

## **Blunt Abdominal Trauma in Pregnancy**

### **Background**

#### **Anatomy**

First trimester

- Uterus is an intrapelvic organ
- Uterus is thick walled - providing muscular protection

Second trimester:

- Uterus rises out of the boney protection of the pelvis
- Small fetus protected by relative abundance of amniotic fluid
- Uterine wall still relatively thick

Third trimester

- Uterus large and now thin walled
- If cephalic, then fetal head is protected – remainder of fetus exposed
- Maternal pelvic fractures can result in fetal skull fractures
- Maternal bowel is relatively well protected cephalad to the fundus, while uterus / fetus become more vulnerable.
- During the last two weeks of gestation, the fundus descends as the fetal head engages in the pelvis

#### **Physiology**

- The myometrium is somewhat elastic, while the placenta is relatively inelastic
- The relative inelasticity makes the placenta subject to shear forces, e. g., abruptio
- The placental vasculature is maximally dilated, yet the uterus is exquisitely sensitive to catecholamine stimulation. An abrupt decrease in maternal intravascular volume can result in a profound increase in uterine vascular resistance - reducing fetal oxygenation, despite reasonably normal maternal vital signs.
- If clinically significant placental abruption is present, it is most evident within the first 4 hrs. (Dahmus 1993, Mendez-Figueroa 2013)

#### **Rh D alloimmunization**

Fetomaternal bleeding has been reported in 2.6 to 30 percent of pregnant trauma patients. It is more common in women with an anterior placenta or tender uterus . Complications associated with fetomaternal bleeding include fetal anemia, fetal death, and maternal alloimmunization.

Although the exact risk of Rh D alloimmunization is unknown, abdominal trauma is sometimes associated with fetal–maternal hemorrhage, which may lead to alloimmunization. The efficacy of anti-D immune globulin in this clinical situation has not been tested in properly designed trials. However, authorities agree that anti-D immune globulin should be administered to Rh D-negative women who have experienced abdominal trauma .

In Rh D-negative pregnant patients who have experienced abdominal trauma, quantification of fetal–maternal hemorrhage should be done to determine the need for additional doses of anti-D immune globulin

The occurrence of fetomaternal bleeding is determined by a Kleihauer-Betke test, which measures the percent of red cells containing fetal hemoglobin in maternal blood. Please obtain a Kleihauer-Betke test in Rh(D)-negative women who have undergone significant abdominal trauma to determine whether additional doses of anti-D-immune globulin are needed due to a large fetomaternal infusion of blood.

**Mechanism(s):** (see Appendix 1)

There are many factors to be considered:

- restrained vs unrestrained MVA
- ejection from automobile ATV or snow machine
- pedestrian / bicyclist: distance thrown, or impact mph
- falls: distance fallen

In pregnancy the chest and uterine fundus should be 10 inches (25 cm) from the airbag cover. During pregnancy the distance to the inferior aspect of the steering wheel decreases to 3.07 - 6.52 cm by 6-9 months gestation. Using these metrics, the pregnant parturient is actually best served in the back seat as a passenger if possible.

**20 mph airbag deployment**

Although there are various factors involved in the deployment of an airbag, it's commonly understood airbags deploy at speeds of 20 miles per hour and higher.

In a slow speed rear-end collision when airbags don't deploy, the face or abdomen can smash into the steering wheel. The force of the impact can break the nose, fracture the cheek and jawbone, and even detach the retina. Less serious injuries are lacerations (cuts), contusions (bruises), and abrasions (scrapes) to the face and scalp.

When speeds are higher than 20 miles per hour and airbags do deploy, the impact can result in burning of the facial area and scalp.

Hence, it is important to query the CO and/or witnesses about airbag deployment, or not.

**Definitions:**

**Incidental Trauma**

History: Does NOT involve significant direct abdominal injury with rapid compression, deceleration, contrecoup effect, or shearing forces.

Signs and symptoms: Does NOT include vaginal bleeding, loss of amniotic fluid, decreased fetal motion, significant abdominal pain, or contractions  $\geq 6$  / hour

Examples: Slips / falls from the height of a few steps and NOT landing directly on abdomen.

