

JOHNS HOPKINS ALL CHILDREN'S HOSPITAL

Care of the Pregnant Trauma Patient Clinical Pathway

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Updated: September 2020

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This pathway is intended as a guide for physicians, physician assistants, nurse practitioners and other healthcare providers. It should be adapted to the care of specific patient based on the patient's individualized circumstances and the practitioner's professional judgment.

Johns Hopkins All Children's Hospital

Care of the Pregnant Trauma Patient

Rationale:

This clinical pathway was developed by a consensus group of Johns Hopkins All Children's Hospital (JHACH) physicians, advance practice providers, and nurses to standardize the management of pregnant trauma patients.

It addresses the following clinical questions or problems:

1. How to evaluate and stabilize a trauma patient with non-viable pregnancy?
2. How to evaluate and stabilize a trauma patient with viable pregnancy?
3. When to consider transfer to definitive care?
4. Where to transfer the pregnant trauma patient?

Background

Trauma is the leading cause of non-obstetric maternal and fetal mortality. Common pregnancy-associated risks in trauma include preterm contractions, preterm labor, preterm delivery, abruption, fetal and neonatal death, and uterine rupture. The most common trauma mechanisms are falls, domestic violence, and motor vehicle crashes.

Diagnosis

In accordance with State and Emergency Medical Services (EMS) guidelines, JHACH will accept all pediatric trauma patients (age 15 and younger) from the field regardless of pregnancy status. These patients will be evaluated and stabilized in the JHACH Emergency Center (EC). Additionally, pregnant patients presenting directly to the EC in distress and requesting examination will be evaluated and stabilized in the JHACH EC per the Emergency Medical Treatment and Active Labor Act (EMTALA) guidelines. At this time, JHACH does not admit pregnant patients to inpatient floors. Stable pediatric trauma patients who require admission after trauma team evaluation will be transferred to a pediatric trauma center with admission capability.

An OB alert will be called for all pregnant patients who meet trauma team activation criteria and are greater than 20 weeks gestation per patient report or best estimate. This will bring an Obstetrics physician and a Labor and Delivery nurse from Bayfront Baby Place to the JHACH Trauma Bay. In the event of active labor or threat of imminent delivery the STORK team will be activated. This team will bring a Neonatal Intensive Care Unit (NICU) Attending, NICU Advanced Practice Provider (APP), NICU (Registered Nurse) RN, and NICU Respiratory Therapist (RT). Management of these patients will be at the discretion of the Trauma Team Leader, EC Attending, and OB Staff.

Special Physiological Considerations:

Table 1: Physiological Changes in Pregnancy

Body System	Physical Adaptation in Pregnancy
Cardiac	<ul style="list-style-type: none">• Increased Stroke Volume: 30%• Increased Cardiac Output: 6L/min• Increased HR: 17%
Vessels	<ul style="list-style-type: none">• Increased Blood Volume: 20 to 50%• Decreased Systemic Vascular Resistance: 20%
Uterus	<ul style="list-style-type: none">• Increased Blood Flow: 500-800 ml/min total• Aortocaval Compression when supine

Clinical signs of hemorrhage and shock can be delayed in pregnant women owing to these cardiovascular adaptations. Once a pregnant patient develops tachycardia and hypotension in response to hemorrhage, at least 20% of her blood volume has been lost.

Lab tests:

Standard trauma labs should be obtained (Complete Blood Count, Comprehensive Metabolic Panel, Lipase, Type and Screen, APTT, Prothrombin Time and INR, venous blood gas with lactate and glucose, and Urinalysis).

Radiologic studies:

Focused Assessment with Sonography for Trauma (FAST) scan is a safe and rapid method to identify intra-abdominal free fluid, fetal viability, and condition.

JHACH Radiologists will perform a viability exam via ultrasound at the bedside. The radiologist will perform continuous fetal heart rate monitoring via ultrasound until arrival of Bayfront Medical Center (BMC) OB Alert team. BMC OB alert team will bring a tocometer and external fetal heart rate monitor.

