Simulation Patient Design (October, 2020)
Case of Maternal Sepsis Presenting to L&D Triage

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Introduction
Sepsis is a leading cause of maternal morbidity and mortality accounting for approximately 12.7% of maternal deaths in the United States.[1] The World Health Organization has defined maternal sepsis as a life-threatening condition with organ dysfunction resulting from infection during pregnancy, childbirth, post-abortion, or post-partum.[2] Early recognition and prompt treatment of sepsis usually results in good outcomes, however physiologic changes of pregnancy and labor may mask signs of sepsis delaying recognition. Screening tools such as systemic inflammatory response syndrome (SIRS) criteria, quick sequential organ failure assessment (qSOFA), and maternal early warning score (MEWS) all perform poorly in identifying pregnant and postpartum patients with sepsis.[3,4]

In January 2020, the California Maternal Quality Care Collaborative (CMQCC) published a toolkit aimed at improving diagnosis and treatment of maternal sepsis.[4] The toolkit outlines a two-step sepsis screening tool aimed to optimize sensitivity and specificity in the maternal population. Step 1 in the 2-step approach utilizes 4 criteria: 1) oral temperature <36°C (96.8°F) or ≥38°C (100.4°F), 2) maternal heart rate >110 beats per minute (sustained for 15 minutes), 3) respiratory rate >24 breaths per minute (sustained for 15 minutes), 4) white blood cell count >15000 mm^3 or <4000 mm^3 or >10% immature neutrophils (bands). A patient is considered as having a positive screen if there is suspicion for infection and any 2 of the 4 criteria are met. Step 2 is confirmation of sepsis by confirming end-organ dysfunction using a combination of laboratory values and bedside patient assessment including respiratory, cardiac, renal, coagulation, liver, and mental status assessment.[4] Only one of the Step 2 criteria needs to be met to confirm the diagnosis of sepsis.

Management and treatment of maternal sepsis includes fluid resuscitation, antibiotic administration (broad-spectrum antibiotics including one antibiotic for gram-negative and anaerobic coverage in addition to gram-positive coverage), source control and identification, and possibly vasopressor support.[4] Blood cultures should be draw as early as possible; however, antibiotic administration should not be delayed. Fluid resuscitation should include 30 mL/kg of intravenous crystalloid fluid. If the patient is unresponsive to fluid resuscitation, vasopressor support with norepinephrine should be administered.[4] Many institutions utilize either a rapid response team or code sepsis team to respond to patients presenting with concern for sepsis. Response teams typically consist of a combination of nursing staff, physicians, pharmacists, and ancillary staff. The response team aims to prevent delays by facilitating diagnosis and treatment, including aggressive fluid resuscitation, immediately obtaining blood cultures, antibiotic administration within one hour, additional blood draws (complete blood count, lactate value, liver function test, and coagulation panel), vasopressor administration as needed, and intensive care consult and transfer as indicated. Institutional ordersets within the electronic medical record systems often facilitate efficient implementation of diagnostic and therapeutic steps including laboratory test, fluid administration, and antibiotic administration.

Utilizing a toolkit (e.g. CMQCC's toolkit) for recognizing and managing maternal sepsis allows for timely identification and an evidence-based response to maternal sepsis.

Educational Rationale: To teach team skills in recognizing and managing maternal sepsis
Target Audiences: Nursing, OB, Anesthesiology, Neonatology, and Intensive Care
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*: Describe the clinical signs, symptoms, and management of maternal sepsis
- *Patient care*: Describe application of the two-step maternal sepsis screening tool for early recognition of sepsis in the pregnant or postpartum patient
- *Practice-based learning and improvement*: Evaluate the multidisciplinary team response, and escalation of level of care needed to manage an obstetric patient who presents with sepsis/septic shock
- *Interpersonal and communication skills*: Demonstrate multidisciplinary team management, including closed-loop and SBAR communication to manage a patient with concern for maternal sepsis
- *Professionalism*: Demonstrate respect for the expertise of all team members
- *Systems-based practice*: Readily access screening and treatment protocols, medication, and other necessary equipment, and identify barriers to such access when managing sepsis in the L&D unit and hospital system

Questions to Ask After the Scenario:
- Did each member of the team have well-defined roles?
- Were the next steps for management clearly outlined by the care team?
- Was the emergency response team appropriately activated?
- Were there any barriers or system issues identified when caring for the patient?

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

Equipment Needed and Set-up:
In-situ L&D setup
Mannequin (or simulated patient) in L&D triage room
Blood pressure, EKG, and pulse oximeter on patient

Simulation Scenario Set-up:
The case
A 22-year-old nulliparous patient at 35 weeks gestation presented to L&D triage with flank pain and shortness of breath that started yesterday. She has a past medical history of mild asthma and reports an uncomplicated pregnancy. Her temperature is 37.8°C (100.0°F), heart rate 130/min, blood pressure 99/60 mm Hg, respiratory rate 25/min, and oxygen saturation 96% (on room air).

