bedside simply to observe. Even if learners are at the bedside, the nature of such emergencies requires that the most experienced hands and minds direct and/or conduct the delivery. In the case of shoulder dystocia in particular, many of the technical skills that may be necessary to relieve the shoulder dystocia (namely the fetal maneuvers) cannot be easily observed by the learner. This tension between medical training and maximizing patient safety is described by Ziv et al, who conclude that simulation-based medical training is an "ethical imperative."[2(p783)] Theoretically, simulation training permits the creation of an environment that is realistic enough to allow for successful development of skills in a manner that is reproducible and safe for the learner and, most importantly, for the patient.

The Institute of Medicine in its report on medical error-related fatalities in the United States recommends multiple times that simulation training be incorporated by medical institutions (both educational and clinical) as a strategy to reduce medical errors.[3] Importantly, it urges that simulation be used not only to teach technical skills but to improve team performance as well. The medical world has heeded this call to action. Medical regulatory and accrediting entities are beginning to recommend simulation training. The US Joint Commission on Accreditation of Healthcare Organizations, for example, has recommended that labor and delivery units conduct drills of obstetric emergencies such as shoulder dystocia.[4]

BACKGROUND

During labor and birth, the fetus rotates its head and shoulders and also flexes and/or adducts its shoulders, extremities, and head to allow for its descent and passage through the maternal pelvis. During the course of a normal birth, these cardinal birth movements include a sequential entry of the posterior and then anterior shoulders into the pelvis with the biacromial diameter in an oblique orientation, and once the shoulders have entered the true obstetric pelvis, the fetus undergoes rotation, which places the biacromial diameter in an anterior-posterior position to allow birth of the shoulders through lateral flexion. During some births, the shoulders rotate into the anterior-posterior diameter before entering the true pelvis and therefore the shoulders become impacted on the pelvic bones. Most commonly, the anterior shoulder becomes impacted above the pubic bone, but it is also possible for the posterior shoulder to become impacted on the sacral promontory. In this situation, the fetal head delivers while the shoulder remains impacted. Relieving this impaction to allow for the birth of the rest of the fetus will often require that the provider(s) attending the birth perform additional obstetric maneuvers.

During the entire time that the fetal shoulder is impacted, particularly if the fetal head has been delivered, there is significant stretching of the nerves in the brachial plexus, which may result in paralysis of part or all of the fetal arm and/or hand. Most of these injuries are temporary, but shoulder dystocia is associated with a 1.4% rate of permanent injury.[5] If the shoulders and body are not delivered in a timely fashion, the fetus may also undergo hypoxic injury to the brain and even death. Because of this, providers must work quickly to relieve the shoulder impaction and deliver the fetus. In the course of effecting this delivery, there is a risk that the provider may cause or aggravate an existing brachial plexus injury.

Given that brachial plexus injury is a leading cause of malpractice claims against providers of obstetric care, the avoidance of brachial plexus injury has become a focus of many risk-reduction efforts.[6–8] While minimizing the risk of fetal brachial plexus injury is indeed an important goal in the management of shoulder dystocia, the main goal is to achieve timely delivery of the fetus before hypoxic injury ensues. Any training and/or drills must emphasize this point and providers must be cognizant that in certain cases this goal may not be achievable without fracture of the fetal arm or injury to the brachial plexus. There is, however, evidence to indicate that the risk of any injury to the fetus, including brachial plexus injury, can be reduced by a systematic approach to shoulder dystocia in which providers attempt a series of maneuvers in a calm, logical, coordinated fashion.[5] There is also evidence to indicate that simulation training can increase the likelihood that providers, both individually and as a team, will be able to successfully execute this systematic approach to shoulder dystocia.[9–11] Recently published results from studies in England, for example, indicate that simulation training can be used effectively not only to improve recognition and coordinated management of shoulder dystocia but to reduce the rates of permanent fetal injury as well.[9,10,12,13]

