PROTOCOLS AND PROCEDURES
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INTRODUCTION

Philosophy:
The Department recognises the value of clear protocols, guidelines and policies (‘protocols’) in a wide range of clinical and administrative situations, for the following reasons:

1. **A superior method**, if one exists, should be followed by all clinicians.
2. **A checklist**, or ‘aide-memoire’, is helpful to avoid embarrassing oversights.
3. **A standard approach** minimises confusion and facilitates continuity of care, even if neither of the above is relevant.

Location of Departmental and other useful ‘protocols’:

i. This Department Protocol Booklet includes a range of ‘protocols’ which can also be found on the hospital network at:

   \[I:\ANA-PER-ICU\Anaesthesia\Information\PROTOCOL\Protocol_Booklet\Current\]

   And on the website of the Cairns Anaesthetists Association at:

   [http://cairnsanaesthesia.org](http://cairnsanaesthesia.org)

ii. APS Guidelines for Prescriptions and Problems, available as hard copy, also at:

   \[I:\ANA-PER-ICU\Anaesthesia\Information\PROTOCOL\APS_Guidelines\]

iii. Orientation Booklet, available as hard copy only

iv. ICU Clinical Practice Guidelines, available as hard copy in ICU; also at:

   \[I:\ANA-PER-ICU\Manuals & Policies\ICU Clinical Guidelines\]

   (‘shortcut to ICU’ icon is on the desktop in ICU)

v. A-Z of Policies, Manuals and Documents on the Cairns Health Service District website, at:

Useful material is available under Anticoagulation Guidelines; Drug Policy Manual (Sections A and B); and Critical Care Drug Guidelines (Sections A-D)
ANAESTHETIC MACHINE CHECK - AESTIVA

This protocol has three levels of testing:

A. **READINESS TEST**
   This is performed immediately before the start of each anaesthetic.

B. **PREOPERATIVE TEST**
   This test confirms that the machine is functional and free of leaks. Any doctor about to use the machine for one or a series of anaesthetics must perform this test, and it is an appropriate check for anaesthetic assistants preparing a theatre for use.

C. **COMPREHENSIVE TEST**
   Make a complete check of the machine. This must be performed weekly on every anaesthetic machine, and on any occasion when a machine is being returned to use after any alterations, repairs or service.

**READINESS TEST**

**Flowmeters**
- Turn oxygen flowmeter to minimum
- Ensure N₂O and Air flowmeters are set to zero

**Vaporiser**
- Ensure the vaporiser is turned off
- Check the anaesthetic fluid level is adequate for the next case
- Anytime a vaporiser is changed the system must be tested using the Vaporiser and Circle System protocols

**Breathing System**
• Check the circle breathing system is ready to use;
  – New breathing system filter fitted
  – Adjustable Pressure Limiting (APL) valve is fully open
  – Ensure switch is set to “APL”
• If using a circuit other than the circle, check it using a protocol suitable for that circuit

**Suction**

• Ensure the suction equipment is operational

**Other Equipment**

• Ensure the equipment needed for intubation is ready for use
• Ensure any other equipment needed for the case is ready for use
PREOPERATIVE TEST

Turn on the machine master switch

Piped Gas Supply

- Check that no Bulk Gas Supply warning lights / alarms are indicating failure
- Check that piped gas supplies are correctly connected and secure
- Check the pipeline supply gauges read about 400 kPa.

Reserve oxygen supply

- Check that the cylinder is firmly secured in the yoke
- Open and then close the cylinder valve, observing the pressure gauge. A falling pressure indicates a leak from the machine’s internal tubing
- Replace cylinder if less than one quarter full.

Flowmeters

- Turn on all the flowmeters and observe that the bobbins spin freely
- Attempt to create a hypoxic mixture by reducing the oxygen flow and observe that the N₂O flow is reduced in proportion
- Turn off the flowmeters and observe that the bobbins return to approx 100ml for O₂ and zero for N₂O and air.