**Minor Trauma**

History: Includes any one of the following – direct or indirect abdominal injury with rapid compression, deceleration, contrecoup effect, or shearing forces.

Signs and symptoms: Includes any one of the following - vaginal bleeding, loss of amniotic fluid, decreased fetal motion, significant abdominal pain, or contractions  $\geq 6$  / hour

Example: Restrained motor vehicle occupant < 20 mph

### **Major Trauma**

History: Includes any one of the following – significant direct or indirect abdominal injury with rapid compression, deceleration, contrecoup effect, or shearing forces.

Signs and symptoms: Includes any one of the following - vaginal bleeding, loss of amniotic fluid, decreased fetal motion, significant abdominal pain, or contractions  $\geq 6$  / hour

Other: Shock, skull fracture, cerebral contusion, intercerebral hemorrhage, spinal column fracture, chest injury necessitating thoracotomy / thoracostomy, injury of abdominal viscera / GU tract treated in the operating room, or pelvic fracture.

Example: Non-restrained motor vehicle occupant

## **Management: Clinically stable**

### **Assumption**

The following management processes assume the patient has already had a prenatal blood type and Rh factor determined. If that test has not been completed previously during this pregnancy, please obtain it as an initial step in the evaluation. (Figure 1)

### **First step**

Please see the ANMC Trauma Service's Activation Criteria Guideline. (See Appendix 1)

### **Incidental Trauma**

#### **Less than 4 hrs since event**

EGA less than 23 weeks

Obtain FHTs (if greater than 12 wks EGA)

-If Rh neg, then administer 300 mcg RhoGam, except isolated extremity injury

-Seatbelt counseling

-IPV Screening

-Refer to PCP or ED

EGA greater than or equal to 23 wks

-Obtain NST

-If Rh neg, then administer 300 mcg RhoGam, except isolated extremity injury

-Seatbelt counseling

-IPV Screening

-Refer to PCP or ED

### **Greater than 4 hrs since the event**

- Obtain FHTs (if greater than 12 wks EGA)
- If Rh neg, then administer 300 mcg RhoGam, if < 72 hrs, except isolated extremity injury
- Seatbelt counseling
- IPV Screening
- Refer to PCP or ED

### **Minor Trauma**

#### **Less than 4 hrs since event**

- EGA greater than or equal to 20 weeks
- Monitor for 4 hrs
- PE: Abdominal exam
- If  $\geq 6$  ctx per hr, VB, or LOF -> perform SVE when aware of placental location

A. < 6 ctx/ hr in last hour of observation and no LOF or VB

- Discharge
- If Rh neg, then administer 300 mcg RhoGam
- Seatbelt counseling
- IPV Screening
- Refer to PCP or ED

B.  $\geq 6$  ctx/ hr in last hour of observation

- 24 hr observation
- CBC
- Consider KB, fibrinogen
- Ultrasound
- Consider betamethasone if EGA < 37 wks EGA
- Consider neuroprotection if EGA < 32 wks EGA

- If Rh neg, then administer 300 mcg RhoGam
- Seatbelt counseling
- IPV Screening
- Refer to PCP or ED

C. Rupture of membranes, persistent vaginal bleeding, abdominal pain/cramping/tenderness, or evidence of hypovolemia

- Admit
- Manage per clinical scenario
- If Rh neg, then administer 300 mcg RhoGam
- Seatbelt counseling
- IPV Screening

### **Greater than 4 hrs since the event**

EGA less than 23 weeks

Obtain FHTs (if greater than 12 wks EGA)

-If Rh neg, then administer 300 mcg RhoGam if < 72 hrs, except isolated extremity injury

-Seatbelt counseling

-IPV Screening

-Refer to PCP or ED

EGA greater than or equal to 23 wks

-Obtain NST

-If Rh neg, then administer 300 mcg RhoGam if < 72 hrs, except isolated extremity injury