[Trauma Radiological Protocols](#) should be followed for the pregnant trauma patient. This includes the use of CT and MRI studies. Diagnostic techniques to evaluate for potentially serious traumatic injury to the mother should not be withheld for fetal concerns. If possible, fetal radiation can be minimized by shielding the abdomen with a lead apron.

Clinical Management

Do not deviate from established trauma guidelines. Priority of care is to the mother. Good care of the mother is good care of the fetus.

Positioning: All pregnant patients greater than 20 weeks gestation should be placed in the left lateral recumbent position. When supine, the gravida uterus compresses the inferior vena cava

and can decrease venous return and cause hypotension. The left lateral recumbent position relieves compression of the inferior vena cava.

Examination: a pelvic exam may need to be performed to examine for the presence of vaginal bleeding, ruptured membranes, or a bulging perineum. Under this circumstance, it would be considered emergent and consent is not needed per Florida law.

Obtain and document obstetrical history: This should include past obstetrical history, any previous obstetrical complications, and the course of the current pregnancy.

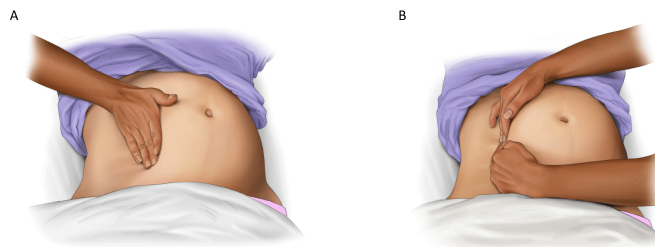
Fetal Heart Rate and Uterine Activity: Fetal Heart Rate and Uterine Activity should be obtained in all trauma patients with viable pregnancy. Fetal heart rate will be obtained by either JHACH Radiology or Bayfront Medical Center OB alert team.

Oxygen supplementation: Oxygen should be supplemented to maintain saturations greater than 95% to ensure adequate fetal oxygenation.

Nasogastric tube: A Nasogastric (NG) should be placed in a semiconscious or unconscious pregnant trauma patient to prevent aspiration of acidic gastric contents. Pregnant patients are at an increased risk of aspiration due to elevation of intragastric pressure from the gravid uterus, relaxed gastroesophageal sphincter, and delayed gastric emptying.

Perimortem Caesarean: A caesarean section should be performed for viable pregnancies no later than 4 minutes (when possible) following maternal cardiac arrest to aid with maternal resuscitation and fetal salvage.

Cardiopulmonary Resuscitation: American Heart Association (AHA) Advanced Care Life Support (ACLS) guidelines recommend performing chest compressions with the pregnant patient in the supine position. Continuous manual left uterine displacement (LUD) should be performed on all pregnant women who are in cardiac arrest in which the uterus is palpated at or above the umbilicus to relieve aortocaval compression during resuscitation.



A, Manual LUD, performed with one-handed technique. B, Two-handed technique during resuscitation.

Figure 1: Manual LUD 1, Photo credit: <https://eccguidelines.heart.org/circulat1>

Pharmacologic considerations:

The following table is not all inclusive and is recommended as a quick reference guide and overview of safe and preferred medications for the pregnant patient.

Table 2: Pharmacologic recommendations for pregnant patients (Credit to: <http://www.emdocs.net/safe-unsafe-medications-pregnancy/>)