REVIEW OF THE LITERATURE

In 2004, Deering et al published the results of a small randomized study in which they demonstrated that residents who underwent simulation training on the management of shoulder dystocia had significantly higher overall evaluation scores than did residents who had not received such training (29.88 ± 7.23 vs 22.24 ± 10.7 out of possible total of 36 points, $P = .012$).[11] Learners were evaluated using a checklist of maneuvers and a 4-question tool to score the timeliness, accuracy, preparedness, and overall performance of critical tasks in the management of shoulder dystocia. They also found that the residents who had received the simulation training effected the delivery of fetus experiencing shoulder dystocia in a shorter amount of time than did those residents who had not received simulation training (61 seconds vs 146 seconds, $P = .003$).

Additional evidence supporting the use of simulation training for shoulder dystocia comes from a series of studies conducted in England. In one study similar to that conducted by Deering et al, 38 obstetricians and midwives from 2 different hospitals were put through a simulated shoulder dystocia and their performance was assessed using a scoring sheet.[9] The participants then received training using a mannequin and put through the simulated scenario and scored again. Participants from both hospitals showed improvement in their scores following training (38.9% vs 83.3%, $P =$ .0001, and 68.1% vs 95.0%, $P = .0002$).

In another study by this same group, 145 participants were randomized to receive shoulder dystocia training on a low-fidelity (not very realistic) mannequin versus a high-fidelity (realistic) mannequin.[10] Again, participants' pretraining scores were compared with their posttraining scores. Simulation training (irrespective of type of mannequin) was associated with an improvement in posttraining versus pretraining evaluation of the use of basic maneuvers (94.7% vs 81.4%, $P = .002$), successful delivery (83.3% vs 42.9%, $P < .001$), and good communication with the patient (82.6% vs 56.8%, $P < .001$). Training on the high-fidelity simulator was associated with a higher success of delivery than training with the low-fidelity mannequins (OR = 6.53, 95% CI, 2.05–20.81, $P = .006$).

In an abstract presented at the 2007 Conference of the Society in Europe for Simulation Applied to Medicine, Draycott and associates announced the upcoming publication of their recent clinical work. This group has demonstrated a statistically significant reduction in clinical error related to shoulder dystocia management following introduction of simulation training, which has resulted in a 70% reduction in brachial plexus injuries.[13] These results indicate that the improvements in performance seen during the posttraining evaluation of the simulation training sessions can translate into measurable improvement in clinical outcomes.

ESTABLISHING GOALS AND OBJECTIVES FOR SHOULDER DYSTOCIA TRAINING

One of the strengths of simulation training is that it allows for teaching in the "higher" levels of cognitive learning (application, analysis, synthesis, and evaluation of information) in an environment where the safety of patients is not compromised and where lessons can be standardized and repeated until learned. In a recent article, Lathrop and colleagues include an excellent overview of the principles of simulation-based learning and a description of a pilot program to introduce simulation into an existing curriculum in a midwifery educational program.[14]

Once the decision is made to conduct training on shoulder dystocia, the first step should be to create goals and objectives for that training. A key component of the goals should be to identify the target audience (eg, medical students, residents, attending physicians, nurses, full labor and delivery team). Goals will describe the desired outcome of the training, whereas the objectives describe the knowledge or skills that the learner will acquire that will enable them to meet that goal. Table 1 provides examples of goals and objectives related to shoulder dystocia training. The goals and objectives drive the content of the training sessions including the choice of model/mannequin. Clear objectives will also help in the design of an evaluation tool and help guide the debriefing sessions that should follow every simulation session.

Table 1. Sample goals and objectives for shoulder dystocia training

Goal	Objectives
The learner will be able to appropriately perform the maternal maneuvers used to alleviate a shoulder dystocia	The learner will be able to describe the McRobert's maneuver and how it works to relieve a shoulder dystocia The learner will be able to demonstrate on a simulated patient when and how to place a woman in the McRobert's position The learner will be able to describe suprapubic pressure and how it works to relieve shoulder dystocia The learner will be able to demonstrate on a simulated patient when and how to apply suprapubic pressure
Members of the labor and delivery team will be able to carry out their assigned/expected responsibilities during a shoulder dystocia	The learner will be able to describe the different roles of team members in response to a shoulder dystocia The learner will be able to describe which of these roles he or she is responsible for The learner will be able to describe the concept of workload management The learner will demonstrate appropriate workload management and execution of his or her role and responsibilities during a simulated shoulder dystocia.

