TRAUMA - MANAGEMENT OF THE PREGNANT TRAUMA PATIENT - SGH

Cross references (including NSW Health/ SESIAHS policy directives)	Nil
1. What it is	Evidence-based recommendations for the management of pregnant trauma patients.
2. Employees it applies to	Emergency Department (ED) Medical personnel, Surgical and Obstetric Registrars and Midwives.
3. When to use it	When managing pregnant trauma patients
4. Why the rule is necessary	Pregnancy leads to a number of physiological changes which impact on the response of the woman to traumatic injury. This Business rule aims to maximise the outcomes for both the pregnant patient and the foetus after trauma.
5. Who is responsible	Director of Trauma, SGH

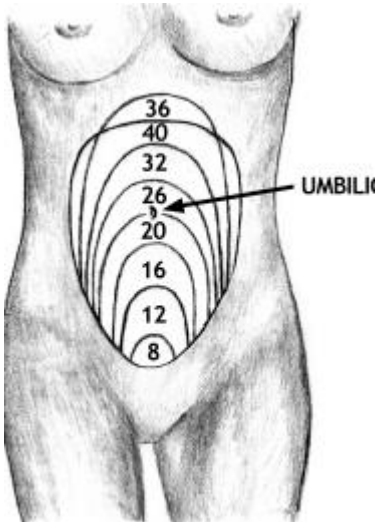
6. Process

6.1 Major trauma in pregnancy is seen relatively infrequently and therefore it is difficult to gain experience in the management of the pregnant trauma patient. Nonetheless trauma is the commonest non-obstetric cause of death in pregnancy. It is important to remember that the lives of two patients, the woman and the foetus, may be at risk.

6.2 Pregnancy causes major physiological changes to the woman and these may mask the effects of trauma. It is essential to know these changes to avoid pitfalls in managing the pregnant trauma patient.

Physiological changes in pregnancy	**Table 1. Cardiovascular Alterations During Pregnancy**
	Physiology • Decreased systemic vascular resistance • Increased intravascular volume and venous hypertension • Increased heart rate and cardiac output • Vena caval compression with supine position in advanced pregnancy • Uterine artery vasoconstriction with volume loss or supine hypotensive syndrome **Clinical correlations** • Despite shock, skin may remain warm and dry, not cool and clammy • Brisk retroperitoneal and lower-extremity haemorrhage after injury • Supine hypotensive syndrome

	Table 2. Pulmonary Alterations During Pregnancy **Physiology** • Elevated diaphragm • Decreased functional residual capacity • Increased minute ventilation • Partially compensated respiratory alkalosis, pCO2 27-32 • mmHg, pH 7.40-7.45 • Depleted bicarbonate, 17-22 mEq/L **Clinical correlations** • Potential for inadvertent intra-abdominal chest tube placement • Tendency for rapid maternal and fetal hypoxia • Rapid desaturation during supine position and during intubation • Limited buffering capacity in the setting of shock
	Table 3. Haematologic/Laboratory Alterations During Pregnancy **Physiology** • Physiologic anaemia, haemoglobin 10-12 mg/dL • Leukocytosis, WBC count 12,000-25,000 • Slight decrease in platelet count • Fibrinogen doubled at term **Clinical correlations** • Potential to incorrectly attribute anaemia to blood loss • White cell dysfunction, susceptibility to infection • Increased risk of thromboembolic disease
	Table 4. Gastrointestinal Alterations During Pregnancy **Physiology** • Decreased gastric motility and emptying • Bowel displaced cephalad in third trimester • Stretching of abdominal wall musculature and peritoneum • Bladder displaced from bony pelvis **Clinical correlations** • Increased risk of aspiration • Increased risk of bowel injury with upper abdominal trauma • Decreased sensitivity of abdominal examination • Increased risk of bladder injury