Simulation Pre-brief
- Read the scenario and instruct team members on their role during the simulation
- The learners take their places on L&D
- Patient (embedded participant)
- The L&D nurse (learner or embedded participant) is in the triage room evaluating the patient

Maternal Sepsis Scenario

Trigger	Patient Condition	Action	Done	Time	Comments

In L&D triage, nurse obtains vitals and assesses patient
 	
Patient reports urinary symptoms and subjective fevers
	Appears uncomfortable (in pain and tachypneic)
	
	HR 130 bpm
	BP 99/60 mm Hg
	RR 25/min
	Sats 96%
	Temp 37.8°C
	FHR 135/min
		1. L&D triage nurse performs initial patient evaluation and examination
		   ☐ Review differential diagnoses
		   ☐ Perform initial sepsis screen
		2. Notify OB team for bedside assessment
		3. Notify anesthesiology team			

Initial sepsis screen is positive for 2 criteria (HR and RR)	Patient deteriorates
	
	HR 135 bpm
	BP 89/59 mm Hg
	RR 27/min
	Sats 95%
	Temp 37.8°C
	FHR 140/min
		1. Initiate prompt fluid therapy:
		   ☐ IV fluid bolus (30 mL/kg)
		
		2. Administer oxygen therapy
		   ☐ 10 L/min via non-rebreather facemask
		
		3. Send samples for source of infection
		   ☐ Urinalysis
		   ☐ Urine cultures
		   ☐ Blood cultures
		   ☐ Other sites (as applicable)
		
		4. Administer antibiotics
		   ☐ Board-spectrum antibiotics			

Confirm sepsis diagnosis
 	
Urinalysis reveals many WBCs and bacteria
 	
Labs:
Lactate 5.0
	Patient appears anxious
	
	Further deterioration of the patient's condition:
	
	HR 135/bpm
	BP 88/45 mm Hg
	RR 40/min
	Sats 94%
	Temp 38.5°C
		1. Send sepsis tests to evaluate for end organ injury (labs)
		   ☐ CBC
		   ☐ Coagulation status (PT/PTT/fibrinogen)
		   ☐ Comprehensive metabolic panel (specifically bilirubin and creatinine)
		   ☐ Venous lactic acid
		   ☐ OR activate sepsis order set (labs, antibiotics, fluids)
		
		2. Send sepsis tests to evaluate for end organ injury (bedside)
		   ☐ Pulse oximetry
		   ☐ Mental status assessment
		   ☐ Urinary output			

	FHR 135/min, with moderate variability Single deceleration – resolves spontaneously	3. Continue to identify for source of infection ☐ Consider bedside imaging			
Minimal response to fluid resuscitation	HR 140 bpm BP 89/40 mm Hg RR 38/min Sats 96% Temp 37.6°C FHR 140/min	1. Administer vasopressor(s) 2. Consider arterial line placement 3. Activate code sepsis, rapid response team, and/or ICU consult			
OB representative (e.g. OB or L&D RN) thinks the patient needs to be delivered	FHR unchanged	1. Multidisciplinary discussion re delivery planning ☐ Delay delivery to optimize maternal status 2. Transfer to intensive care unit			

Appendix 1

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Learner Knowledge Assessment –
Labor and Delivery Multidisciplinary Team Simulation

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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 the incidence and risk factors for maternal sepsis?

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 the diagnostic criteria for maternal sepsis?

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 the initial tests/investigations for a patient with presumed maternal sepsis?

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 the initial treatment steps for maternal sepsis?

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 knowledge regarding delivery planning in a patient with maternal sepsis?

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

PHYSICAL SPACE

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

EQUIPMENT

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

SCENARIOS

Realism of the scenarios	1	2	3	4	5	N/A
Ability of the scenarios to test technical skills	1	2	3	4	5	N/A
Ability of the scenarios to test behavioral skills	1	2	3	4	5	N/A
Overall quality of the debriefings	1	2	3	4	5	N/A

DID YOU FIND THIS USEFUL?

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

FACULTY

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

COMMENTS/SUGGESTIONS:

References:

1. Creanga AA, Syverson C, Seed K, Callaghan WM. Pregnancy-related mortality in the United States, 2011-2013. Obstet Gynecol. 2017;130:366-373

2. World Health Organization: Maternal Sepsis (accessed September, 2020) https://www.who.int/reproductivehealth/publications/maternal-sepsis/en

3. Bauer ME, Housey M, Bauer ST, et al. Risk Factors, Etiologies, and Screening Tools for Sepsis in Pregnant Women: A Multicenter Case-Control Study. Anesth Analg. 2019;129:1613-1620

4. Gibbs R, Bauer M, Olvera L, Sakowski C, Cape V, Main E. Improving Diagnosis and Treatment of Maternal Sepsis: A Quality Improvement Toolkit. Stanford, CA: California Maternal Quality Care Collaborative. January 2020