

## Simulation Patient Design (February, 2023) Case of DIC Secondary to Placental Abruption

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### Introduction:

Obstetric hemorrhage and resultant DIC (Disseminated Intravascular Coagulation) is one of the leading causes of maternal mortality worldwide.<sup>1</sup> DIC does not occur in isolation, but is a secondary condition arising from a maternal and/or fetal condition. The rate of DIC ranges from 0.03% to 0.35%.<sup>1-2</sup> The National Inpatient Sample data revealed an increase in DIC in the United States. In 2010-2011, DIC was associated with approximately one fourth of maternal deaths but was rarely the sole cause of mortality.<sup>3</sup> Multiple obstetric complications, conditions, or disorders can precipitate DIC. It has been associated with acute peripartum hemorrhage, placental abruption, preeclampsia/eclampsia, acute fatty liver of pregnancy, HELLP, retained stillbirth, amniotic fluid embolism, and sepsis.<sup>2,3</sup>

DIC is initiated by the release of tissue factor (TF) by a number of pathological conditions. TF is found in high concentrations within amniotic fluid and trophoblastic tissue. In DIC, instead of there being local activation of TF by damaged endothelium, there is a generalized systemic activation. This initiates a pathologic cycle of coagulation and fibrinolysis, resulting in a consumptive coagulopathy manifested by a depletion of coagulation factors and platelets. DIC originates in the vascular endothelium leading to endothelial dysfunction and possible organ damage.<sup>3,4</sup>

Diagnosing DIC is crucial for early treatment. Diagnosis is most often made based on clinical assessment and laboratory values. Physiologic changes in maternal coagulation factors, underestimation of blood loss, and delayed laboratory testing are some factors that lead to delayed diagnosis of DIC. DIC is a dynamic situation which requires continuous assessment of laboratory values while considering the clinical situation. Diagnosis is made by recognizing the underlying condition, down trending fibrinogen and platelet count, and prolongation of prothrombin time. Although multiple scoring systems exist for DIC, none have proved to be more efficacious than assessment of clinical and pertinent laboratory parameters.<sup>3</sup>

Clinical management involves the prompt identification and treatment of the underlying condition or cause. The majority of DIC cases in pregnancy are associated with massive obstetric hemorrhage. Treatment involves providing supportive care of the consumptive coagulopathy and replacement of blood components according to recommended transfusion protocols. Patients require continued clinical and laboratory surveillance, and likely admission to an intensive care unit.<sup>3,5</sup>

**Educational Rationale:** To teach team skills in early recognition and management of DIC **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*: Identification of patients at high risk for peripartum bleeding. Early recognition and treatment of obstetric complications. Continuous assessment of clinical and laboratory parameter with recognition of DIC. Recognition and treatment of the underlying cause of the DIC. Blood product replacement according to protocols.
- *Patient care*: Discuss acute management of patients with DIC.
- *Practice-based learning and improvement*: Identify the setting, equipment, and protocols necessary to manage a patient with underlying maternal complication, DIC, and its sequelae.
- Interpersonal and communication skills: Designate a team leader who will manage the team through the crisis and maintain communication amongst the various team members to optimize patient care.
- *Professionalism*: Demonstrate mutual respect for the experience, expertise, and opinions of all team members.
- *Systems-based practice*: Ensure all resuscitation equipment, medications, and protocols are readily identifiable on the labor and delivery unit including rescue airway devices, massive transfusion equipment, vascular access devices, laboratory parameter monitoring.

## Questions to ask after the scenario:

- What were the signs or symptoms of potential DIC in this patient?
- What are the risk factors for a parturient developing DIC?
- How was the management for DIC?
- Was a team leader identified?
- Did each team member feel that they had a defined role and were effectively able to communicate to the team leader?
- Were there any barriers identified in diagnosing and stabilizing the unstable 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 L&D suite: Gravid Mannequin in the labor and delivery room Standard monitors: BP cuff, pulse oximeter, ECG available Fetal heart rate monitor 18 gauge IV in place and IV fluids L&D OR: Standard ASA monitors Anesthesia Machine Airway equipment, i.e., non-rebreather, video laryngoscope, ETTs, suction Crash Cart with resuscitation and intubation medications Rapid transfuser/fluid warmer Central/arterial vascular access Massive Transfusion Protocol blood products Laboratory surveillance