It is not realistic to expect that a single simulation session or drill will be able to meet all training goals. Learners, for example, will likely need a separate session to learn and practice hand skills (such as the fetal rotation maneuvers) from one aimed at teaching and allowing the learner to practice comprehensive management of a shoulder dystocia (such as what maneuver to employ when). Similarly, training a team on the concepts of crew resource management during a shoulder dystocia may also require a specific training session. Once a group of learners has gone through some initial simulation/drill training, it may be more appropriate to use a single training session to meet multiple teaching goals.

DESIGN AND IMPLEMENTATION OF SHOULDER DYSTOCIA TRAINING SESSION

With clearly outlined goals and objectives, decisions on how to meet these goals and objectives can be made. Key questions to consider at this point include the following: (1) Where and by whom will the training be conducted? (2) When and how often will the training be conducted? (3) What sort of model/trainer/mannequin/simulator will be needed? (4) What management approach is going to be taught? (5) Should force monitoring (measurement of the force applied on the fetal mannequin by the learner) be used in the training? (5) What sort of evaluation/debriefing tools will be used?

CHOOSING A TRAINING SITE AND A TRAINER

The decision on where and by whom the training should take into account site-dependent factors such as budget, existing resources, logistics, and staff availability. Options include (1) in situ (on labor and delivery unit) training by internal staff or by external trainers, (2) training in internal simulation laboratory/center or other internal nonclinical space by internal trainers or by external trainers, (3) training at an external simulation center (usually conducted by staff of that center), or (4) a combination of these options.

Local training, especially in situ training (training in a room on labor and delivery), has the advantages of increased realism as well as familiarity and convenience for the trainees. Local training (including in situ training) conducted by local trainers allows for increased scheduling flexibility as well as sustainability of a training program for a long term and may increase the likelihood that the anesthesiology and NICU teams can participate. These advantages are of particular significance in large units or in units with high turnover such as academic centers or other centers that train residents. Disadvantages of in situ training include the unpredictability of availability of a labor and delivery room for training as well as an increased likelihood of distractions and competing obligations for the trainees. Local training and in situ training may also be limited by the availability of a simulator and/or multiple rooms in which to conduct simultaneous sessions.

Simulation centers offer the advantages of high-fidelity mannequins, pre-prepared curriculum, and staff who are experienced with simulation training. Many centers also have the availability of multiple training rooms so that more team members can receive training in the allotted time. Many of these centers also have video recording systems that can be used during debriefing sessions to highlight specific training points. Disadvantages of training at an external site include the need for trainees to travel, which may add significant travel expenses/inconveniences. The cost of training sessions at a simulation center may also be a disadvantage, but this cost needs to be balanced against the costs of internal training that include the cost of a person or persons to design and implement the training and that may also include the purchase and upkeep of a simulator and/or training space.

The results from the study by Crofts et al indicate that local training may facilitate training on team management while training at a simulation center with high fidelity mannequins seemed to improve individual performance.[10] It must be noted, however, that this study was not designed to measure success of training by locality but rather to compare success of training using a high versus low fidelity mannequin (the former that were located at a simulation center and the latter that were located at local hospitals).

While choosing an adequate site at which to conduct training is crucial, choosing appropriate individuals to conduct the training may be more critical to the success of the training program. The person(s) conducting shoulder dystocia training must be knowledgeable on shoulder dystocia, how to use the trainer/simulator to accurately teach the relevant skills, team dynamics/team training, and perhaps most critically, on facilitating postsimulation discussion and debriefing. A growing number of simulation centers and programs are offering train-the-trainer courses and will conduct training at local hospitals.

