Management of trauma in pregnancy

Shane Curran
Whats New in Management of the pregnant trauma patient?

- Not a lot it seems
- Systems based multidisciplinary management
- Research into extent of problem
Systems based

- Whole of system
- Australian Jurisdictions
  - Queensland
  - Western Australia
  - Victoria
1. Key Messages

The Victorian State Trauma System provides support and retrieval services for critically injured patients requiring definitive care, transfer and management via the Specialist Trauma Transfer Guidelines. This guideline provides evidence-based advice on the delivery and transfer of major trauma patients who present with obstetric trauma to Adult Major Trauma Centres.

This guideline is intended for use by the clinical staff that provide early care for major trauma patients outside of major trauma centres, however access to this resource is not restricted to any one group. These obstetric trauma management guidelines provide up-to-date information for front line health care providers. They include:

1. Key Messages
2. Background Information
3. Early Activation
4. Primary Survey
5. Secondary Survey
6. Planning and Communication
7. Early Management
8. Cluster and Transport
9. Transport and retrieval
10. Recognition

These guidelines align with the Victorianinterhospital Major Trauma Transfer Guidelines. They provide the same with evidence-based advice and uniformly provide early care for the critically injured patient. The guideline has been assessed using the AROM framework for patient safety and is approved by the Victorian State Trauma Committee.

Clinical Challenge Scenario:

An 8 week pregnant woman presents with multiple injuries following a traffic accident. She is hypotensive and tachycardic. Obstetric management is essential in this scenario.

State Trauma Guidelines for the Management of Injured Pregnant Women

IMPORTANT PLEASE READ THIS FIRST:

All Patients with Major Trauma or the potential for major trauma should be transferred to the Adult Major Trauma Centre. If the patient's condition is immediately life-threatening, resuscitate and stabilize according to EMST principles prior to transfer.

Initial treatment and imaging priorities in the pregnant trauma patient are the same as for the non-pregnant patient.

*Refer to Section 7 for Trauma Team Activation Criteria

Section 1: Notification Procedures

1. The most appropriate senior clinician in your medical facility should be notified as soon as possible.

2. If you do not have access to local Obstetric expertise, contact the on-call obstetric consultation.

3. Activation of transfer processes, if required, should be initiated as early as possible. The RTDS should be activated via the established process, utilizing the single 1800 number: 1800 629 888.

4. If necessary, the KEMH Obstetric Consultant will contact the on-call Obstetrician and ring the KEMH Hospital Manager to arrange interhospital support via switchboard 9346 2220, paper 3339. A conference call may be useful to facilitate a three-way conversation, if necessary.

5. The Newborn Emergency Transport Service WA (NETS WA) is a statewide retrieval service for sick newborns or patient transfers, and consists of 2 teams of neonatal-trained doctors and nurses.

6. Major Trauma Service (RTDS) via switchboard 9234 2244 Trauma Fellow (Page 18).

Delivering a Healthy WA
Demographics

- First report in 1600’s (Pare, gunshot wound)
- Complicates up to 7% of all pregnancies
- Admission rate 4/1000
- Foetal mortality is 61-80% with maternal shock
- Over 50% trauma in third trimester
Demographics

- Leading cause non obstetric maternal deaths
  - MVA 49%
  - Falls 25%
  - Assaults 18%
  - guns 4%
Falls in pregnancy

- 75% have a fall during their pregnancy
- 25% of patients fall or slip in final trimester
  - altered centre of gravity
- Being pregnant is an independent risk factor for worse outcome with orthopaedic injuries
- Being pregnant does not stop you being investigated properly
Intimate partner violence

Of women who experienced partner violence since the age of 15, some 36 per cent reported experiencing violence from a previous partner during pregnancy;
18 per cent experienced domestic violence for the first time while they were pregnant.
Some 15 per cent reported experiencing violence from a current partner during pregnancy;
eight per cent for the first time
Trauma by trimester

- First trimester
  - Pregnancy mainly intrapelvic
- Second trimester
- Third trimester
  - Where most of the talks are
Physiological changes in pregnancy

An understanding of the anatomic and physiologic alterations of pregnancy is essential. Refer to Appendix C for normal pregnancy values.