## Simulation Scenario Set-up:

### The case

Patient is a 36 year old G2P1001 at 37 weeks who presented for induction of labor due to preeclampsia without severe features. She has a history of 1 prior vaginal delivery 7 years ago. Her past medical history is otherwise significant for a BMI of 35. Initially laboratory values show elevated LFTs (ALT 67 U/L and AST 88 U/L). Pt received a labor epidural at 4 cm dilated. She is comfortable with a T10 sensory level bilaterally, but her labor is complicated by intermittent late FHR decelerations. The Obstetric team makes the decision for artificial rupture of the amniotic membrane. During AROM, 300 cc of blood is noted with subsequent fetal bradycardia to the 80's.

## Simulation Pre-brief

- Read the scenario and instruct team members on their role during the simulation.
- The learners take their places inside of the Labor and Delivery suite.
- Other team members include a circulating RN.
- Patient's partner is in the room as plays confederate role.

Trigger	Patient Condition	Action	Done	Time	Comments
Pt laboring in the L&D suite and is comfortable with a labor epidural (T10 sensory level bilaterally). Ob Resident notes 300 cc of frank blood with AROM.	HR 118 bpm BP 128/85 mm Hg SpO <sub>2</sub> 95% (air) Resp 26/min Temp 36.9°C FHR 80s for 3 minutes (baseline 140)	<ol> <li>L&amp;D nurse calls for additional help.</li> <li>Anesthesia is alerted about the blood loss and fetal heart rate deceleration to the 80s.</li> <li>OB attending is alerted.</li> <li>OR team is informed about a possible emergent cesarean section.</li> </ol>			
Fetal Heart Rate in the 70s for 4 minutes.	Patient appears visually agitated.	<ol> <li>OB team decides to proceed with emergent cesarean section for sustained FHR in the 70s and suspected placental abruption.</li> <li>Inform OR team that an emergent cesarean section has been called.</li> <li>Cord prolapse is ruled out</li> <li>Anesthesia team discuss plan for surgical anesthesia</li> </ol>			

Patient in OR. She is	HR 134	1. Emergently intubate due to fetal
altered and	BP 88/52	bradycardia, hypotension, altered
minimally	SpO2 92%	mental status, inability to protect
responsive.		airway, and urgency of the case.
		Consider the use of induction
	FHR 72	agents with more preferable
		hemodynamic profile than
		propofol e.g. ketamine or
		etomidate. Inhalational agent and
		nitrous oxide started for
		maintenance of anesthesia.
		2. Prepare oxytocin and give
		antibiotics if not already given.
		3. Tell Ob surgeon to proceed after
		airway is secured.
		4. Establish additional large bore IV
		access +/- central line, and place
		arterial line.
		5. Vasopressors in line and started:
		phenylephrine or norepinephrine
		given hypotension.
		6. Send labs: CBC, Coagulation profile,
		Fibrinogen, BMP, TEG/ROTEM, ABG
During	Intubated	1. Decrease inhalational agent to half
hysterotomy,		MAC, supplement with nitrous
placental abruption	HR 134	oxide or propofol.
is noted.	BP 85/53	
Neonate delivered	SpO2 97%	2. Start oxytocin dosing per protocol.
with Apgars of		
1/6/8.		3. Discuss other potential uterotonics
		given preeclampsia history.