CHOOSING A SIMULATOR

For those centers or programs considering purchase of a simulator for shoulder dystocia training, key factors to consider include (1) learning objectives, (2) type of shoulder dystocia training that will be conducted on the model, (3) available budget, and (4) other training purposes not related to shoulder dystocia that the simulator will be used for. It is especially important to know whether the simulator will be used for training on the internal/rotational/fetal maneuvers such as Rubin's, Wood's Screw, and delivery of the posterior arm.

Childbirth models and simulators vary as much in nature and fidelity as they do in price. At one end of the spectrum is the anatomically correct, vinyl bony pelvic model that comes in a set with a fetus and a cloth placenta complete with fetal membranes and umbilical cord. At the other end of the spectrum are the high-fidelity, full-body simulators such as NOELLE 575 (Gaumard Scientific, Miami, Florida), which comes equipped with a remote controlled motor that automatically rotates and delivers the baby either to the head or to the shoulders and can produce a turtle sign and which will prevent delivery of the baby until signaled to do so by the instructor.

Again, which model will be most useful will depend to a great extent on the training goals and objectives. The basic vinyl pelvic models work well to teach how shoulder dystocia occurs. The trainer can demonstrate the normal rotation and descent of the shoulders and birth of the head and can also then demonstrate the lodging of the anterior shoulder on the symphysis pubis as happens with shoulder dystocia and the subsequent stretch on the brachial plexus that occurs when the head delivers and the shoulder is still impacted. This type of model also allows for demonstration of the fetal rotational maneuvers and delivery of the posterior shoulder. This is not the best model to use, however, to conduct a full simulation of a shoulder dystocia. It does not come with the ability to attach to a bed and has no covering to simulate maternal muscle or skin, and the baby's cloth shoulders are too easily dislodged allowing the learner to overcome the dystocia by force rather than by performing the appropriate maneuvers.

If the main goal of training requires that the learners conduct the maneuvers during a simulated dystocia scenario, a higher fidelity mannequin designed to serve as a shoulder dystocia trainer is preferable. The following requirements facilitate successful training on the maneuvers used to relieve shoulder dystocia (particularly the fetal maneuvers): (1) ability to prevent delivery of the fetus until the student has completed the desired set of maneuvers, (2) the ability to rotate the fetal head to deliver in the OA position (or at least in the ROA or LOA) while keeping the fetal shoulders in the anterior-posterior diameter of the pelvis, (3) accurate fetus-to-pelvis proportion and appropriate landmarks on the pelvis and the fetus, (4) the ability to lodge the anterior fetal shoulder above the symphysis pubis, and (5) the ability of the fetus to rotate and deliver when the rotational maneuvers and delivery of the posterior arm are performed. Of the available simulators at this time, the PROMPT (Limbs & Things, Savannah Georgia, http://www.golimbs.com/index.php) model by Limbs and Things best meets these criteria. This PROMPT simulator is the high-fidelity mannequin that was used by Crofts et al in their 2006 study.[10] A disadvantage of this model is that unlike the model by Gaumard, the PROMPT model will not deliver on its own and requires a person in the pelvis to maneuver the fetal model through the pelvis and, once the head is delivered, to hold the rest of the fetus in the pelvis until the learner has performed the desired maneuvers. The person in the pelvis can, however, add a degree of realism by pretending to be the birthing mother and interacting, if desired, with the learners.