	Figure 1. Uterine Size Based On Weeks Of Gestation 
Treatment priorities	Priorities for treatment remain the same in the pregnant trauma patient despite the presence of the foetus. Primary survey should be conducted according to EMST/ATLS principles i.e. ABCDE. It should be remembered that the principal cause of foetal death after trauma is maternal death and foetal mortality can be 2-3 times greater than maternal mortality after major trauma. Furthermore the emergency physician must be concerned about foetal distress in women who have suffered seemingly minor injuries—especially if the child is old enough to survive outside of the uterus. Fortunately, foetal demise occurs in fewer than 5% of women who experience minor trauma. All women of child-bearing age who suffer trauma should be asked about the possibility of pregnancy. If there is uncertainty a urine pregnancy test should be performed. In managing pregnant major trauma the team should include an emergency physician, trauma surgeon, obstetrician, neonatologist, midwives and emergency nurses. **<u>Maternal Primary Survey</u>** A – Decreased FRC and increased risk of aspiration Simple manoeuvres such as chin lift/jaw thrust if airway Compromised – remember C-spine protection Pre-oxygenate if intubation required, cricoid pressure Have “difficult airway” trolley close by due to higher incidence in pregnancy B – Open technique for intercostal catheter placement in the THIRD or FOURTH intercostal space i.e. *ONE OR TWO INTERCOSTAL SPACES HIGHER THAN NORMAL* C – Stop obvious haemorrhage – remember PV examination In late pregnancy avoid supine hypotension by placing the mother in the left lateral position. If concern exists about spinal injury manual displacement of the gravid uterus will minimise compression of the IVC.

	Commence cardiotocographic monitoring or assess foetal heart rate if CTG not yet available - Remember that the first signs of haemodynamic compromise in the mother may be foetal distress. Normal foetal heart rate is 120 – 160bpm. Rates above or below this indicate distress. By the time tachycardia or hypotension occur the woman has had a catastrophic haemorrhage. Damage control resuscitation in the unstable patient 2 large bore cannulae, use Hartmann's/Ringer's lactate but limit crystalloid infusion. Commence massive transfusion protocol where appropriate – use Rh compatible or O negative blood to avoid Rhesus sensitisation If the patient is unstable and an abdominal source of bleeding needs to be excluded rapidly FAST (Focussed Assessment Sonography in Trauma) is useful but advanced pregnancy may make interpretation difficult. Diagnostic Peritoneal Aspirate or Lavage (DPA/DPL) can be utilised even in late pregnancy but an open technique in a supraumbilical approach must be used. D – AVPU/GCS – comatose pregnant patients may still deliver a viable infant therefore should receive rigorous support. Beware of ascribing seizure activity to head injury – "Is this pre-eclampsia, did this precipitate the trauma?" E – Expose and examine the patient with specific attention to the presence of bruising on the back or abdomen, PV and perineal exam, logroll.
	Secondary Survey Proceed as per EMST guidelines. Beware the "benign abdomen" in the setting of blunt abdominal trauma as the peritoneum is less sensitive to irritation in the second trimester. Assess for pelvic pain and instability if not already done as part of the primary survey. Assess for uterine irritability.
Fatal Assessment	Once maternal primary and secondary surveys are complete proceed with foetal assessment via CTG if not already commenced.
Diagnostic studies	**Table 5.** Useful Laboratory Tests In Obstetric Trauma. Urine pregnancy test Always test women of childbearing potential (unless there are foetal heart tones) Hematocrit Stat and serial levels should be used in the multiple trauma victim Rh type Draw in all victims of major and minor trauma if greater than four weeks' gestation Acid-base status Measurement of serum bicarbonate, lactate, or base deficit is a useful and sensitive indicator of occult shock Kleihauer-Betke test Not useful in Rh-+ve women and not predictive of pregnancy complications