Vaporisers

Test each vaporiser in turn:

- Check that the vaporiser is seated correctly and locked in place
- Check that the vaporiser can be turned on
- Check that only one vaporiser can be turned on at a time
- Turn the vaporiser off
- Check that the vaporiser contains enough anaesthetic agent
• Check that the vaporiser filling ports are closed.

**Flow Sensor Calibration**

• Open front of flow sensor cartridge
• Push up on the latch under flow sensor module
• Pull out flow sensor cartridge fractionally. When the ventilator screen shows ‘No Insp Flow Sensor’ and ‘No Exp Flow Sensor’ the calibration is complete
• Reinstall flow sensor cartridge

**Condensate Drainage**

• Push drain button (silver) located in flow sensor cartridge for ≥10 seconds to remove condensate.

**Circle System**

Prior to performing the leak test:

• Check that all the breathing hose connections are correct and firm
• Check the absorber-locking lever is locked and that the CO₂ bypass warning is not displayed on the ventilator screen
• Check the condensate bleed plug is closed
• Set selector switch to “APL” mode
• Close the Adjustable Pressure Limiting (APL) valve
• Disconnect the reservoir bag and form a ‘circle’ by attaching the reservoir bag tubing to the patient “Y” connection (or the breathing system filter)
• Pressurise the circuit to 30 cm H₂O using an O₂ flow of 1 l/Min
• Turn the O₂ flow down to 300 ml/min while observing the pressure gauge and ensure the pressure in the circuit continues to rise slowly
• Turn each vaporiser on and off in turn: the pressure should continue to rise
• Reconnect the reservoir bag
• Attach another 2-litre reservoir bag (as a test lung) onto the patient “Y” connection and use the oxygen flush button to inflate the reservoir bags

---

1 The pressure in the circuit has to be seen to rise. This ensures there is no leak greater than 300 ml/min in the circle system and in the machine low-pressure circuit (“backbar”) back to the oxygen flowmeter. If the pressure rises there is no need to perform any other leak tests. If the pressure falls or remains static, this indicates a leak in the circle system or the back bar - perform a machine low pressure leak test to distinguish between them.
• Visually and audibly check the reservoir bags for leaks by squeezing the bag and increasing the circuit pressure to >30 cm/H₂O
• Check proper functioning of the unidirectional valves.

**The Ventilator**

• Turn on The ventilator
• Fill the ventilator bellows with oxygen using the oxygen flush
• Set the oxygen flow to 300 ml/min
• Verify that during inspiration the bellows delivers the set tidal volume (ventilator in volume control mode) or set pressure (ventilator in pressure control mode) and that during exhalation the bellows fills completely
• Now set the fresh gas flow to 5 L/min
• Ensure the ventilator continues to function without sustained pressure at the end of expiration
• Remove the test lung and ensure the low airway pressure and apnoea alarms sound after 30 seconds
• Turn the ventilator off and open APL valve.

**Anaesthesia Gas Scavenging System (Active AGSS)**

• Verify that the flow indicator ball is in the green zone.  
• Open the APL valve and occlude patient “Y” connection
• Set oxygen flow to minimum
• Ensure the pressure gauge reads about zero
• Activate O₂ flush and verify that the pressure gauge does not read above 10 cm H₂O.

**Soda Lime**

• Visually check that the canister contains Soda Lime. You can only check for exhaustion of the Soda Lime during a case. At rest it may return to a normal colour but when in use it will change colour, remain cool and the inspired CO₂ will be seen to rise.

**Oxygen**

• Verify that the low O₂ alarm is enabled and functioning by setting it to above 21% and disconnect the gas-sampling line

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2 If the ball is in the upper red zone this indicates that the either the extraction flow rate is too high or that the filter is blocked. If the ball is in the lower red zone this indicates that the extraction flow rate is too low.
• Reconnect the gas-sampling line to the breathing filter, flush with oxygen and ensure the monitor reads >90%.

**Suction System**

• Ensure the system is operational.