Any group that is interested in purchasing a model to train birth attendants on the maneuvers to relieve shoulder dystocia should have someone who is experienced in performing these maneuvers to test the various available models to gauge their relative suitability to the group's learning goals. While none of the models have complete fidelity, researchers have demonstrated that students can be taught to successfully manage a shoulder dystocia without complete simulator fidelity.[9,11]

While a high-fidelity mannequin is preferable when teaching the fetal rotational maneuvers, groups whose main goal is to achieve timely and organized team approach to shoulder dystocia may not need an expensive or high-fidelity simulator. Many of the team-related learning goals and objectives may be met with a less-expensive model, with a model that the group or institution already owns, or without a model at all. A realistic shoulder dystocia scenario to be used for team training can be achieved by having someone pretend to be a mother experiencing a shoulder dystocia. In this scenario the learners can be told that the focus of the training/drill is to improve team response and team interactions during a shoulder dystocia. During these scenarios the person at the perineum can be asked to state what they would do ("I am evaluating the need for an episiotomy") instead of actually doing it. Of note, is that McRobert's and suprapubic pressure (maneuvers that are often performed by team members other than the one at the perineum) can also be taught and simulated without a high-fidelity mannequin.

THE CONTENT OF TRAINING

Selection of a shoulder dystocia management protocol/guideline is necessary to standardize the content of the training sessions and create a tool to evaluate participants. There are multiple examples of management protocols available in the medical literature.[1,5,15,16] Crofts et al created a management protocol on the basis of the management described by Naef and Martin.[9,16] This protocol had 7 components: assessment, call for help, episiotomy, McRobert's, suprapubic pressure, delivery of the posterior shoulder, and Wood's Screw maneuver. Trainees received no points if they did not perform a step/maneuver, 1 point if they performed it but did so incorrectly, in the wrong order of for longer than 1 minute, and 2 points if the maneuver was performed correctly in the right order and for less than 1 minute.

Deering et al generated their own list of critical and important tasks in the management of shoulder dystocia that they derived from the medical literature.[11] The critical tasks they identified were as follows: recognizes shoulder dystocia, calls for assistance, calls for pediatrics, performs McRobert's maneuver, applies suprapubic pressure, and applies gentle downward traction. Study participants received 1 point for each of the 6 tasks the performed, they were also evaluated on the timeliness of interventions, whether or not the interventions were performed correctly, overall preparedness using a 9-point Likert scale and finally, the length of time that the student required to achieve delivery (if they were able to achieve delivery).

Baxley and Gobbo describe a management protocol that is accompanied by a mneumonic.[15] This HELPERR protocol includes the following: call for **H**elp, **E**valuate for episiotomy, **L**egs (McRobert's), suprapubic **P**ressure, **E**nter maneuvers (internal rotation), **R**emove the posterior arm (delivery of the posterior arm), and **R**oll the patient (all-fours or Gaskin maneuver). Jevitt also describes the management of shoulder dystocia including maternal position changes (left lateral and Gaskin maneuver), which are often omitted from management protocols, but which have been demonstrated to be effective in decreasing the incidence of and/or alleviating shoulder dystocia.[17]

In deciding on a management protocol to use for training, it is necessary to ensure that the learners receive training on this management approach and are aware of the reasoning behind the management steps being taught. It is also important to keep in mind that new research studies may reveal that certain management techniques or sequencing of techniques may be more efficacious than others in achieving delivery and/or preventing injury. Protocols being used to train practitioners should, therefore, be periodically reviewed and revised if necessary. For example, Gonik and associates demonstrated in their model that internal (endogenous) forces such as contractions and maternal pushing exert significant force on the fetal shoulder and stretch on the brachial plexus.[18] These findings support having a woman stop pushing until the shoulder has been freed from behind the pubic bone.

The need for and timing of episiotomy is another management step, which deserves discussion as a group decides on a management protocol. Recent literature suggests that episiotomy should not be a routine part of management as has been taught in the past but rather that episiotomy should be used only if necessary to gain enough room to deliver the posterior arm or conduct the fetal maneuvers.[19]