-Seatbelt counseling

-IPV Screening

-Refer to PCP or ED

### **Management: Major Trauma or clinically unstable**

-ABCDs

-Consider visceral injury, including uterine rupture and abruptio placenta

Imaging as appropriate for maternal status vs exploratory laparotomy

-Manage per clinical scenario

If Rh neg, then administer 300 mcg RhoGam

Seatbelt counseling

IPV Screening

CBC, KB, fibrinogen

Ultrasound

Betamethasone if EGA < 37 wks EGA

Neuroprotection if EGA < 32 wks EGA

The complete management of major trauma in pregnancy is beyond the scope of this particular guideline, but includes the precepts of Advanced Life Support in Obstetrics (ALSO), Advanced Trauma Life Support (ATLS), and Advanced Cardiac Life Support (ACLS). These include:

#### **Modification of BLS**

-Manual left uterine displacement

#### **ACLS**

-Use all standard medications and defibrillation

#### **ATLS**

-Trauma Primary Survey

-Primary Maternal Survey with Resuscitation

-Maternal Secondary Survey

## **Resuscitative hysterotomy**

As a last resort, the team should be prepared to perform a resuscitative hysterotomy (perimortem cesarean delivery) in the obviously gravid female who has not responded to ACLS after four minutes. Please see the ALSO, ATLS, and ACLS chapters on that process.

## **Other: Counseling**

### **1. Intimate Partner Violence**

Intimate partner violence is a major cause of injury to women during cohabitation, marriage, and pregnancy, regardless of ethnic background, cultural influences, or socioeconomic status. Seventeen percent of injured pregnant patients experience trauma inflicted by another person, and 60% of these patients experience repeated episodes of intimate partner violence.

According to estimates from the U.S. Department of Justice, 2 million to 4 million incidents of intimate partner violence occur per year, and almost one-half of all women over their lifetimes are physically and/or psychologically abused in some manner. Worldwide, 10% to 69% of women report having been assaulted by an intimate partner.

Document and report any suspicion of intimate partner violence. These attacks, which represent an increasing number of ED visits, can result in death and disability. Although most victims of intimate partner violence are women, men make up approximately 40% of all reported cases in the United States.

Indicators that suggest the presence of intimate partner violence include:

- Injuries inconsistent with the stated history
- Diminished self-image, depression, and/or suicide attempts
- Self-abuse
  - Frequent ED or doctor's office visits
- Symptoms suggestive of substance abuse
- Isolated injuries to the gravid abdomen
- Self-blame for injuries
- Partner insists on being present for interview and examination and monopolizes discussion

These indicators raise suspicion about the potential for intimate partner violence and should serve to initiate further investigation. The screening questions in when asked in a nonjudgmental manner and without the patient's partner being present, can identify many victims of intimate partner violence. Suspected cases of intimate partner violence should be handled through local social service agencies or the state health and human services department. Two examples for IPV screening are below.

### **Assessment of immediate safety screening questions**

1. Are you in immediate danger?
2. Is your partner at the health facility now?
3. Do you want to (or have to) go home with your partner?
4. Do you have somewhere safe to go?
5. Have there been threats of direct abuse of the children (if she has children)?
6. Are you afraid your life may be in danger?

7. Has the violence gotten worse or is it getting scarier? Is it happening more often?
8. Has your partner used weapons, alcohol, or drugs?
9. Has your partner ever held you or your children against your will?
10. Does your partner ever watch you closely, follow you or stalk you?
11. Has your partner ever threatened to kill you, him/herself or your children?

### **Intimate Partner Violence Screening Questions**

While providing privacy, screen for intimate partner violence during new patient visits, annual examinations, initial prenatal visits, each trimester of pregnancy, and the postpartum checkup.

#### **Framing Statement**

“We’ve started talking to all of our patients about safe and healthy relationships because it can have such a large impact on your health.”\*

#### **Confidentiality**

“Before we get started, I want you to know that everything here is confidential, meaning that I won’t talk to anyone else about what is said unless you tell me that...  
(insert the laws in Alaska about what is necessary to disclose).”\*

#### **Sample Questions**

“Has your current partner ever threatened you or made you feel afraid?”  
(Threatened to hurt you or your children if you did or did not do something, controlled who you talked to or where you went, or gone into rages)†

“Has your partner ever hit, choked, or physically hurt you?”  
(“Hurt” includes being hit, slapped, kicked, bitten, pushed, or shoved.)†

#### **For women of reproductive age:**

“Has your partner ever forced you to do something sexually that you did not want to do, or refused your request to use condoms?”\*

