

Simulation Patient Design (January, 2022) Case of Twin delivery (Twin A vaginal delivery, Twin B cesarean delivery)

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Introduction:

Over the past few decades, there has been an increase in the incidence of multiple gestation pregnancies, with approximately 3 in 100 pregnancies in the United States (US) being twin gestation.¹ Compared to singleton pregnancies, there is significantly higher maternal and neonatal morbidity (e.g. fetal anomalies, prematurity, preeclampsia, gestational diabetes, and postpartum hemorrhage (PPH)).² Delivery planning is based on various factors, including chorionicity, amnionicity, gestational age, and clinician experience.² The average delivery timing of all twin pregnancies is at 36 weeks gestation, although earlier delivery may be recommended depending on the above factors.²

Twin gestation alone is not a primary indication for cesarean delivery (CD), and the mode of delivery is based on multiple factors, which include the type of twins, fetal lie/presentation, ability to monitor, gestational age, maternal-fetal well-being, and the OB provider's experience.² While monoamniotic twins are typically delivered by CD to avoid umbilical cord complications for Twin B, cephalic presenting diamniotic twins are considered candidates for vaginal delivery (VD). At the time of labor, approximately 80% of the presenting twin are cephalic. Twin gestations with cephalic/cephalic presentation (which account for approximately 40% of twins), have the highest success rate for VD.³ Cephalic/non-cephalic presentation is associated with an increased rate of CD for the non-presenting twin (e.g. Twin B), but VD may be successful with breech extraction, or after internal podalic or external version of Twin B. CD may be necessary due to malpresentation of the presenting twin (e.g. Twin A), maternal complications, failure to progress, or emergencies such as cord prolapse and fetal bradycardia. An estimated 4-10% of planned VDs result in an unplanned CD for Twin B.⁴⁻⁶ A population-based study performed in the US (1995-1997) comprising over 61,000 twin deliveries showed an overall CD rate of 9.5% for Twin B after VD of Twin A, but 6.3% if Twin B was cephalic.^{4,7}

Neuraxial anesthesia is typically recommended as adequate analgesia via an epidural catheter can allow for uterine manipulation (e.g. breech extraction, internal podalic or external version), operative delivery, and conversion to CD if necessary.² Many institutions attempt a twin VD in the operating room (OR) with an anesthesiologist present because an emergent intervention may be needed. In addition to providing neuraxial anesthesia, the anesthesiologist can assist during VD by providing uterine relaxation with nitroglycerin to facilitate manipulation of Twin B if necessary, as described above.⁸ The anesthesiology team is crucial to manage postpartum complications such as uterine atony and PPH, the incidence of which are increased in multiple gestation deliveries.^{2,9}

Educational Rationale: To teach team skills in management of an obstetric patient who necessitates urgent CD of Twin B, after VD of Twin A

Target Audiences: Nursing, OB, Anesthesiology, OR personnel

Learning Objectives: As per Accreditation Council for Graduate Medical Education (ACGME) Core Competencies. Upon completion of this simulation (including the debrief) learners will be able to:

- *Medical knowledge:* Recognize the need and initiate emergency management of an obstetric patient who necessitates CD of Twin B, after VD of Twin A
- *Patient care:* Discuss the institutional protocol for management of twin gestation deliveries. Describe management of Twin B including reasons to potentially proceed with CD for Twin B, and describe how to safely administer general anesthesia and intubate a pregnant patient in this situation.
- *Practice-based learning and improvement:* Discuss neuraxial anesthesia dosing and testing in an emergency situation, and discuss anesthesia drug effects on the fetus and risk for PPH
- *Interpersonal and communication skills:* Effectively communicate with the L&D team regarding urgency and status of the fetus. Effectively communicate anesthesia management with the patient during an emergency situation such as during conversion from neuraxial analgesia/anesthesia to general anesthesia. Effectively communicate with the obstetrician regarding urgency for the CD. Utilize closed-loop communication among all participants.
- *Professionalism:* Demonstrate mutual respect for the expertise of other team members
- *Systems-based practice:* Ensure all resuscitation equipment including suction are set up in the L&D OR; ventilator is checked; drugs are available; identify the location of airway equipment and back-up airway equipment (e.g. video laryngoscope and fiberoptic scope).

Questions to ask after the scenario:

1. What are the reasons Twin B may need to be delivered by emergent CD after VD of Twin A?
2. How often is Twin B born by CD, after VD of Twin A?
3. How prepared was your team when the decision was made to proceed with CD for Twin B?
4. Did each team member have well-defined roles?
5. Were important steps followed for administration of general anesthesia in a pregnant patient (e.g. correct position, suction available prior to RSI, nitrous oxide administration and a reduction in the volatile agent post-delivery etc.)?
6. What are the PPH risk factors in this scenario?
7. Was all the necessary equipment available?
8. Were any system-based barriers identified to care for this patient?