BP 79/562.Utilize rapid transfuser.OBs reporting continued bleeding despite adequate uterine tone.SpQ2 96%3.Activate Massive Transfusion Protocol, which allows for rapid delivery of blood products. Treat unstable vitals with vasopressors, Fibrinogen 74 Platelets 78 x10°/L INR 1.5FEG/ROTEM with prolonged clotting time, low clot amplitude with low fibrinogen clot toribution, and increased clotBleeding has slowed prolonged units following 4 units of platelets rand increased clot platelets rand toribution, and increased clot10Bleeding has slowed platelets rand following 4 units of platelets rand following 4 units of platelets rand platelets rand increased clot platelets rand toribution, and increased clot platelets rand proving10 </th <th>Good uterine tone.</th> <th>HR 138</th> <th>1.</th> <th>Recognize DIC.</th> <th></th> <th></th>	Good uterine tone.	HR 138	1.	Recognize DIC.		
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cryoprecipitate.(intubated) Temp 36.9°C5. Discuss consulting IR for potential uterine artery embolization in case of continued medical bleeding.QBL 3600 mLRepeat labs: Hb 8.1 g/dL Plt 94 x10°/L INR 1.36. Discuss not to remove epidural until coagulopathy resolved.Surgery almost completed.Fib 158 mg/dL Fib 158 mg/dL-Per Obstetricians, very slow oozing isHR 108 bpm BP 89/51 mm Hg1. Transfer to ICU signing out that she will need to be closely	of platelets and 1	BP 89/51 mm Hg		intubated and sedated.		
Temp 36.9°Cuterine artery embolization in case of continued medical bleeding.QBL 3600 mLRepeat labs: Hb 8.1 g/dL Plt 94 x10°/L INR 1.36. Discuss not to remove epidural until coagulopathy resolved.6. Discuss not to remove epidural ountil coagulopathy resolved.Surgery almost completed.Fib 158 mg/dL Fib 158 mg/dL BP 89/51 mm Hg1. Transfer to ICU signing out that she will need to be closely1. Transfer to ICU signing out that she will need to b	unit of	SpO <sub>2</sub> 94%	4.	Update family.		
QBL 3600 mLRepeat labs: Hb 8.1 g/dL Plt 94 x109/L INR 1.36. Discuss not to remove epidural until coagulopathy resolved.6. Discuss not to remove epidural until coagulopathy resolved.Surgery almost completed.Fib 158 mg/dL Fib 158 mg/dL6. Discuss not to remove epidural until coagulopathy resolved.6. Discuss not to remove epidural until coagulopathy resolved.Per Obstetricians, very slow oozing isHR 108 bpm BP 89/51 mm Hg1. Transfer to ICU signing out that she will need to be closely6. Discuss not to remove epidural until coagulopathy resolved.	cryoprecipitate.	(intubated)	5.	Discuss consulting IR for potential		
QBL 3600 mLRepeat labs: Hb 8.1 g/dL Plt 94 x10°/L INR 1.36. Discuss not to remove epidural until coagulopathy resolved.6. Discuss not to remove epidural until coagulopathy resolved.Surgery almost completed.Fib 158 mg/dL Fib 158 mg/dL6. Discuss not to remove epidural until coagulopathy resolved.6. Discuss not to remove epidural until coagulopathy resolved.Per Obstetricians, very slow oozing isHR 108 bpm BP 89/51 mm Hg1. Transfer to ICU signing out that she will need to be closely6. Discuss not to remove epidural until coagulopathy resolved.		Temp 36.9⁰C		uterine artery embolization in case		
QBL 3600 mLHb 8.1 g/dL Plt 94 x10 <sup>9</sup> /L INR 1.3until coagulopathy resolved.Image: Coagule of the second se				of continued medical bleeding.		
Plt 94 x109/L INR 1.3Plt 94 x109/L INR 1.		Repeat labs:	6.	Discuss not to remove epidural		
INR 1.3 Surgery almost completed.INR 1.3 Fib 158 mg/dLInstanceInstancePer Obstetricians, very slow oozing isHR 108 bpm BP 89/51 mm Hg1.Transfer to ICU signing out that she will need to be closelyInstance	QBL 3600 mL	Hb 8.1 g/dL		until coagulopathy resolved.		
Surgery almost completed.Fib 158 mg/dLImage: Completed com		Plt 94 x10 <sup>9</sup> /L				
completed.Image: Completed stateImage: Completed statePer Obstetricians,HR 108 bpm1. Transfer to ICU signing out thatvery slow oozing isBP 89/51 mm Hgshe will need to be closely		INR 1.3				
Per Obstetricians,HR 108 bpm1.Transfer to ICU signing out thatvery slow oozing isBP 89/51 mm Hgshe will need to be closely	Surgery almost	Fib 158 mg/dL				
very slow oozing is BP 89/51 mm Hg she will need to be closely	completed.				 	
	Per Obstetricians,	HR 108 bpm	1.	Transfer to ICU signing out that		
	very slow oozing is	BP 89/51 mm Hg		she will need to be closely		
still noted. They do $SpO_2 94\%$ monitored for further bleeding, $ $	still noted. They do	SpO <sub>2</sub> 94%		monitored for further bleeding,		
not think it is (intubated) serial CBCs and coagulation	not think it is	(intubated)		serial CBCs and coagulation		
surgical bleeding, Temp 36.9°C studies until stable.	surgical bleeding,	Temp 36.9⁰C		studies until stable.		
but rather some 2. Discuss lab/hemodynamic			2.	Discuss lab/hemodynamic		
continued "medical parameters for when IR procedure	continued "medical			-		
bleeding" from DIC. vs. additional surgical procedure	bleeding" from DIC.					
would be indicated	÷					
Surgery completed.	Surgery completed.					