Condition		Preferred Medication	2 nd Line	Avoid
Airway	Intubation	Propofol, Ketamine	Etomidate, Fentanyl	Midazolam
	Paralytics	Succinylcholine	Rocuronium, Vecuronium	
Breathing	Bronchospasm	Albuterol, Ipratropium	Magnesium	Corticosteroids (unless severe)
Circulation	Code Blue (Cardiac Arrest)	ACLS PROTOCOLS +Leftward uterine displacement	If >20 weeks, consider peri-mortem C-section @ 4 minutes if no ROSC	
	Tachycardia	Lidocaine, Sotalol	Adenosine	Amiodarone, Atenolol
	Bradycardia	Atropine		
	Hypertension	Labetalol, Hydralazine (Avoid lowering BP below 140/90)		ACE-Inhibitors, ARB's, Aldosterone antagonists Nitroprusside
	Hypotension	Aggressive Fluid Resuscitation	Vasopressors (only for intractable hypotension)	
	Anaphylaxis	Diphenhydramine, Ranitidine, Famotidine	Epinephrine, Methylprednisolone	
GI	N/V/D	Metoclopramide, Aluminum Hydroxide, Magnesium Hydroxide, Simethicone	Ondansetron, Loperamide	Prochlorperazine
Neuro	Seizure	Benzodiazepines, Lamotrigine, (Magnesium if peripartum)	Zonisamide, Topiramate	Valproate, Carbamazepine, Phenytoin, Phenobarbital
	Pain Control	Acetaminophen	Opiates, Fentanyl (relay times to OB if imminent delivery)	Aspirin, NSAIDS (after 24 weeks)
Micro	Antibiotics	Penicillin's, Ceftriaxone, Clindamycin, Macrobid,	Vancomycin, Flagyl (Safest in 2 nd and 3 rd trimester)	Tetracyclines, Sulfonamides, Fluoroquinolones
	Antivirals	Acyclovir, Valacyclovir		Ganciclovir
	Antifungals	Fluconazole, Nystatin		
Toxicology	Overdose	Naloxone, Charcoal, NAC, Cyan kit, Digi bind, Calcium, Glucagon, Insulin, Deferoxamine, Flumazenil, 2-PAM, Fomepizole	Methylene Blue	Penicillamine

Obstetric Specific Medications:

- BMC OB alert team will bring the medications with them when responding to a trauma activation. These medications are not available in the JHACH formulary.

Complications of the Pregnant Trauma Patient

Blunt Abdominal Trauma: (Follow [JHACH Blunt Abdominal Trauma Clinical Pathway](#))

Hematuria after injury should be aggressively evaluated. Splenic injuries occur most commonly in the 3rd trimester and may occur with only mild trauma.

Injury to the spleen and retroperitoneal bleeds are the most common injuries resulting from blunt abdominal trauma. Splenic injury is the most common cause of intraperitoneal hemorrhage.

Pelvic fractures are also commonly associated with blunt abdominal trauma. Due to engorged pelvic vessels there is increased risk for retroperitoneal hemorrhage.

Obstetric complications from blunt abdominal trauma include: preterm labor, preterm delivery, preterm premature rupture of membranes, abruption, fetomaternal hemorrhage, and uterine rupture (rare).

Abruption:

Abruption is the most common cause of fetal death from trauma second to maternal death.

Signs include abdominal or back pain, pre-mature uterine contractions, vaginal bleeding, and a tender rigid uterus. Patient at increased risk of DIC if there is an abruption. Fetal heart rate should be monitored continuously for presence of bradycardia or absent fetal heart tones as this is a symptom.

If abruption is suspected, prepare for emergency caesarean section.