**Intubating Equipment**

Check the presence and function of:

• Two laryngoscopes and blades
• Suitable facemasks
• Suitable LMAs
• Guedel airways
• Endotracheal tubes
• Stylet and bougie
• Air syringe
• Magill forceps
• Scissors

**Self-Inflating Bag**

• Ensure it is present (kept behind the anaesthetic machine)
• Ensure it is properly assembled
• Ensure the one-way valve is working correctly.
CHECK LIST:

- Gas Supply ✓
- Flowmeters ✓
- Vaporisers ✓
- Circle System ✓
- Leak Test ✓
- Ventilator ✓
- Scavenging System ✓
- Suction ✓
- Other Apparatus ✓
- Monitor. ✓

When you have finished checking the anaesthetic machine you should be able to safely perform the following for a patient:

- Oxygenate
- Ventilate
- Anaesthetise
- Intubate
- Suction.
The following tests are performed in addition to the Preoperative Test.

**The machine low-pressure circuit (Backbar) leak test**

- With the machine power off, turn all the flow controls one and one half turns anticlockwise (on) - no gas will flow.
- Attach the suction bulb to the common gas outlet (ensure the lever is down to access common gas outlet)
- Squeeze the bulb until fully deflated. If the bulb re-inflates in 30 seconds or less there is a leak in the machine low-pressure circuit
- Turn on a vaporiser, deflate the bulb again and observe that it stays collapsed. Turn the vaporiser off
- Repeat for each vaporiser
- Flick the lever back up reconnecting the circle system
- Turn the machine back on
- Turn the N₂O and air flows off
- Flush the N₂O and the inhalational agents out of the system by running oxygen at 1L/min for one minute and then turn the oxygen flowmeter to minimum.

**Reserve gas supply and oxygen failure warning device**

- Disconnect the bulk oxygen supply
- Open the oxygen cylinder and turn on the oxygen flowmeter to 2 l/min
- Check that gas is able to pass from the cylinder through the flowmeter and that the monitor reads >90% oxygen
- Close the oxygen cylinder
- Turn on the nitrous oxide flowmeter to 2 l/min
- Press the emergency oxygen button to release the oxygen pressure in the machine. The audible warning device should now operate and the nitrous oxide should cease to flow
- Restore the bulk oxygen supply and the warning device should cease.

**One Gas Test**

- Ensure the oxygen cylinder is turned off
- Check that the oxygen hose is connected to the correct wall outlet and to the oxygen inlet of the machine
- Check that the gas-sampling line from the monitor is connected to the breathing system
- Turn on the oxygen and the nitrous oxide flowmeters to 2 l/min
- Disconnect the nitrous oxide supply from the wall outlet. Nitrous oxide flow should cease after a short delay. Check that only oxygen flows as detected by the oxygen analyser
- Reconnect the nitrous oxide hose to the wall outlet
- Check that nitrous oxide flows in the correct flowmeter and that the gas analyser reads 50% oxygen and 50% nitrous oxide.
ANTIBIOTIC PROPHYLAXIS FOR ELECTIVE SURGERY

To decrease the incidence of postoperative wound infection, antibiotic prophylaxis should be given routinely to adult patients without a history of allergy. A single dose is usually adequate; up to 24 hours of prophylaxis is acceptable for vascular and orthopaedic surgery.

- **Abdominal/Bowel Surgery**
  - Cephazolin 2g or gentamicin 2mg/kg IV, before induction of anaesthesia (ideally 15-30 minutes before incision)
    - PLUS,
  - Metronidazole 500mg IV, if the large bowel is to be breached
  - If surgery is not completed within 3 hours of the first dose, repeat the Cephazolin

- **Caesarean Section**
  - Cephazolin 2g IV before skin incision.
  - Use Clindamycin 600mg IV over 20 minutes OR Lincomycin 600mg IV over 1 hour if substantial risk of severe adverse reaction to Cephazolin

- **ENT surgery**
  - Antibiotics are not indicated for routine tonsillectomy or endoscopic sinus surgery.
  - For repair of facial fractures use Cephazolin 2g IV as above, adding Metronidazole 500mg IV for incisions through oral or nasal mucosa.
  - For complex head and neck surgery use Cephazolin 2g IV

- **Endoscopies/ERCP**
  - Routine upper or lower endoscopy or ERCP, including biopsy, do not require antibiotics
  - For obstructed biliary disease use Cephazolin 2g or Gentamicin 2mg/kg

- **Hernia repair with mesh insertion**
  - Cephazolin 2g IV before induction of anaesthesia.