INCORPORATING TEAMWORK PRINCIPLES

If training is aimed at improving team response, a general management protocol is also necessary, but the components of the protocol that require a team response (eg, transfer of an infant to neonatology team) become the focus rather than the technical components. Some sites have opted to assign specific roles for people to carry out during a shoulder dystocia (eg, one nurse activates the call for help and documents events while a second nurse performs suprapubic pressure and takes the infant to the pediatric team). Some sites also assign an "event manager" who coordinates/directs the response to an emergency. During a shoulder dystocia, assigning an event manager other than the person at the perineum allows for the person at the perineum to focus on performing the maneuvers to deliver the infant without having to also be the person tracking time, tracking whether or not the pediatric team has arrived, and so forth. Training/drill sessions can be used to practice these roles. Dalby and associates describe an obstetric-specific crisis team.[20] This 8-member team includes members from anesthesiology, obstetrics, nursing, and critical care. In this study, the team is asked to respond to a crisis requiring an urgent cesarean delivery under general anesthesia. This crisis response model, however, could be applied to shoulder dystocia and to other obstetric emergencies. Shoulder dystocia training can also focus on team behaviors such as leadership, communication, mutual monitoring, workload management, situational awareness, and in identifying and proactively addressing latent failures in team or system response to shoulder dystocia.

Table 2. Shoulder dystocia checklist and debriefing guide

Management checklist	Team principles debriefing questions[a]
Recognizes dystocia	**Clear leadership**
Calls for help	Did someone take charge/guide the management?
Extra hands	**Followership**
NICU team	Did team members follow the lead?
Anesthesiology	Did team members speak up when they could not perform a task?
Asks woman to stop pushing	**Did leadership and followership result in appropriate role delegation and effective workload distribution?**
Position woman at end of bed	
Maternal Maneuvers	Was any team member overwhelmed?
McRobert's	Was any team member underutilized?
Suprapubic	Did team members speak up if they could best perform a task/had relevant information?
Reassess/Reattempt delivery	
Assess need for episiotomy	**Were any additional necessary resources/team members brought to bedside?**
Fetal Maneuvers	
Rubin's	Did someone cross-check to make sure that resources and additional team members arrived?
Wood's	
Delivery of Posterior Arm	**Was there effective communication?**
Gaskin Maneuver	Could team members hear each other?
Delivery achieved	Did team members clearly direct their communications?
Hand-off of neonate to NICU team/Neonatal resuscitation team	**Was there closed loop communications (teller tells—recipient(s) receives/acknowledges and repeats—teller confirms receipt message/direction as accurate)**
	Did team adjust management in response to changes in clinical scenario?

[a]From Rall and Miller.[27]

INCORPORATING TRAINING ON DOCUMENTATION AND/OR PATIENT DEBRIEFING

Maslovitz and associates recently published findings on a study in which videotapes of a simulation-based training on 4 obstetric emergencies (including shoulder dystocia) conducted in a 26-month period were analyzed.[21] The videotape reviews were conducted to identify the most commonly occurring mistakes during the response to these emergencies. In the shoulder dystocia scenario, inadequate documentation was the most common error detected. Similarly, Deering et al describe a study in which they evaluated residents' notes following a simulated shoulder dystocia.[22] The researchers found that the notes often lacked important elements. Adequate documentation of a delivery is a critical component of patient care and of reducing liability related to shoulder dystocia. Simulation/drill training can be used to practice documentation of these events. Guidelines on what should be included in the medical record should be determined in conjunction with risk management or liability insurer. Jevitt provides a useful description of the elements of defensible documentation in shoulder dystocia that can be used in determining these guidelines.[17]

An abstract presented by Raemer of the Center for Medical Simulation at Massachusetts General Hospital describes the use of simulation to practice debriefing of medical error.[23] It must be noted that much of the literature describes debriefing on medical error rather than postevent debriefing with a patient. While many of the principles are the same, it must be kept in mind that a shoulder dystocia, even if it resulted in an Erb's palsy, should not be considered or dealt with as a medical error. Risk management should also be consulted if a group plans to conduct training on postshoulder dystocia debriefing with the patient and her family. The American College of Obstetricians and Gynecologists has recently published a committee opinion that can help guide creation of training on disclosure and discussion of adverse events and which provides further references/guidelines on how to disclose errors or unintended outcomes.[24]

INCORPORATING FORCE MONITORING

Some of the available simulators offer the ability to measure the force applied on the fetal mannequin during a simulated delivery. The decision on whether or not to train using this force monitoring should be a deliberate one and not one based simply on the availability of this option. Force monitoring can be used as an effective teaching tool to demonstrate the reduction in force that can be achieved by not attempting delivery of the fetus until the impacted shoulder has been dislodged. Students can also use force monitoring to measure the forces they would use during a normal delivery on the model and use that to gauge how that compares to the force they employ during a shoulder dystocia on the model. The instructor and learner must keep in mind, however, that the forces measured on the simulator apply to the simulator only and cannot be used to make assumptions on how much force a given individual uses during a real birth.