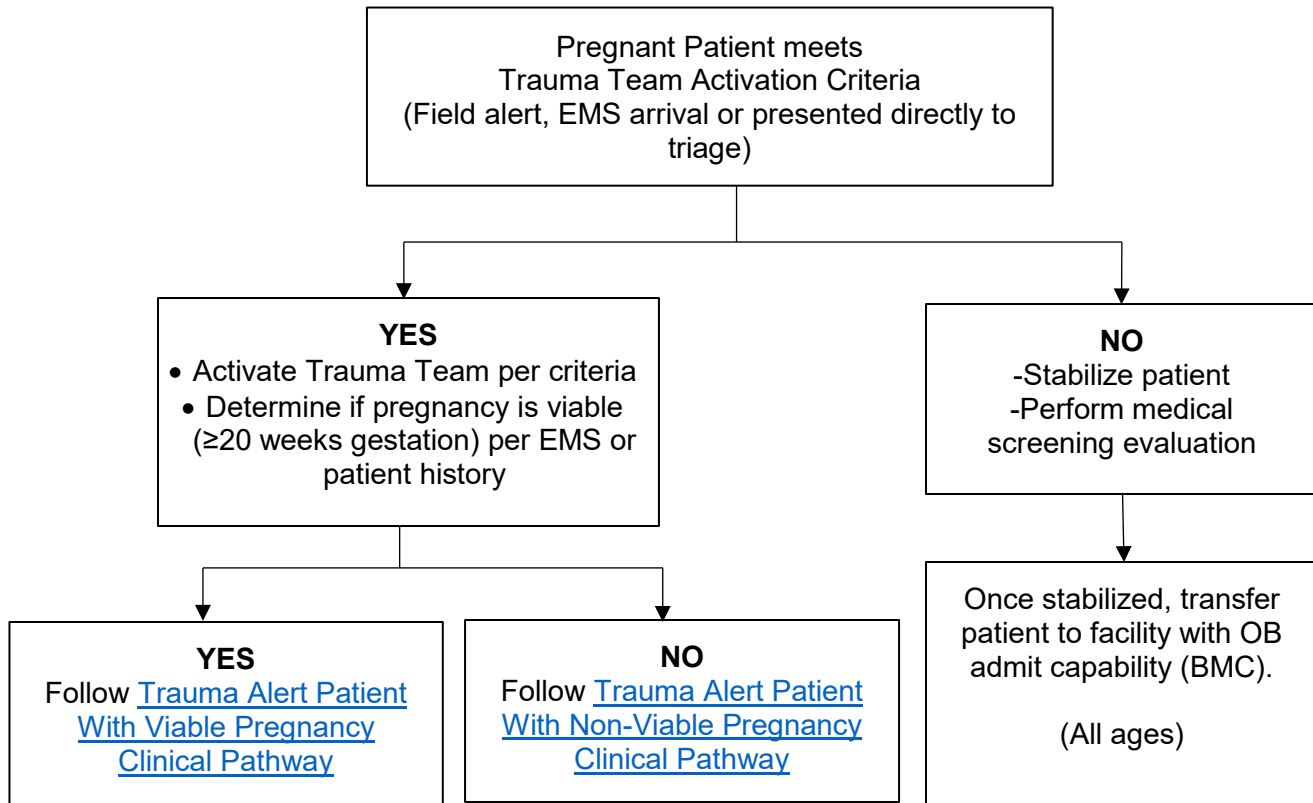
Uterine Rupture:

Uterine rupture is extremely rare and usually occurs as a result of direct abdominal trauma. Immediate caesarean is indicated in uterine rupture as fetal mortality is close to 100% in these cases. Fetal heart rate should be monitored continuously for presence of bradycardia or absent fetal heart tones as this is a symptom.

If uterine rupture is suspected, prepare for emergency caesarean section.

Penetrating Abdominal Trauma (Follow [JHACH Thoracoabdominal Penetrating Trauma Clinical Pathway](#))