- **Hysterectomy**
  - Cephazolin 2g IV before induction of anaesthesia
    - For vaginal hysterectomy, ADD
  - Tinidazole 2g orally the night before surgery OR Metronidazole 500 mg IV before induction of anaesthesia
- Use Clindamycin 600mg IV over 20 minutes OR Lincomycin 600mg IV over 1 hour if risk of severe adverse reaction to Cephazolin

**Orthopaedic Surgery**  
(With insertion of metalwork eg joint replacement, internal fracture fixation)  
- Cephazolin (as above) 2g IV before induction of anaesthesia  
- If surgery is not completed within 3 hours of the first dose, repeat the Cephazolin  
- If the patient is known to be colonised with MRSA within the last year, ADD Vancomycin 1g (approx. 15mg/kg) IV over 2 hours by infusion pump, commenced at least 30 minutes before surgery  
- Use only Vancomycin if risk of severe adverse reaction to Cephazolin

**Plastic surgery**  
- Cephazolin 2g IV before skin incision for extensive surgery or damaged/irradiated skin  
- For patients colonised with MRSA, ADD Vancomycin 1g IV over 2 hours  
- Use only Vancomycin if risk of severe adverse reaction to Cephazolin

**Urology**  
- Check culture and antibiotic susceptibility on any recent urine specimen.  
- With high risk of resistant organisms use Meropenem 500mg IV  
- Otherwise for routine ureteric stenting/lithotripsy or rigid cystoscopy use Ceftriaxone 1g and Amoxy/ampicillin 1g IV before induction  
- For open procedures use Cephazolin 2g IV  
- For prostatic biopsies use Ciprofloxacin 500mg orally 1 hour beforehand

**Vascular surgery**  
- Cephazolin 2g IV before skin incision  
- For amputation of ischaemic limbs, ADD Metronidazole 500m IV  
- Piperacillin/Tazobactam 4.5g IV as a sole agent is also suitable for infected diabetic feet.

**Paediatric Patients**  
The same drugs are applicable with the following doses:  
- Cephazolin 30mg/kg up to 2g  
- Metronidazole 12.5mg/kg up to 500mg  
- Vancomycin 15mg/kg up to 1g
- **Other Procedures, non-elective or complicated Patients**
  - Advice can be sought from the Antibiotic Guidelines and/or the Infectious Diseases Physician.
# MANAGEMENT OF ANAPHYLAXIS

Adapted from Guidelines from Australian & New Zealand Anaesthetic Allergy Group & Australian & New Zealand College of Anaesthetist - [www.anzaag.com](http://www.anzaag.com)

## IMMEDIATE MANAGEMENT

| DR  | Danger & Diagnosis Response to stimulus | Unresponsive Hypotension or Bronchospasm  
Cease triggers including Chlorhexidine & Colloid  
Stop procedure. Use minimal volatile if GA |
|-----|----------------------------------------|------------------------------------------------------------------------------------------|
| S   | Send for help & organise team           | Call for Help  
Assign a designated leader & scribe  
Assign a reader of Anaphylaxis Card |
| A   | Secure Airway Breathing with 100% Oxygen | Intubate: airway oedema or compromise  
Confirm FiO$_2$ is 100% |
| C   | Circulation: CPR if no pulse Give iv Fluid bolus | **If no pulse** give 1mg Adrenaline iv (Paed 10 μg/kg) & follow ALS protocol  
**IV Fluid:** 20 ml/kg bolus repeat PRN |
| D   | Drugs: Adrenaline IV Bolus repeat if needed 1-2 minutely & Prepare Infusion | IV Adrenaline Boluses  
Draw up 1mg in 10 ml  
- 100 μg/ml  