### Table 2: Physiological and physical changes in pregnancy

<table>
<thead>
<tr>
<th>Changes in pregnancy</th>
<th>Implication</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Cardiovascular system</strong></td>
<td></td>
</tr>
<tr>
<td>Plasma volume</td>
<td>Increased by up to 10%</td>
</tr>
<tr>
<td>Heart rate</td>
<td>Increased up to 20 bpm</td>
</tr>
<tr>
<td>Cardiac output</td>
<td>Increased by 40%</td>
</tr>
<tr>
<td>Uterine blood flow</td>
<td>Increased</td>
</tr>
<tr>
<td><strong>Respiratory system</strong></td>
<td></td>
</tr>
<tr>
<td>Respiratory rate</td>
<td>Increased</td>
</tr>
<tr>
<td>Oxygen consumption</td>
<td>Increased by 30%</td>
</tr>
<tr>
<td>Arterial PO2</td>
<td>Decreased</td>
</tr>
<tr>
<td><strong>Urine</strong></td>
<td></td>
</tr>
<tr>
<td>Uterine blood flow</td>
<td>Increased</td>
</tr>
<tr>
<td><strong>Other changes</strong></td>
<td></td>
</tr>
<tr>
<td>Gastric motility</td>
<td>Decreased</td>
</tr>
<tr>
<td><strong>Pelvic examination</strong></td>
<td></td>
</tr>
<tr>
<td>Pelvic examination</td>
<td>Increased</td>
</tr>
<tr>
<td><strong>Bladder</strong></td>
<td></td>
</tr>
<tr>
<td>Anterior and superior displacement by uterus</td>
<td></td>
</tr>
<tr>
<td><strong>Renal blood flow</strong></td>
<td></td>
</tr>
<tr>
<td>Increased by 60%</td>
<td></td>
</tr>
</tbody>
</table>

**Appendix C: Haemodynamic and laboratory values in pregnancy**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Reference Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>White Blood Cells (WBC)</td>
<td>5.0-10.0 x 10^9/L</td>
</tr>
<tr>
<td>Neutrophils</td>
<td>2.0-7.5 x 10^9/L</td>
</tr>
<tr>
<td>Lymphocytes</td>
<td>0.4-1.2 x 10^9/L</td>
</tr>
<tr>
<td>Platelets</td>
<td>150-400 x 10^9/L</td>
</tr>
<tr>
<td>Hb</td>
<td>12.5-16.5 g/dL</td>
</tr>
<tr>
<td>Hct</td>
<td>35%-45%</td>
</tr>
<tr>
<td>Mean Cell Hemooglobin (MCH)</td>
<td>32-36 pg</td>
</tr>
<tr>
<td>Mean Cell Hemooglobin Concentration (MCHC)</td>
<td>32-36 g/dL</td>
</tr>
<tr>
<td>Erythrocyte Sedimentation Rate (ESR)</td>
<td>1-20 mm/h</td>
</tr>
</tbody>
</table>