“Does your partner support your decision about when or if you want to become pregnant?”\*

“Has your partner ever tampered with your birth control or tried to get you pregnant when you didn’t want to be?”\*

#### **For women with disabilities:**

“Has your partner prevented you from using a wheelchair, cane, respirator, or other assistive device?”‡

“Has your partner refused to help you with an important personal need such as taking your medicine, getting to the bathroom, getting out of bed, bathing, getting dressed, or getting food or drink or threatened not to help you with these personal needs?”‡

\*Family Violence Prevention Fund. Reproductive health and partner violence guidelines: an integrated response to intimate partner violence and reproductive coercion. San Francisco (CA): FVPF; 2010. Available at: [http://www.futureswithoutviolence.org/userfiles/file/HealthCare/Repro\\_Guide.pdf](http://www.futureswithoutviolence.org/userfiles/file/HealthCare/Repro_Guide.pdf). Retrieved October 12, 2011. Modified and reprinted with permission.

†Family Violence Prevention Fund. National consensus guidelines on identifying and responding to domestic violence victimization in health care settings. San Francisco (CA): FVPF; 2004. Available at:

<http://www.futureswithoutviolence.org/userfiles/file/Consensus.pdf>. Retrieved October 12, 2011. Modified and reprinted with permission.

Center for Research on Women with Disabilities. Development of the abuse assessment screen–disability (AAS–D). In: Violence against women with physical disabilities: final report submitted to the Centers for Disease Control and Prevention. Houston (TX): Baylor College of Medicine; 2002. p. II–1–II–16. Available at <http://www.bcm.edu/crowd/index.cfm?pmid=2137>. Retrieved October 18, 2011. Modified and reprinted with permission.

## 2. Use of seat belts and air bags

Pregnant women should continue wearing three-point seat belts during pregnancy. The lap belt is placed across the hips and below the uterus; the shoulder belt goes between the breasts and lateral to the uterus. Although there are case reports of maternal and fetal injuries resulting from seat belt use, the overall effect is that seat belts provide significantly more benefit than risk to the mother and fetus in the event of collision.

The American College of Obstetricians and Gynecologists (ACOG) recommends that pregnant occupants of motor vehicles wear lap and shoulder seatbelts and should not turn off air bags.

### References:

Alaska Native Medical Center Trauma Program (Accessed 8/24/17)

<http://share.home.anthc.org/anmc/trauma/SitePages/Home.aspx>

ANMC Trauma Center Activation Criteria Figure (Accessed 8/24/17)

[http://share.home.anthc.org/anmc/trauma/Shared%20Documents/Trauma%20Team%20Activation%20Criteria%20Poster%20\(002\)\\_2017.pdf](http://share.home.anthc.org/anmc/trauma/Shared%20Documents/Trauma%20Team%20Activation%20Criteria%20Poster%20(002)_2017.pdf)

American College of Obstetricians and Gynecologists. Intimate partner violence. Committee Opinion No. 518. *Obstet Gynecol* 2012;119:412–7.

American College of Obstetricians and Gynecologists. Car Safety for Pregnant Women, Babies, and Children <https://www.acog.org/Patients/FAQs/Car-Safety-for-Pregnant-Women-Babies-and-Children> (Accessed on August 20, 2017).

American College of Surgeons. Trauma in Pregnancy and Intimate Partner Violence. Chapter 12. In: *Advanced Trauma Life Support Student Course Manual, Tenth Edition*. Chicago, IL, American College of Surgeons, In Press.

Cahill AG, Bastek JA, Stamilio DM, Odibo AO, Stevens E, Macones GA. Minor trauma in pregnancy--is the evaluation unwarranted? *Am J Obstet Gynecol*. 2008 Feb;198(2):208.e1-5.

Dahmus MA, Sibai BM. Blunt abdominal trauma: are there any predictive factors for abruptio placentae or maternal-fetal distress? *Am J Obstet Gynecol*. 1993 Oct;169(4):1054-9

Lavonas EJ, Drennan IR, Gabrielli A, Heffner AC, Hoyte CO, Orkin AM, Sawyer KN, Donnino MW. Part 10: Special Circumstances of Resuscitation: 2015 American Heart Association Guidelines Update for Cardiopulmonary Resuscitation and Emergency Cardiovascular Care. *Circulation*. 2015 Nov 3;132(18 Suppl 2):S501-18.