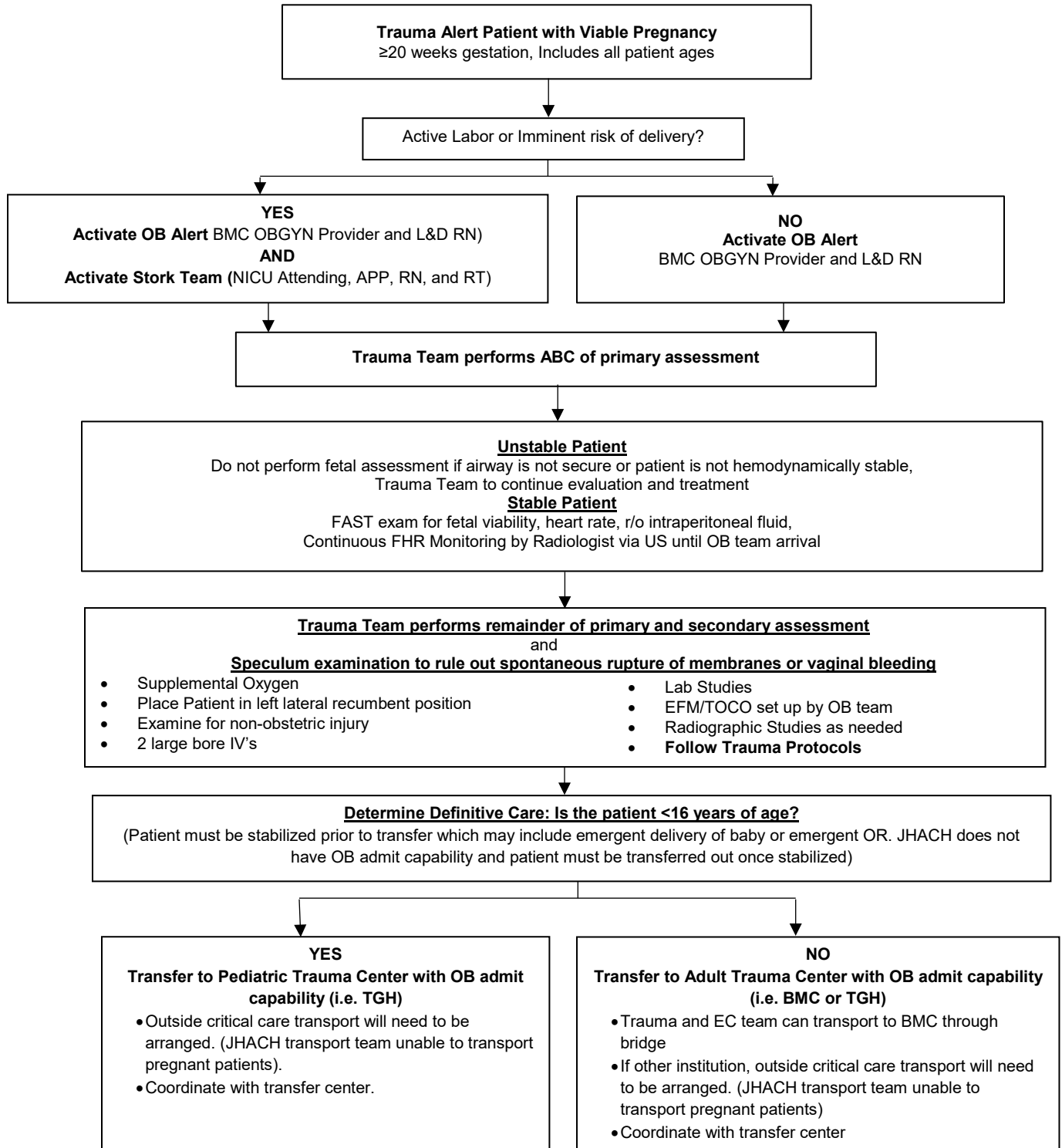
Emergency Center Initial Evaluation of the Pregnant Trauma Patient Clinical Pathway



Level 1 Trauma Team Activation Criteria
<ul style="list-style-type: none"> • Intubated/requiring active airway assistance • Age-specific hypotension • Extremity injury with loss of pulse/traumatic amputation (other than isolated finger/toe)/pulsatile bleeding/expanding hematoma • GCS 8 or less, or decrease by 2 attributable to trauma • Paralysis with concern for spinal cord injury • Gunshot wound to head/neck/torso/extremity above knee/elbow • Stab wound to neck/torso • Transfer patient: unstable or requiring active/continued resuscitation • Physician discretion