*Refer to online version, destroy printed copies after use.*
<table>
<thead>
<tr>
<th>Cardiovascular system</th>
<th>Changes in pregnancy</th>
<th>Implication</th>
</tr>
</thead>
</table>
| Plasma volume         | Increased by up to 50% | Dilutional anaemia  
Reduced oxygen-carrying capacity  
Signs of shock due to blood loss appear late |
| Heart rate            | Increased 15–20 bpm    | Increased CPR demands |
| Cardiac output        | Increased by 40%  
Significantly reduced by pressure of gravid uterus on IVC | Increased CPR demands |
| Uterine blood flow    | 10% of cardiac output at term | Potential for rapid massive haemorrhage |
| Systemic vascular resistance | Decreased | Sequesters blood during CPR |
| Arterial blood pressure (BP) | Decreased by 10–15 mmHg | Decreased reserve |
| Venous return         | Decreased by pressure of gravid uterus on inferior vena cava (IVC) | Increased CPR circulation demands  
Increased reserve |
| Coagulation           | Increased concentrations of most clotting factors | Activated state of coagulation cascade  
Increased tendency for thrombosis |
<table>
<thead>
<tr>
<th><strong>Respiratory system</strong></th>
<th><strong>Increased</strong></th>
<th><strong>Decreased buffering capacity, acidosis more likely</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Respiratory rate</td>
<td>Increased</td>
<td></td>
</tr>
<tr>
<td>Oxygen consumption</td>
<td>Increased by 20%</td>
<td>Hypoxia develops more quickly</td>
</tr>
<tr>
<td>Residual capacity</td>
<td>Decreased by 25%</td>
<td>Decreased buffering capacity, acidosis more likely</td>
</tr>
<tr>
<td>Arterial pCO₂</td>
<td>Decreased</td>
<td>Decreased buffering capacity, acidosis more likely</td>
</tr>
<tr>
<td>Laryngeal oedema</td>
<td>Increased</td>
<td>Difficult intubation</td>
</tr>
<tr>
<td>Mucosal congestion</td>
<td>Increased</td>
<td>Predisposition to airway bleeding</td>
</tr>
<tr>
<td>Other changes</td>
<td>Decreased</td>
<td>Increased risk of aspiration</td>
</tr>
<tr>
<td>-------------------------------------</td>
<td>-----------</td>
<td>-----------------------------</td>
</tr>
<tr>
<td>Gastric motility</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lower oesophageal sphincter</td>
<td>Relaxed</td>
<td></td>
</tr>
<tr>
<td>Uterus</td>
<td>Enlarged</td>
<td>Diaphragmatic splinting reduces residual capacity and makes ventilation more difficult. Aortal compression causes supine hypotension, reduced venous return and significantly impairs CPR. Heart rotation to the left – left axis deviation on ECG can be normal in 3rd trimester.</td>
</tr>
<tr>
<td>Weight</td>
<td>Increased neck and mammary fat levels</td>
<td>Difficult airway management</td>
</tr>
<tr>
<td>Pelvic vasculature</td>
<td>Hypertrophied</td>
<td>Potential for massive retroperitoneal haemorrhage with pelvic fracture, uterine trauma.</td>
</tr>
<tr>
<td>Bowel</td>
<td>Superior displacement</td>
<td>Potential for complex and multiple intestinal injuries with penetrating trauma of the upper abdomen.</td>
</tr>
<tr>
<td>Bladder</td>
<td>Anterior and superior displacement by uterus</td>
<td>Susceptible to injury as effectively an intra-abdominal organ.</td>
</tr>
<tr>
<td>Renal blood flow</td>
<td>Increased by 60%. Serum urea, nitrogen, creatinine reduced</td>
<td>‘Normal’ serum urea nitrogen and creatinine may reflect seriously compromised function.</td>
</tr>
</tbody>
</table>

Overall principles

<table>
<thead>
<tr>
<th>Principles of care for the pregnant trauma patient</th>
</tr>
</thead>
<tbody>
<tr>
<td>Follow ATLS guidelines</td>
</tr>
<tr>
<td>First priority is to treat the woman</td>
</tr>
<tr>
<td>Multidisciplinary team that includes an obstetrician is essential</td>
</tr>
<tr>
<td>Contact neonatal team early if birth imminent/likely</td>
</tr>
<tr>
<td>Recognise anatomical and physiological changes of pregnancy</td>
</tr>
<tr>
<td>Clear, coordinated and frequent communication essential</td>
</tr>
<tr>
<td>Generally, medications, treatment and procedures as for non-pregnant patient</td>
</tr>
<tr>
<td>Refer pregnant women with major trauma to a trauma centre</td>
</tr>
<tr>
<td>&lt; 20 weeks gestation: to the nearest trauma centre</td>
</tr>
<tr>
<td>≥ 20 weeks gestation: to a trauma centre with obstetric services</td>
</tr>
<tr>
<td>Thoroughly assess all pregnant women – even after minor trauma</td>
</tr>
</tbody>
</table>