## 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 risk factors for placental abruption with subsequent DIC?

BEFORE THE SIMULATION						END OF SIMULATION							
1	2	2 3 4 5 6 7						2	3	4	5	6	7
Littl	le/none				Knowled	dgeable	Little	e/none			K	nowled	geable

## 2. How would you rate your knowledge of differential diagnosis of Maternal Hemorrhage?

BEFORE THE SIMULATION						END OF SIMULATION							
1	2	3	4	5	6	7	1	2	3	4	5	6	7
Littl	e/none				Knowled	dgeable	Little	/none			K	nowled	lgeable

## 3. How would you rate your knowledge of signs and symptoms of DIC?

BEFORE THE SIMULATION							END OF SIMULATION						
1	2	3	4	5	6	6 7 1 2 3 4 5 6						6	7
Little	/none				Knowled	dgeable	Little/none Knowle				nowled	lgeable	

## 4. How would you rate your knowledge of delivery planning for DIC?

BEFORE THE SIMULATION							END OF SIMULATION						
1	2	3	4	5	6	7	1	2	3	4	5	6	7
Little	/none				Knowle	dgeable	Little	/none			ł	Knowle	dgeable

# 5. How would you rate your overall confidence when confronted with placental abruption with subsequent DIC?

BEFC	RE THE	RE THE SIMULATION						END OF SIMULATION						
1	2	3	4	5	6	7	1	2	3	4	5	6	7	
Little	/none				Knowle	dgeable	Little	Little/none Knowledge					lgeable	

## Appendix 2

	Simulatio	n Activity Eval	uation				
DATE OF SIMULATION:							
OCCUPATION: Consultant PG YOTHER	Yr 1 2 3 4	STUDENT	NURSE	MI	DWIFE		
SPECIALTY:	YEARS	IN PRACTICE:					
Please rate the following aspec	ts of this tra	iining program	using the so	cale liste	ed below:		
1 = Poor 2 = Suboptimal	3 = Ac	lequate	4 = Good		5 = Excell	ent	
Use "N/A" if you did not experi	ence or othe	erwise cannot	rate an item	ı			
INTRODUCTORY MATERIALS							
Orientation to the simulator		1	2	3	4	5	N/A
PHYSICAL SPACE		1	2	2	4	F	N1 / A
Realism of the simulator space		1	2	3	4	5	N/A
EQUIPMENT							
Satisfaction with the mannequi	n	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 t	echnical ski	lls 1	2	3	4	5	N/A
Ability of the scenarios to test t			2	3	4	5	N/A
Overall quality of the debriefing	gs	1	2	3	4	5	N/A
	-						
DID YOU FIND THIS USEFUL?			_	_			
To improve your clinical practic		1	2	3	4	5	N/A
To improve your teamwork skil		1	2	3	4	5	N/A
To improve your VERBAL comm		1	2	3	4	5	N/A
To improve your NONVERBAL c	ommunicat	ion? 1	2	3	4	5	N/A
FACULTY							
Quality of instructors		1	2	3	4	5	N/A
Simulation as a teaching metho	d	1	2	3	4	5	N/A

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