Level 2 Trauma Activation Criteria
<ul style="list-style-type: none"> • Extremity injury with concern for vascular compromise (diminished pulses/neuro deficit) • Multiple long bone fractures • GCS 9-13, or other altered mental status attributable to trauma • Paresthesia/weakness with concern for spinal cord injury • Any other non-superficial penetrating injury to head/neck/torso/groin/axilla • Major avulsion/degloving/soft tissue loss • 2nd/3rd degree burns covering 10% or more of total body surface area • Transfer patient: stable, but requiring additional timely diagnostics • Concern for occult injury with significant mechanism of injury • Single long bone fracture in patient 11 kg or less/non-ambulatory • Physician discretion

Johns Hopkins All Children's Hospital
Trauma Alert Patient with Viable Pregnancy Clinical Pathway



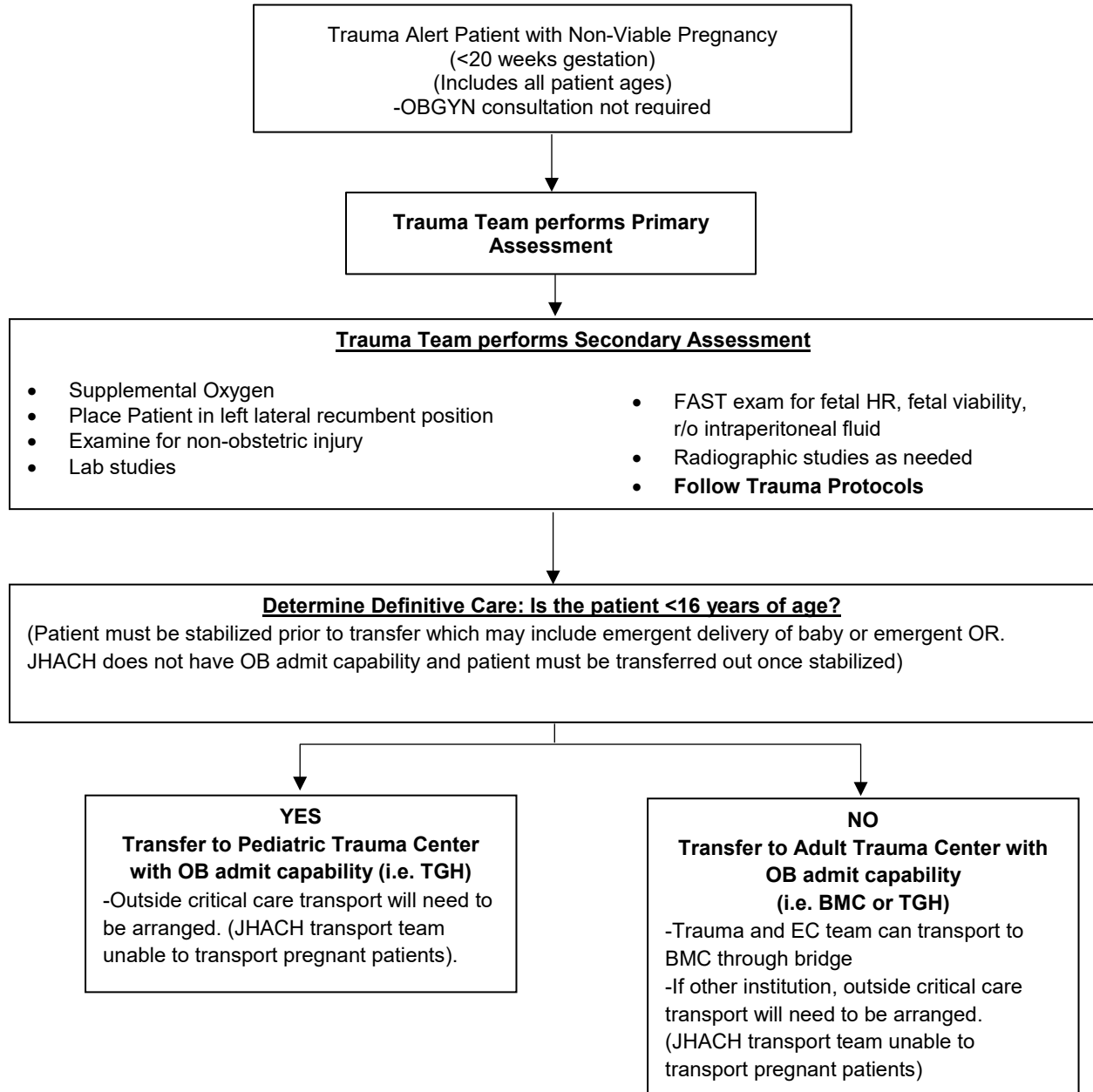
Special Considerations

Fetal Distress: optimize maternal circulation and oxygenation and perform Caesarean section.

CPR: Continuous manual left uterine displacement (LUD) should be performed during CPR

Perimortem Caesarean Section: Recommended for viable pregnancies (>20 weeks) no later than 4 minutes (when possible) following maternal cardiac arrest to aid with maternal resuscitation and fetal salvage.

Trauma Alert Patient with Non-Viable Pregnancy Clinical Pathway



Special Considerations

Fetal Distress:

- Optimize maternal circulation and oxygenation.
- Routine Caesarean delivery is not warranted unless the presence of the fetus compromises maternal stability.
- +/- Induction of labor
- +/- Allow spontaneous delivery
- OBGYN consultation in emergency situations

Admission

JHACH does not have inpatient admit capability for the pregnant trauma patient. The patient must be dispositioned from the emergency center or the operating room to either home or a facility with OB admit capability. If the patient is less than 16 years old, they must be transferred to a pediatric trauma hospital with OB admit capability (i.e. Tampa General Hospital (TGH)). If the patient is 16 years of age or older, then they can be admitted to an adult trauma center with OB admit capability (i.e. BMC).

The baby can be admitted to JHACH NICU if delivery occurs prior to transfer.