Queensland Clinical Guideline: Trauma in pregnancy

Flow Chart: Initial assessment and management of the pregnant trauma patient
Principles of care for the pregnant trauma patient

- Follow ATLS guidelines
- First priority is to treat the woman
- Multidisciplinary team that includes an obstetrician is essential
  - Contact neonatal team early if birth imminent/likely
  - Recognise anatomical and physiological changes of pregnancy
  - Clear, coordinated and frequent communication essential
- Generally, medications, treatments and procedures as for non-pregnant patient
- Refer pregnant women with major trauma to a trauma centre
  - < 20 weeks gestation: to the nearest trauma centre
  - ≥ 20 weeks gestation: to a trauma centre with obstetric services
- Thoroughly assess all pregnant women – even after minor trauma

Initial stabilisation

- As indicated for all trauma patients
- Follow ATLS guidelines
- Initiate early obstetric consultation
- Contact GCC (1300 799 127) to expedite transport & identify receiving facility as required
- Additionally for pregnancy
  - Position (sit or wedge):
    - Left lateral 15-30° (right side up) or
    - Manual displacement of uterus
    - Place wedge under spinal board if necessary
  - Routinely administer Oxygen therapy
  - Large-bore IV access
  - Volume resuscitation (Crystallloid infusion)

Airway compromise?

- Early ETT intubation
  - Pre-oxygenation
  - Consider orogastric tube
  - Consider smaller ETT
  - Insert orogastric tube

Respiratory compromise?

- High-flow Oxygen 100%
  - Consider tube thoracostomy in 3rd or 4th rib space if pneumothorax or haemothorax

Cardiac arrest

- Follow ATLS guidelines
- Defibrillate as for non-pregnant patient
- Advanced cardiac life support drugs as indicated for non-pregnant patients
- Perimortem C/S if
  - ≥ 20 weeks gestation
  - No response to effective CPR after 4 minutes

Haemodynamic compromise?

- Control obvious haemorrhage
  - 2 large-bore IV access
  - Recognise occult bleeding
  - Commence Crystalloid infusion
  - Assess response
  - Avoid volumes > 2 L
  - PAST
  - Consider Massive Transfusion Protocol (MTP) activation
  - Rapid transfer to OT

Proceed to flowchart
Secondary assessment and management of pregnant trauma patient
**Initial Stabilisation**
- As indicated for all trauma patients
- Follow ATLS guidelines
- Initiate early obstetric consultation
- Contact QCC (1300 799 127) to expedite transport & identify receiving facility as required
- **Additionally for pregnancy**
  - Position (sitting or wedge)
    - Left lateral 15-30° (right side up) or
    - Manual displacement of uterus
    - Place wedge under spinal board if necessary
  - Routinely administer Oxygen therapy
  - Large-bore IV access
  - Volume resuscitation (Crystalloid infusion)

**Airway Compromise?**
- Yes
  - Early ETT intubation
    - Pre-oxygenation
    - Consider orotracheal pressure
    - Consider smaller ETT
    - Insert oesophageal tube
- No

**Respiratory Compromise?**
- Yes
  - High-flow Oxygen 100%
    - Consider tube thoracostomy in 3rd or 4th rib space if pneumothorax or haemothorax
- No