### Adrenaline infusion:

<table>
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<tr>
<th></th>
<th>Adrenaline 6mg in 100ml (1ml/h = 1 μg/min)</th>
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<tr>
<td></td>
<td>Adult 0.05-0.4 mg/kg/min</td>
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<tr>
<td></td>
<td>Child 0.1-5 μg/kg/min</td>
</tr>
<tr>
<td>Moderate Hypotension or Bronchospasm</td>
<td>Adult 5-20 μg</td>
</tr>
<tr>
<td></td>
<td>Child 1-5 μg/kg</td>
</tr>
<tr>
<td>Severe Hypotension or Bronchospasm</td>
<td>Adult 100-200 μg</td>
</tr>
<tr>
<td></td>
<td>Child 5-10 μg/kg</td>
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REFRACTORY MANAGEMENT

1. Ensure possible triggers removed
   - Consider Chlorhexidine (impregnated CVCs / IDCs inserted with Chlorhex lube)
   - Colloid stop if running
   - Ensure no LATEX in theatre

2. Consider other causes

3. Monitoring
   - Consider IA Line & CVC

4. Request further help

5. Resistant Hypotension
   - Noradrenaline 0.1 μg/kg/min (metaraminol or phenylephrine if Norad not immediately available)
   - Vasopressin 1-2 unit bolus then 2 units/h infusion
   - Glucagon 1.5 mg over 5min for β-blockers reversal

6. Resistant Bronchospasm
   - Salbutamol iv bolus 100-200 μg +/- infusion 5-25 μg/min (Child 5 μg/min for then 1-2 μg/kg/min)
   - Consider AutoPEEP & Tension Pneumothorax

7. Pregnancy
   - Lateral tilt
   - Caesarean section if arrest or peri-arrest

POST CRISIS MANAGEMENT

1. Consider Steroids
   a. Dexamethasone 0.1-0.4 mg/kg
   b. Hydrocortisone 2-4 mg/kg

2. Consider ORAL antihistamines Promethazine 0.2-0.5 mg/kg (Parental not recommended)

3. Investigations
   a. Tryptase at 1 hour, 4 hours & >24 hours
      i. Send promptly & notify lab as unstable
   b. ABG if unstable

4. Observations
   a. Monitor closely for 6 hours
   b. 24 hours ICU if severe reaction as 20% incidence of biphasic reactions

5. Discharge patient with letter with reaction description & agents use

Refer for skin testing (Dr Mecklem at Cairns Hospital)
LATEX ALLERGY – GUIDELINES FOR MANAGEMENT

Essential:
- Only use non-latex gloves
- First on theatre list in the morning (Much lower concentration of aerosolised latex particles in the atmosphere)
- Obtain equipment (as below) from latex allergy trolley in Recovery

A. General Preparation:

1. Theatre
   - Remove all non-essential items especially non-sterile latex gloves
   - Have only non-latex gloves available in theatre
   - Cover surgical glove dispenser
   - Cover theatre table with plastic and cotton sheet
   - Similarly cover armrests and any other attachments
   - ‘Patient Allergic to Latex’ warning signs in theatre and on theatre doors
   - Essential staff only

2. Surgical team
   - Check all equipment is latex-free e.g.:
     - Urinary catheters
     - Tourniquets
     - Drains
     - Surgical instruments

3. Anaesthetic team
   - Avoid patient waiting too long in holding bay
   - Induce and ?recover in theatre
   - Check all equipment is latex-free (see overleaf)