Mendez-Figueroa H, Dahlke JD, Vrees RA, Rouse DJ. Trauma in pregnancy: an updated systematic review. *Am J Obstet Gynecol*. 2013;209(1):1-10.



Murphy NJ. Chapter K Maternal Resuscitation and Trauma (including Amniotic Fluid Embolism) Advanced Life Support in Obstetrics, American Academy of Family Physicians. Leawood, Kansas. (In press)

Murphy NJ, Quinlan JD. Trauma in pregnancy: assessment, management, and prevention. *Am Fam Physician*. 2014 Nov 15;90(10):717-22.

Pearlman MD, Tintinalli JE, Lorenz RP. A prospective controlled study of outcome after trauma during pregnancy. *Am J Obstet Gynecol*. 1990;162(6):1502-1507, discussion 1507-1510.

Approved OB Safety Mtg 7/17/17njm

**Alaska Native Medical Center**

**Trauma Service**

**TRAUMA TEAM ACTIVATION CRITERIA GUIDELINES**

**A. Trauma Alert One Activation:**

1. The Trauma Alert One team will be activated for any acutely injured patient requiring hospital admission who presents to the emergency department with one or more of the following criteria:
  - a. Pre-hospital designated Status I patients
  - b. Confirmed systolic blood pressure less than 90mm Hg at any time in adults and age-specific hypotension in children
  - c. See Pediatric Hypotension (at end of document)
  - d. Gunshot wounds to the head, neck, chest, abdomen or extremities proximal to the elbow and/or knee
  - e. Glasgow Coma Scale (GCS) less than or equal to 8 (or with deterioration of 2 points or more) with mechanism attributed to trauma
  - f. Transfer patients receiving blood to maintain vital signs
  - g. Intubated patients transferred from the scene *or* patients with respiratory compromise or obstruction, including intubated patients who are transferred from another facility with ongoing respiratory compromise (does not include patients who were intubated at another facility and are now stable from a respiratory standpoint)
  - h. Flail chest
  - i. Major crush injury to torso or upper thigh
  - j. Major burns
  - k. Emergency Physician's discretion
  
2. The Trauma Alert One team consists of the following members:
  - a. Attending General Trauma Surgeon
  - b. Surgery Resident
  - c. ED Physician
  - d. Pediatric Intensivist (if patient < 15 years of age)
  - e. ED Trauma Charge RN
  - f. ED Trauma RN
  - g. CCU RN
  - h. Pediatric RN (if patient < 15 years of age)
  - i. OR/PACU RN (*or* OR Tech)
  - j. ED Technician
  - k. Anesthesia
  - l. Radiology/CT Technician
  - m. Respiratory Therapist
  - n. Nursing Supervisor (*or* designee)
  - o. Pharmacist

p. Security Officer

3. For a Trauma Alert One activation, the attending surgeon and/or 4<sup>th</sup> year surgical resident will meet the transferred patient in the emergency department upon patient arrival or arrive in the emergency department within 15 minutes of patient arrival for locally injured patients.

B. **Trauma Alert Two Activation:**

1. The Trauma Alert Two team will be activated for any acutely injured patient requiring hospital admission who presents to the emergency department with one or more of the following criteria and who is hemodynamically stable:
  - a. Penetrating injuries to the torso (chest, abdomen) that are hemodynamically stable
  - b. Two or more proximal long-bone fractures
  - c. Pelvic fractures – hemodynamically stable
  - d. Limb paralysis
  - e. Amputation proximal to wrist and ankle
  - f. Injured patients with GCS > 8 and ≤ 13
  - g. Ejection from vehicles (automobiles, ATV, motorcycle, snowmachine, etc.)
  - h. Pedestrian/bicyclist struck/ run over by vehicle at >20 mph or thrown > 15 feet
  - i. Falls > 20 feet or Pediatric falls > 10 feet
  