**Haemodynamic Compromise?**
- Yes
  - Control obvious haemorrhage
    - 2 x large-bore IV access
    - Recognise occult bleeding
    - Commence Crystalloid infusion
      - Assess response
      - Avoid volumes > 2 L
    - FAST
    - Consider Massive Transfusion Protocol (MTP) activation
    - Rapid transfer to OT
- No

**Cardiac arrest**
- Follow ATLS guidelines
- Defibrillate as for non-pregnant patient
- Advanced cardiac life support drugs as indicated for non-pregnant patients
- Perimortem CS if:
  - ≥ 20 weeks gestation
  - No response to effective CPR after 4 minutes

**Proceed to flowchart: Secondary assessment and management of pregnant trauma patient**
Flow Chart: Secondary assessment and management of the pregnant trauma patient.

- **Secondary survey**
  - For non-pregnant patient and
  - Consult obstetric team
  - Maintain high index of suspicion for occult shock and abdominal injury
  - Maintain position (tilt or wedge)/left lateral 15-30° (right side up) or
  - Manual displacement of uterus
  - Wedge spinal board if required
  - Obtain obstetric history
  - Gestation
  - Estimated date of delivery
  - Pregnancy complications
  - Physical examination
  - Assess uterus
    - Tone, rigidity, tenderness
    - Contraction
    - Estimate gestational age
    - Fetal heart
    - US
    - If uncertain (i.e., severe trauma, no prior US or lack of accurate records)
    - Presume viability
    - Assess and record FHR
    - Other criteria or
    - Other criteria

Consider - especially for major trauma
- Racial examination
- Pelvic exam (obstetric team)
  - Sterile speculum
  - Assess for rupture of membranes, vaginal bleeding, cervical effacement and dilation, cord prolapse, fetal presentation
  - Imaging
    - FAST ultrasound
    - Formal obstetric ultrasound
    - Other radiographs
  - Blood tests
    - Standard trauma bloods
    - Group and Antibody screen
    - Kleihauer Test if Rh D negative and all women if major trauma (EDTA tube)
    - Consider Coag Profile (major trauma)
  - If Rh D negative and > 12 weeks gestation, administer Rh D immunoglobulin (but do not delay definitive care to do this)

- **Gestation > 24 weeks?**
  - Yes or uncertain
    - CTG
      - Application and interpretation by experienced obstetric team member
      - Interpret with caution at < 20 weeks
      - Monitor uterine activity

  - Maternal or fetal compromise?
    - Yes
      - Consider discharge criteria
        - Obstetric team consulted/agree for discharge
        - Reassuring maternal status
        - No vaginal bleeding
        - Normal CTG/FHR (minimum 4 hours CTG)
        - Interpret CTG with caution at < 20 weeks
        - No contractions
        - No blood results reviewed
        - Rh immunoglobulin given if required
        - Social worker referral offered
    - No
      - Consider discharge criteria

- **Discharge criteria met?**
  - Yes
    - Admit
      - Assess for:
        - Placental abruption
        - Feto-maternal haemorrhage
        - Uterine rupture
        - Postpartum labour
        - DIC
        - Continuous CTG if > 24 weeks gestation
        - Intervene as appropriate
        - Consider emergency C-section
  - No
Secondary survey
As for non-pregnant patient AND
- Consult obstetric team
- Maintain high index of suspicion for occult shock and abdominal injury
- Maintain position (tilt or wedge) left lateral 15-30° (right side up) or
  o Manual displacement of uterus
  o Wedge spinal board if required
- Obtain obstetric history
  o Gestation
  o Estimated date of delivery
  o Pregnancy complications
- Physical examination
- Assess uterus
  o Tone, rigidity, tenderness
  o Contractions
- Estimate gestational age
  o Fundal height
  o US
  o If uncertain (i.e. severe trauma, no prior US or lack of accurate records) presume viability
- Assess and record FHR
  o Stethoscope or
  o Doppler

Decision making of the pregnant trauma patient.