Similarly, force monitoring should not be used to teach what degree of force will lead to fetal injury. As was mentioned above, the forces necessary to deliver a simulated fetus may not be equivalent to those used to deliver a real fetus. It would be difficult to continuously and accurately calibrate the model to a precision that would allow for a realistic comparison. Second, the relative importance of applied exogenous (by the attendant) force in the development of brachial plexus injury is still undetermined. The amount of stretch on the brachial plexus (a function that cannot be measured by any commercially available simulator) is a key determinant on whether injury will occur. The amount of stretch placed on brachial plexus is only partially a function of force applied by the delivering provider. Both in vivo and in vitro studies suggest that endogenous forces (maternal pushing effort and uterine contractions) may be greater than exogenous forces and therefore potentially implicated in the development of brachial plexus injury.[18,25,26] Furthermore, the direction of the force and the resistance encountered to that force are also factors that determine the likelihood of injury. Gonik et al demonstrated that the tilt of the pelvis to 30° (as accomplished by McRobert's), the direction of force axially rather than laterally, and the reduction of endogenous forces (as could be achieved by asking the mother to stop pushing) were all associated with reductions in the amount of brachial plexus stretching and in the amount of exogenous force needed to achieve delivery.[26]

Although training birth attendants to achieve delivery with minimal external force is desirable, the authors would recommend against overly emphasizing force monitoring. Teaching birth attendants how to reduce force and stretch—by asking the mother to stop pushing, by placing the mother in McRobert's position, by employing suprapubic pressure and the rotational maneuvers, and by minimizing lateral flexion and rotation of the fetal head during delivery attempts—can be accomplished without the force monitor.

EVALUATION AND DEBRIEFING

Postsimulation/drill debriefing is a key component of shoulder dystocia training. A debriefing session is a time in which emotions may be running high and the need for a skilled individual to guide the debriefing is particularly important. Allowing personal attacks or dysfunctional team interactions during a debriefing session will be counterproductive to training goals. To ensure the effectiveness of the debriefing session, these sessions should be focused and constructive. The use of checklists/debriefing tools created to promote the goals and objectives of the training will facilitate this. If the training session was videotaped, the instructor or person conducting the debriefing may want to use the tape during the debriefing to highlight relevant teaching points and as an adjunct to the debriefing tools. Table 2 includes an example of a shoulder dystocia management checklist and a debriefing guide on team principles derived from Rall and Gaba's work in the field of human factors in medicine.[27]

CONCLUSION

Few obstetric emergencies cause as much anxiety as shoulder dystocia. Much of this anxiety is related to the nature of shoulder dystocia including (1) that it is generally unpredictable; (2) that it is common enough that all providers will encounter at least one, but not common enough to allow providers to become comfortable in its management; (3) that it requires a very quick and coordinated response with no time to debate the general merits of one management strategy over another; (4) that it can lead to fetal injury; and (5) that this fetal injury may also lead to litigation. Training on shoulder dystocia gives providers an opportunity to gain experience at managing this obstetric emergency—experience that in and of itself can reduce some of this provider anxiety. Furthermore, there is now evidence to support the assertion that shoulder dystocia training translates into more expedient and effective individual and team performance, which in turn has the potential to translate into a measurable reduction in maternal and fetal sequelae from shoulder dystocia. Such a reduction in shoulder dystocia-associated morbidity should reduce the anxiety of providers, insurers, and patients alike.

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