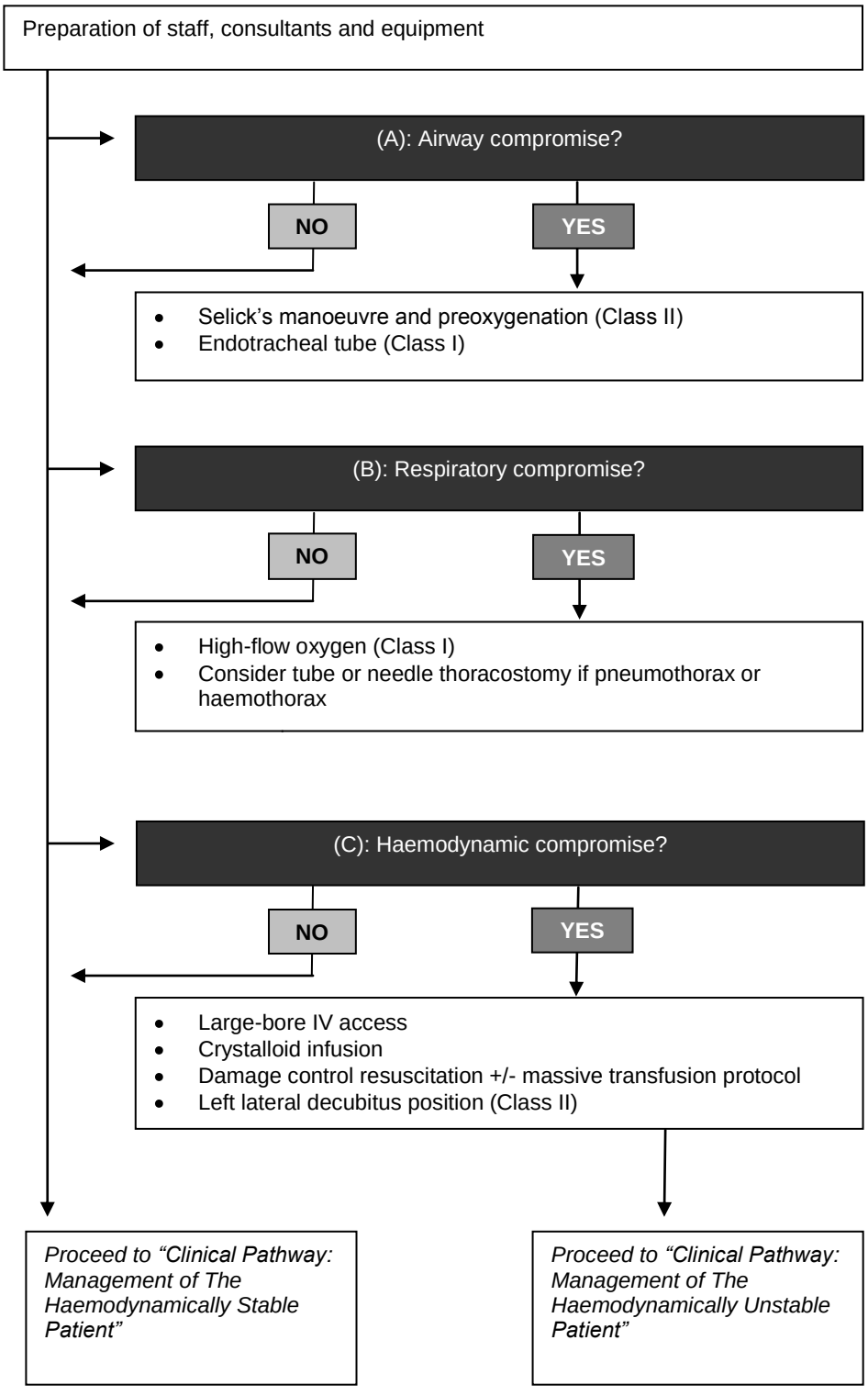
	or foetal distress. Occasionally helpful in determining proper dose of RhoGAM in Rh-negative women at risk for massive maternal-foetal haemorrhage Coagulation studies May be helpful in severely injured patients
Radiology	Always order indicated radiographic studies. The adverse effects of radiologic imaging are smaller than commonly held belief. The cumulative dose of 5 rads has been offered as the threshold exposure for increased foetal risk. This is a conservative estimate, and no single plain radiographic study even approaches this level (SeeTable 6). Use the ALARA (As Low As Reasonably Achievable) principle but do not compromise the care of the mother due to concerns regarding risk to the foetus. Computed Tomography CT can identify hemoperitoneum and characterize solid organ injury in the stable or meta-stable (not haemodynamically normal but not deteriorating) pregnant patient. If the primary concern is injury to the liver or spleen, scan only the upper abdomen, and shield the uterus to limit fatal exposure to 2-3 rads. This will identify most cases of hemoperitoneum. With inclusion of the pelvis, the exposure increases to a concerning 3-9 rads. Therefore, if there is no pelvic pain and no instability and/or a normal plain pelvic x-ray, the likelihood of the pelvis being the source of haemorrhage is virtually zero. CT to evaluate the head or chest delivers less than 0.05 rad even to the unshielded abdomen. Contrast enhancement (category B) is known to cross the placenta but is not mutagenic or teratogenic in animals; no human trials have been performed. Often the question to ask is: “Will CT provide the information unobtainable from the physical examination or other diagnostic modalities?” The following factors need to taken into account in answering this question: 1. the decreased sensitivity of the clinical abdominal examination in pregnancy 2. the trend toward non-operative management of selected injuries 3. evidence that CT may detect placental abnormalities (avascular regions or abruption) undetected by ultrasound that might lead to foetal distress or demise