Gestation > 24 weeks?
- Yes or uncertain
  o CTG
    - Application and interpretation by experienced obstetric team member
    - Interpret with caution at < 28 weeks
    - Monitor uterine activity

Maternal or fetal compromise?
- Yes
  o Discharge criteria?
    o Maternal and fetal compromise
      o Discharge criteria met?
        o Admit
          + Assess for: Placental abruption Feto-maternal haemorrhage Uterine rupture Preterm labour DIC Continuous CTG if > 24 weeks gestation
          + Intervene as appropriate
          + Consider emergency C/D
        o No
          + Discharge criteria met?
            o Yes
              o Discharge criteria met?
                o Yes
                  + Discharge criteria met?
                    o Yes
                      o Discharge criteria met?
                        o Yes
                          o Discharge criteria met?
                            o Yes
                              o Discharge criteria met?
                                o Yes
                                  o Discharge criteria met?
                                    o Yes
                                      o Discharge criteria met?
                                        o Yes
                                          o Discharge criteria met?
                                            o Yes
                                              o Discharge criteria met?
                                                o Yes
                                                  o Discharge criteria met?
                                                    o Yes
                                                      o Discharge criteria met?
                                                        o Yes
                                                          o Discharge criteria met?
                                                            o Yes
                                                              o Discharge criteria met?
                                                                o Yes
                                                                  o Discharge criteria met?
                                                                    o No
                                                                      o Discharge criteria met?
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                                                                                                  o Discharge criteria met?
                                                                                                  o No
                                                                                                      o Discharge criteria met?
                                                                                                      o No
                                                                                                          o Discharge criteria met?
                                                                                                          o No
                                                                                                              o Discharge criteria met?
                                                                                                              o No
Consider - especially for major trauma

- Rectal examination
- Pelvic exam (obstetric team)
  o Sterile speculum
  o Assess for rupture of membranes, vaginal bleeding, cervical effacement and dilation, cord prolapse, fetal presentation
- Imaging
  o FAST ultrasound
  o Formal obstetric ultrasound
  o Other radiographs
- Blood tests
  o Standard trauma bloods
  o Group and Antibody screen
  o Kleihauer Test if Rh D negative and all women if major trauma (EDTA tube)
  o Consider Coag Profile (major trauma)
- If Rh D negative and ≥ 12 weeks gestation, administer Rh D immunoglobulin (but do not delay definitive care to do so)
Consider discharge criteria
- Obstetric team consulted/agree for discharge
- Reassuring maternal status
- No vaginal loss/bleeding
- Normal CTG/FHR (minimum 4 hours CTG)
  - Interpret CTG with caution at < 28 weeks
- No contractions
- Blood results reviewed
- Rh immunoglobulin given if required
- Social worker referral offered

Discharge criteria met?

Yes
- Advise to seek medical advice if:
  - Signs of preterm labour
  - Abdominal pain
  - Vaginal bleeding or discharge
  - Change in fetal movements
- Advise to inform usual maternity care provider of trauma event

No
- Admit for:
  - Placental abruption
  - Feto-maternal haemorrhage
  - Uterine rupture
  - Preterm labour
  - DIC
  - Continuous CTG if > 24 weeks gestation
  - Intervene as appropriate
  - Consider emergency CS

Discharge
- Advise to seek medical advice if:
  - Signs of preterm labour
  - Abdominal pain
  - Vaginal bleeding or discharge
  - Change in fetal movements
- Advise to inform usual maternity care provider of trauma event
Imaging

- plain films versus CT versus ultrasound
  - CT
    - single scan with contrast better than multiple plain scans
  - Plain Films
    - what's the dose?
    - <1 mSv
  - Ultrasound
    - Solid organ injury, intraperitoneal fluid, gestational age, FHR, foetal activity, foetal presentation, placental location, amniotic fluid volume
### Appendix G: Approximate fetal effective doses (mSv) from common radiological examinations