Transfer Out

Ensure the electronic medical record (EMR) is printed, all radiological films burned to disk, and a copy of the trauma flow sheet goes with the EMS crew transporting the patient.

JHACH transport team cannot transfer pregnant patients. Transportation of the patient will need to be coordinated with the receiving facility, transfer center, and/or local EMS. The patient may require critical care transport (i.e. Bayflight or Sunstar Critical Care Transport).

In the event the patient is 16 years of age or older and is being transferred to Bayfront medical center, the trauma team can transport the patient to Bayfront Medical Center.

Additional Resources

Please refer to the following JHACH Policies in HPO (links only work on JHACH campus)

1. [Organizational Plan for Provision of Care Clinical Scope of Care- Trauma](#)
2. [Emergent Delivery of Baby](#)

Outcome Measures

- Emergency Center Length of Stay
- Total Number of Pregnant Trauma Patients Annually
- All RAVE alerts sent correctly based on pathways

References

1. American College of Emergency Physicians (July 2010). *Trauma in the Obstetric Patient: A Bedside Tool*. Retrieved from <https://www.acepnow.com/article/trauma-obstetric-patient-bedside-tool/>.
2. Hill, C. (2009). Future Science Group. Trauma in the Obstetrical Patient. *Women's Health, Volume 5*, 269-285.
3. Jain, V., Radha, C., Masslovitz, S., Farine, D. (2015, June). Guidelines for the Management of a Pregnant Trauma Patient. *Journal of Obstetrics and Gynaecology Canada, Volume 325*, 553-571.

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Date Approved by JHACH Clinical Practice Council:

Date Available on Webpage: Sept 3, 2020

Last Revised: September 2020

Disclaimer

Clinical Pathways are intended to assist physicians, physician assistants, nurse practitioners and other health care providers in clinical decision-making by describing a range of generally acceptable approaches for the diagnosis, management, or prevention of specific diseases or conditions. The ultimate judgment regarding care of a particular patient must be made by the physician in light of the individual circumstances presented by the patient.

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