Table 6. Estimated Fetal Exposure For Various Diagnostic Imaging Methods.

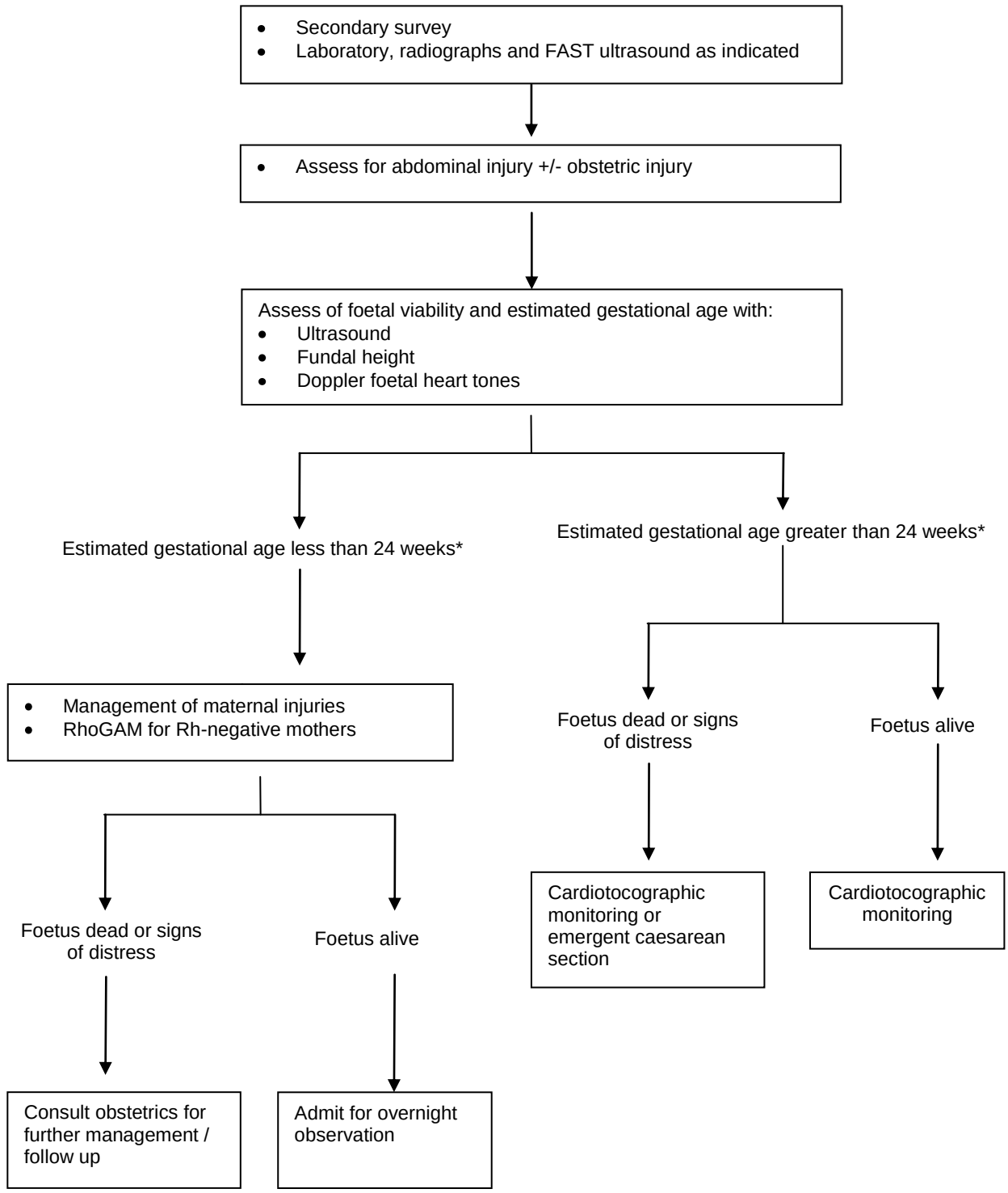
Examination type	Estimated fetal dose per examination (in rads)	Number of examinations required for a cumulative 5 rad dose
Plain Films		
Skull	0.004	1250
Dental	0.0001	50,000
Cervical spine	0.002	2500
Upper or lower extremity	0.001	5000
Chest (2 views)	0.00007	71,429
Abdominal (multiple views)	0.245	20
Thoracic spine	0.009	555
Lumbosacral spine	0.359	13
Pelvis	0.040	125
Hip (single view)	0.213	23
CT scans (slice thickness: 10 mm)		
Head (10 slices)	<0.050	>100
Chest (10 slices)	<0.100	>50
Abdomen (10 slices)	2.600	1
Lumbar spine (multiple views)	3.500	1
Fluoroscopic studies		
Upper GI series	0.056	89
Barium swallow	0.006	833
Barium enema	3.986	1
Nuclear medicine studies		
Ventilation-perfusion scan	0.215	23
Perfusion: technetium	0.175	28
Ventilation: xenon	0.040	125
Environmental (for comparison)		
Environmental background radiation (cumulative dose over 9 months)	0.100	N/A