2. The Trauma Alert Two Team consists of the following members:
  - a. Attending General Trauma Surgeon
  - b. Surgery Resident
  - c. ED Physician
  - d. Pediatrician (if patient < 15 years of age)
  - e. ED Trauma Charge RN
  - f. ED Trauma RN
  - g. CCU RN
  - h. Pediatric RN (if patient < 15 years of age)
  - i. ED Technician
  - j. Radiology/CT Technician
  - k. Nursing Supervisor (and/or designee)
  - l. Security Officer

**Note:** The Trauma Clinical Nurse Coordinator will respond to trauma activations as available in-house. When responding, he/she will function as the recorder, assuring all members of the team have arrived and will evaluate the trauma activation process for opportunities for improvement. When the Trauma Clinical Nurse Coordinator is present in the emergency department for the trauma team activation, the nursing supervisor will also respond to assist with crowd control, the admission process and the MBTP process, as applicable.

3. For a Trauma Alert Two activation, the attending surgeon or 4<sup>th</sup> year surgical resident will meet the transferred patient in the emergency department upon patient arrival or arrive in the emergency department within fifteen (15) minutes of patient arrival for locally injured patients.

4. Other indications include patients with severe but stable injuries < 24 hours old who are transferred from another facility where a physician may have evaluated them and who may require a trauma team activation if one or more of the above criteria are met.
5. Patients presenting to the emergency department with one or more of the following criteria deserve serious consideration by the emergency physician regarding a Trauma Team Activation:
  - a. Automobile / pedestrian collision > 10 mph
  - b. Major automobile deformity
  - c. Rollover motor vehicle crash
  - d. Death at scene of motor vehicle crash
  - e. Uncontrollable bleeding wound
6. The following co-morbid factors should always be considered when determining the level of trauma team activation:
  - a. Patients < 12 years of age or > 60 years of age
  - b. Pre-existing severe medical illnesses (e.g., COPD, Diabetes)
  - c. Pregnancy
  - d. ETOH

C. **Trauma Consult (Evaluation):**

1. The attending trauma surgeon and/or 4<sup>th</sup> year surgical resident is expected to assess any stable trauma patient not meeting the above criteria but who may require admission or evaluation, within one hour after the trauma consultation is requested.

From 1c.

Pediatric Hypotension:

SBP <60 Term Neonates

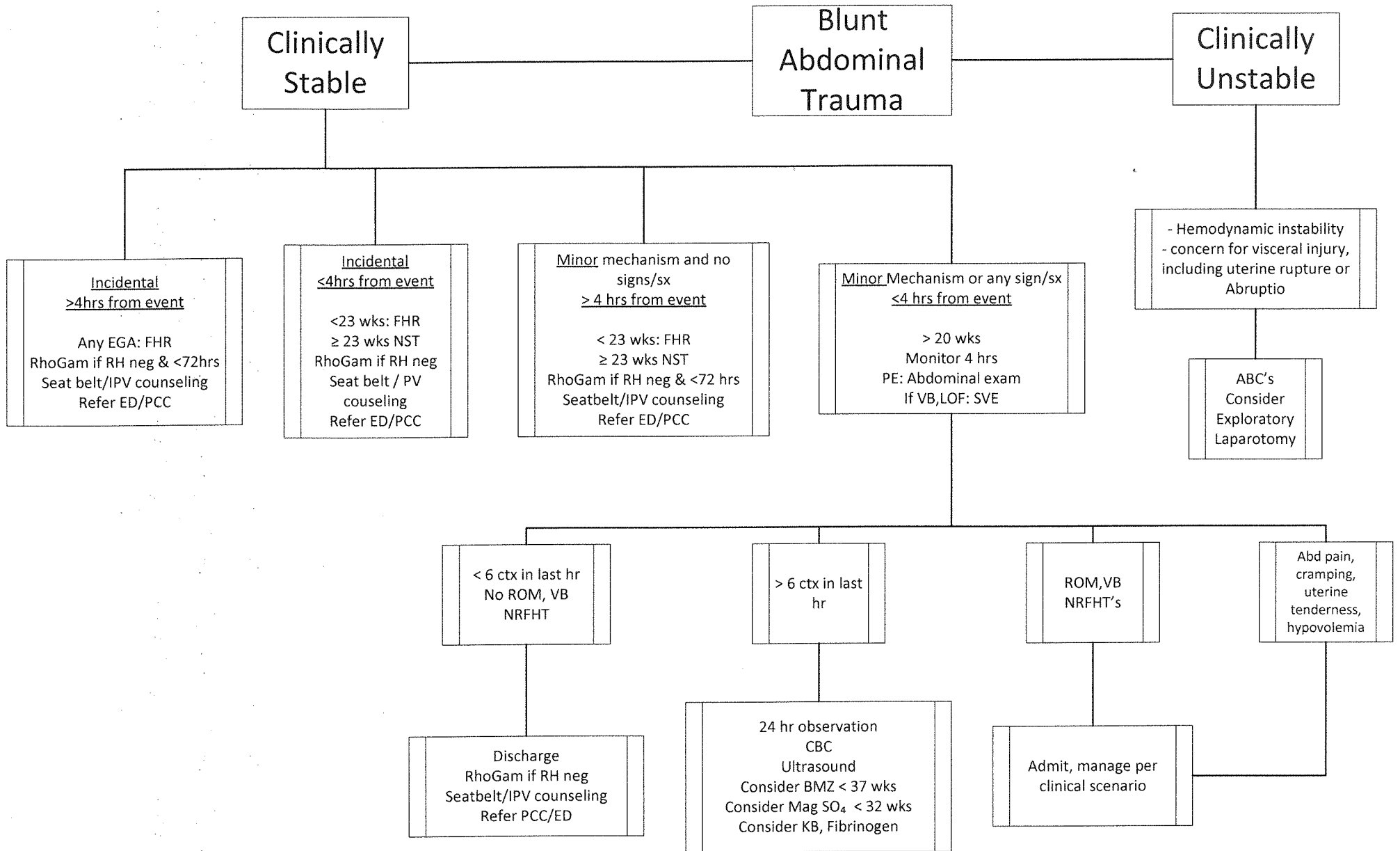
SBP <70 Infants 1-12 months

SBP <70 +2x age Ages 1-10 years

SBP <90 Ages >10 years

Responsibility	Trauma
Written	1997
Approval	Multidisciplinary Trauma QAI Peer Review Committee
Date last reviewed	01/20/2014; June 2014; March 2015; August 2015
Date last revised	01/20/2014; June 2014; March 2015; August 2015
Supersedes	Circular No. ANMC 97-16 & Trauma Response Activation Plan 05/13; Trauma Response Activation Guidelines #2002-02; 05/13; Trauma Response Activation Criteria #TR2009-01; March 2015

Figure 1



Clinically Stable

Blunt Abdominal Trauma

Clinically Unstable

Incidental  
>4hrs from event  
Any EGA: FHR  
RhoGam if RH neg & <72hrs  
Seat belt/IPV counseling  
Refer ED/PCC

Incidental  
<4hrs from event  
<23 wks: FHR  
≥ 23 wks NST  
RhoGam if RH neg  
Seat belt / PV  
counseling  
Refer ED/PCC

Minor mechanism and no  
signs/sx  
> 4 hrs from event  
< 23 wks: FHR  
≥ 23 wks NST  
RhoGam if RH neg & <72 hrs  
Seatbelt/IPV counseling  
Refer ED/PCC

Minor Mechanism or any sign/sx  
<4 hrs from event  
> 20 wks  
Monitor 4 hrs  
PE: Abdominal exam  
If VB, LOF: SVE

- Hemodynamic instability  
- concern for visceral injury,  
including uterine rupture or  
Abruptio

ABC's  
Consider  
Exploratory  
Laparotomy

< 6 ctx in last hr  
No ROM, VB  
NRFHT

> 6 ctx in last  
hr

ROM,VB  
NRFHT's

Abd pain,  
cramping,  
uterine  
tenderness,  
hypovolemia

Discharge  
RhoGam if RH neg  
Seatbelt/IPV counseling  
Refer PCC/ED

24 hr observation  
CBC  
Ultrasound  
Consider BMZ < 37 wks  
Consider Mag SO<sub>4</sub> < 32 wks  
Consider KB, Fibrinogen

Admit, manage per  
clinical scenario