<table>
<thead>
<tr>
<th>Examination</th>
<th>1st Trimester</th>
<th>3rd Trimester</th>
</tr>
</thead>
<tbody>
<tr>
<td>Conventional radiography</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Skull</td>
<td>&lt;0.01</td>
<td>&lt;0.01</td>
</tr>
<tr>
<td>Chest</td>
<td>&lt;0.01</td>
<td>&lt;0.01</td>
</tr>
<tr>
<td>Cervical spine</td>
<td>&lt;0.01</td>
<td>&lt;0.01</td>
</tr>
<tr>
<td>Thoracic spine</td>
<td>&lt;0.01</td>
<td>&lt;0.01</td>
</tr>
<tr>
<td>Lumbar spine</td>
<td>2</td>
<td>6</td>
</tr>
<tr>
<td>Abdomen</td>
<td>1.5</td>
<td>2.5</td>
</tr>
<tr>
<td>Pelvis</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Intravenous pyleogram (IVP)</td>
<td>2</td>
<td>10</td>
</tr>
<tr>
<td>Extremities</td>
<td>&lt;0.01</td>
<td>&lt;0.01</td>
</tr>
<tr>
<td>Mammography</td>
<td>&lt;0.01</td>
<td>&lt;0.01</td>
</tr>
<tr>
<td>Barium meal</td>
<td>1</td>
<td>6</td>
</tr>
<tr>
<td>Barium enema</td>
<td>7</td>
<td>25</td>
</tr>
<tr>
<td>Computerised Tomography (CT)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Head</td>
<td>&lt;0.005</td>
<td>&lt;0.005</td>
</tr>
<tr>
<td>Neck</td>
<td>&lt;0.005</td>
<td>&lt;0.01</td>
</tr>
<tr>
<td>Chest without portal phase</td>
<td>0.1</td>
<td>0.6</td>
</tr>
<tr>
<td>Chest with portal phase</td>
<td>1</td>
<td>7</td>
</tr>
<tr>
<td>Chest (pulmonary embolism)</td>
<td>0.1</td>
<td>0.4</td>
</tr>
<tr>
<td>Chest/abdomen/pelvis</td>
<td>12</td>
<td>13</td>
</tr>
<tr>
<td>Abdomen/pelvis – single phase</td>
<td>12</td>
<td>12</td>
</tr>
<tr>
<td>Abdomen/pelvis – multiple phase</td>
<td>15</td>
<td>30</td>
</tr>
<tr>
<td>Thoracic spine</td>
<td>0.2</td>
<td>1.0</td>
</tr>
<tr>
<td>Lumbar spine</td>
<td>10</td>
<td>25</td>
</tr>
<tr>
<td>Pelvimetry</td>
<td>–</td>
<td>0.2</td>
</tr>
</tbody>
</table>

*Note: All doses should be treated as indicative only as individual doses can differ from the tabulated values by as much as a factor of 10, except for those examinations remote from the lower abdomen.*

Foeto-maternal haemorrhage

- Occurs in 10-30%
- Quantified by Kleihauer test
  - Negative result <1ml foetal blood
  - Is not a test for placental abruption
- Determines amount of anti D
  - 625 IU anti D protects against 6 ml foetal blood if given within 72 hours
Perimortem Caesarean section

- Is started after CPR has commenced
- Is primarily for mother survival
  - may improve foetal survival
- Should be done within 4-6 minutes of starting unresponsive CPR
- Done in situ
Summary

• Management is a team sport
• The mother comes first
• There are many guidelines out there!
  • Pick one
• They mostly all say the same thing
References


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• http://www.uptodate.com/contents/trauma-in-pregnancy

• http://www.east.org/resources/treatment-guidelines/pregnant-patient,-diagnosis-and-management-of-injury
Practice Management Guidelines for the Diagnosis and Management of Injury in the Pregnant Patient: The EAST Practice Management Guidelines Work Group