Clinical Pathway: Initial Management of Obstetric Trauma

Emergency Department

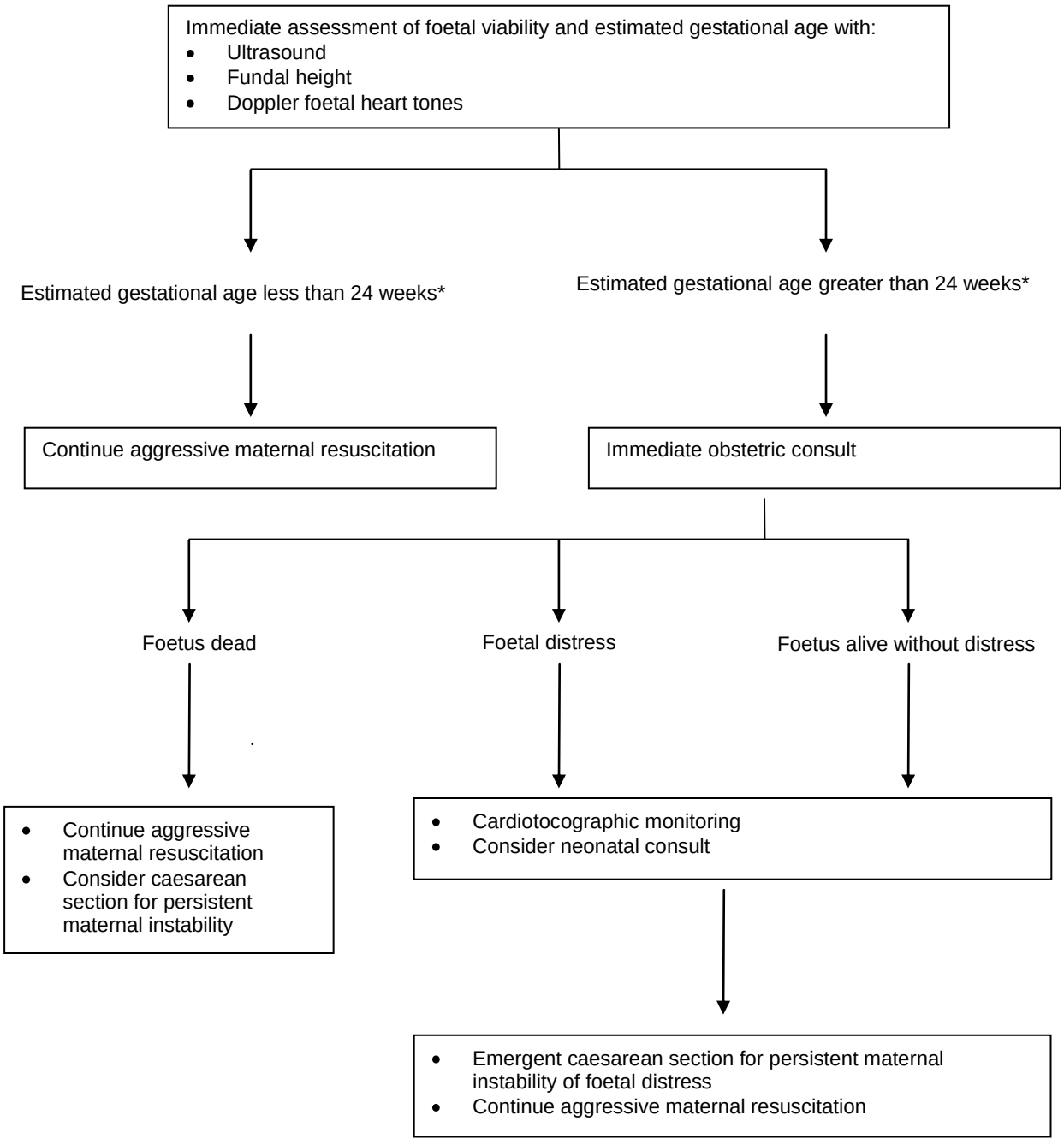


Clinical Pathway: Management of The Haemodynamically Stable Patient



* Caveat: When a precise gestational age is unobtainable (i.e., severe trauma, no prior ultrasound dating, or lack of accurate records), it is wise to use a conservative age of viability – 20 weeks.

Clinical Pathway: Management of The Haemodynamically Unstable Patient



* Caveat: When a precise gestational age is unobtainable (i.e., severe trauma, no prior ultrasound dating, or lack of accurate records), it is wise to use a conservative age of viability – 20 weeks.

7. Compliance evaluation	• The SGH Trauma Service has 7 day a week coverage and routinely assesses all trauma patient admissions for QA factors. • Compliance with this ClBR will be evaluated through routine trauma patient rounds.
8. External references	1. Hanley M, Thompson C. Trauma in Pregnancy: Double Jeopardy. Emerg Med Practice 2003 Jan;5(1):4-28 2. Esposito TJ. Trauma during pregnancy. Emerg Med Clin North Am 1994 Feb;12(1):167-199. 3. Obstetric aspects of trauma management. Number 251, September 1998 American College of Obstetricians and Gynecologists. J Gynaecol Obstet 1999 Jan;64(1):87-94 3. Mossman KL, Hill LT. Radiation risks in pregnancy. *Obstet Gynecol* 1982 Aug;60(2):237-242. 4. Lowdermilk C, Gavant ML, Qaisi W, et al. Screening helical CT for evaluation of blunt traumatic injury in the pregnant patient. *Radiographics* 1999 Oct;19 Spec No:S243-S255; discussion S256-S258.

I, *Mary Langcake, Director of Trauma Services* of *St George Hospital* attest that this business rule is not in contravention of any legislation, industrial award or policy directive.

Revision and approval history

Date	Revision number	Contact Officer (Position)	Date for revision
June 2011	0	T. Wiseman, CNC Trauma, SGH	June 2014