Assessment Instruments:

1. Learner Knowledge Assessment form (Appendix 1)
2. Simulation Activity Evaluation form (Appendix 2)

Equipment Needed and Set-up:

In-situ set-up

Mannequin with fetal monitoring in place

Monitors: EKG, BP, pulse oximetry

18 g IV connected to IV fluid

Anesthesia machine (simulated) with circuit attached

Suction with Yankeur

Airway equipment
 Anesthetic drugs, vasoactive drugs, uterotonic drugs
 Ultrasound

Simulation Scenario Set-up:

The case

Ms. Caitlin Black is 34-years old, G3P2 at 38 weeks gestation admitted for induction of labor for diamniotic, dichorionic twin gestation with cephalic/cephalic presentation. She has no significant medical history and her first two VD's were uncomplicated with neuraxial labor analgesia. On admission, her cervix was 3 cm dilated and induction was initiated with oxytocin per protocol. She had an epidural placed uneventfully four hours ago and currently has a continuous infusion of 0.0625% bupivacaine with fentanyl 2 mcg/mL at 8 mL/h. Per report from the previous anesthesiologist she has been comfortable since the epidural was placed.

The patient is now fully dilated and was moved to the L&D OR approximately 10 min ago as her nurse felt delivery was imminent.

NKDA

Weight = 95 kg (209 lbs), Height = 5'7" (170 cm), BMI = 32.7

Vital signs: BP = 114/85 mm Hg, HR = 75 bpm, oxygen sat = 98%, RR = 16/min

Airway exam: Mallampati class II, full neck ROM, normal mouth opening and thyromental distance

Simulation Pre-brief

- Read the scenario and instruct team members on their roles during the simulation
- The learners take their places inside and outside of the OR
- One nurse, one OB, and one anesthesiologist in the OR initially when patient begins pushing
- Confederate plays the role of the patient's voice
- An additional confederate can play the role of the patient's partner

Scenario Details

Trigger	Patient Condition	Action	Done	Time	Comments
Patient in the OR	Patient awake, responsive + comfortable T10 bilateral level with the epidural infusion FHTs: Twin A - 130s Twin B - 140s	1. OR techs informed to prep OR in case of emergent delivery 2. OB confirms patient's cervical examination + patient begins to push 3. Anesthesiology team: <ul style="list-style-type: none"> <input type="checkbox"/> Assesses patient's epidural level + IV access <input type="checkbox"/> Places monitors: EKG, BP cuff, pulse ox <input type="checkbox"/> Prepares oxytocin + reviews access to 2nd-line uterotonic drugs <input type="checkbox"/> Prepares drugs for conversion from labor analgesia to surgical anesthesia (drugs for 			

		neuraxial anesthesia + general anesthesia)			
After 1 min: VD of Twin A Neonatal nurse announces Twin A's Apgar scores are 9 and 9	HR 110 bpm BP 124/82 mm Hg SpO ₂ 99% (air) Resp 20/min Temp 37.1°C	1. OB team delivers Twin A <input type="checkbox"/> OB hands Twin A to neonatal nurse <input type="checkbox"/> Nurse attempts to monitor FHT of Twin B			
Nurse unable to identify FHT of Twin B Twin B's position confirmed as transverse lie	Supine, awake + oriented HR 101 bpm BP 106/67 mm Hg SpO ₂ 97% (air) Resp 15/min Temp 36.9°C FHT: Twin B - 120s (on USS)	1. OB team performs USS to assess FHT of Twin B 2. OB team discusses with the patient to attempt external cephalic version of Twin B vs. CD due to change in fetal position <input type="checkbox"/> Decision made to proceed with external cephalic version (as FHT is reassuring)			
After 30 sec: Non-reassuring FHT of Twin B	FHT: Twin B - 80s (with minimal variability) Patient scared: "What are you doing, is my baby OK?"	1. Discussion of need for emergency CD for Twin B (FHT remains in the 80s) 2. Anesthesiology team: <input type="checkbox"/> Doses epidural catheter with 20 mL of 3% chloroprocaine <input type="checkbox"/> Administers oxygen (10 L/min) via non-rebreather face mask <input type="checkbox"/> Optimizes maternal hemodynamics + position (LUD + head/neck position) <input type="checkbox"/> Prepares to emergently convert to general anesthesia (if indicated)			
Failed Allis test by OB Confederate (if present) is worried and asks what is happening	"Why does that feel sharp, am I going to feel pain?" Patient in tears after failed Allis clamp test due to	1. Anesthesiology team tests block (inadequate surgical block) 2. Anesthesiology team discusses with OB regarding urgency 3. Anesthesiology team explains to patient that she will need general anesthesia for the emergency CD (not enough time to optimize neuraxial block)			

	sharp pain with testing	<ol style="list-style-type: none"> Support person (if present) is escorted out of OR OB team performs betadine skin prep NICU team called 			
Induction of general anesthesia	<p>Patient looks pale + is restless</p> <p>HR 122 bpm BP 88/55 mm Hg SpO₂ 95% (air) Resp 20/min Temp 36.1°C</p>	<ol style="list-style-type: none"> Anesthesiology team confirms with OB team that they are ready (patient prepped + OB with scalpel in hand) Induction drugs administered + cricoid pressure initiated Patient is intubated + correct ETT position is confirmed OB is instructed to start the surgery (by the intubating anesthesiologist) 			
<p>Surgery starts</p> <p>Twin B delivered + resuscitation managed by NICU team</p>	<p>Post-intubation:</p> <p>HR 128 bpm BP 80/42 mm Hg SpO₂ 98% (intubated) Temp 36.0°C</p>	<ol style="list-style-type: none"> Rapid infusion of IV fluids Vasopressors administered as indicated Additional peripheral IV access obtained Active warming Nitrous oxide/volatile anesthetic administered at appropriate MAC Oxytocin IV bolus (2 units) + infusion (7.5 units/h) administered immediately after delivery 			
<p>OB reports poor uterine tone</p> <p>Moderate bleeding (EBL 1400 mL)</p> <p>Uterine tone improves + bleeding slows down after 2nd-line uterotonic drug</p>	<p>HR 122 bpm. BP 100/61 mm Hg SpO₂ 98% (intubated) Temp 36.4° C</p>	<ol style="list-style-type: none"> Second oxytocin IV bolus (max 5 units, total) administered + oxytocin infusion rate increased (max 30 units/h) 2nd-line uterotonic drug administered (methylergonovine 0.2 mg IM) Additional 2nd-line uterotonic drug considered (e.g. carboprost 0.25 mg IM) Tranexamic acid bolus (1 g IV) considered depending on EBL 			
Surgery complete	<p>HR 102 bpm BP 109/72 mm Hg SpO₂ 98% (intubated) Temp 35.9° C</p>	<ol style="list-style-type: none"> Anesthesiology team discusses <ul style="list-style-type: none"> <input type="checkbox"/> Postoperative analgesia <input type="checkbox"/> Extubation criteria <input type="checkbox"/> Disposition Family member updated 			

Appendix 1

Learner Knowledge Assessment Labor and Delivery Multidisciplinary Team Simulation

Name of simulation: _____

Date: _____

OB Nursing Anes

Each item has two components. The “Before the simulation” column (left side) examines your perspective at the beginning of the simulation. The “End of Simulation” column (right side) is to evaluate your perspective at the completion of the simulation.

1. How would you rate your knowledge of delivery planning for multiple gestation pregnancies?

BEFORE THE SIMULATION							END OF SIMULATION						
1	2	3	4	5	6	7	1	2	3	4	5	6	7
Little/none					Knowledgeable		Little/none					Knowledgeable	

2. How would you rate your knowledge of your institutional protocol for twin gestation deliveries?

BEFORE THE SIMULATION							END OF SIMULATION						
1	2	3	4	5	6	7	1	2	3	4	5	6	7
Little/none					Knowledgeable		Little/none					Knowledgeable	

3. How would you rate your knowledge of potential factors that may necessitate CD of Twin B after VD of Twin A?

BEFORE THE SIMULATION							END OF SIMULATION						
1	2	3	4	5	6	7	1	2	3	4	5	6	7
Little/none					Knowledgeable		Little/none					Knowledgeable	

4. How would you rate your knowledge of assessing adequacy of labor neuraxial analgesia for conversion to surgical anesthesia?

BEFORE THE SIMULATION							END OF SIMULATION						
1	2	3	4	5	6	7	1	2	3	4	5	6	7
Little/none					Knowledgeable		Little/none					Knowledgeable	

5. How would you rate your competence to safely perform general anesthesia in a pregnant patient for an emergent CD?

BEFORE THE SIMULATION							END OF SIMULATION						
1	2	3	4	5	6	7	1	2	3	4	5	6	7
Little/none					Knowledgeable		Little/none					Knowledgeable	

Appendix 2

Simulation Activity Evaluation

DATE OF SIMULATION: _____

OCCUPATION: Consultant PG Yr 1 2 3 4 STUDENT NURSE MIDWIFE OTHER

SPECIALTY: _____ YEARS IN PRACTICE: _____

Please rate the following aspects of this training program using the scale listed below:

1 = Poor 2 = Suboptimal 3 = Adequate 4 = Good 5 = Excellent

Use "N/A" if you did not experience or otherwise cannot rate an item

INTRODUCTORY MATERIALS

Orientation to the simulator	1	2	3	4	5	N/A
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PHYSICAL SPACE

Realism of the simulator space	1	2	3	4	5	N/A
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EQUIPMENT

Satisfaction with the mannequin	1	2	3	4	5	N/A
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SCENARIOS

Realism of the scenarios	1	2	3	4	5	N/A
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Ability of the scenarios to test technical skills	1	2	3	4	5	N/A
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Ability of the scenarios to test behavioral skills	1	2	3	4	5	N/A
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Overall quality of the debriefings	1	2	3	4	5	N/A
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DID YOU FIND THIS USEFUL?

To improve your clinical practice?	1	2	3	4	5	N/A
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To improve your teamwork skills?	1	2	3	4	5	N/A
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To improve your VERBAL communication?	1	2	3	4	5	N/A
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To improve your NONVERBAL communication?	1	2	3	4	5	N/A
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FACULTY

Quality of instructors	1	2	3	4	5	N/A
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Simulation as a teaching method	1	2	3	4	5	N/A
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COMMENTS/SUGGESTIONS:

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