B. Anaesthetic Checklist

1. Airway Equipment
   - Standard CIG facemasks and bag contain latex
   - Circle circuit: Use plastic disposable breathing tubing
     Use silicone bag
   - Bain circuit: Use silicone bag
- Ayres circuit: Use disposable circuit
- The Omeda ventilator does not contain latex
- The Laerdel self-inflating bag does not contain latex
- Use (blue) Silicone Masks
- Use PVC ET tubes
- Use clear plastic oropharyngeal airways
- The gum elastic bougie and Satinslip introducer contain no latex
- There is no latex in the LMAs
- There is no latex in the Hudson mask
- Use airway filters as these also filter latex particles

2. IV Equipment

The following do not contain latex:

- Syringes - Glass or Terumo
- IV cannulae - Insyte
- CVP catheters - Arrow or Cook
- IA cannulae - Arrow or Insyte
- IV tubing - Interlink
- Burettes - Interlink
- Syringe pump extension sets - Terumo
- Reflux-valve - Braun.

- There is latex in the bung of the Haemacel bottle.
- There is no latex in the Albumex bottle.
- The Gemini infusion tubing does not contain latex.
- There is no latex in the injection port of Baxter IV fluids.
- Remove the rubber stopper from drug vials.
- There is no latex in the stopper or plunger of the Diprifusor syringes.

C. Monitoring
- Use Velband under NIBP cuff. Cover tubing and cables with Velband, as there is latex in bladder and tubing
- The pulse oximeter probe does not contain latex
- The temperature probe does not contain latex
- Baxter transducer sets do not contain latex
- 3M ECG dots do not contain latex
- The balloon of the Swan Ganz catheter does contain latex

D. Other Equipment
- The anaesthetic forceps have rubber shoes
- The Warm Touch hot air blanket does not contain latex
- Suction tubing does not contain latex
- The following do not contain latex:
  - NG tubes: Indoplas or Sherwood
  - Epidural catheters: Portex or BD
  - Tapes and dressings: Micropore
    - Tegaderm
    - Steri-strips
    - Velband
    - Hypofix.
  (Sleek does contain latex)
MANAGEMENT OF LOCAL ANAESTHETIC TOXICITY

Adapted from Guidelines from The Association of Anaesthetists of Great Britain and Ireland

endorsed by Australian & New Zealand College of Anaesthetists - www.aagbi.org

1. Recognition

<table>
<thead>
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<th>Signs of severe toxicity</th>
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<td>– Sudden alteration of mental state, severe agitation or loss of consciousness, with or without tonic-clonic convulsions</td>
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<td>– Cardiovascular collapse: sinus bradycardia, conduction blocks, asystole and ventricular tachyarrhythmias may all occur</td>
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<tr>
<td>– LA toxicity may occur sometime after the initial injection</td>
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2. Immediate Management

| – Stop injecting LA |
| – Call for help |
| – Maintain the airway & intubate if necessary |
| – Give 100% oxygen and ensure adequate lung ventilation (hyperventilation may help in increasing plasma pH in the presence of metabolic acidosis) |
| – Confirm or establish intravenous access |
| – Control seizure with benzodiazepine, thiopentone or propofol |
| – Assess cardiovascular status throughout |

3. Treatment

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<th>Circulatory Arrest</th>
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<tr>
<td>– Start CPR using ALS protocols</td>
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<td>– Manage arrhythmias using ALS protocols (may be refractory to treatment) – Lignocaine not indicated</td>
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<tr>
<td>Administer Intralipid$^3$ (see below)</td>
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<tr>
<td>– Continue CPR throughout treatment</td>
</tr>
<tr>
<td>– Recovery may take &gt;1 hour</td>
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<table>
<thead>
<tr>
<th>Without Circulatory Arrest</th>
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<tbody>
<tr>
<td>Use conventional therapies to treat:</td>
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<tr>
<td>– Hypotension</td>
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<tr>
<td>– Brady or tachyarrhythmias</td>
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</tbody>
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<table>
<thead>
<tr>
<th>Consider intralipid</th>
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4. Follow-up

| – Observe until sustained recovery achieved |
| – Regular clinical review for pancreatitis |

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$^3$ Propofol is not a suitable substitute for Intralipid
LIPID EMULSION (INTRALIPID) PROTOCOL

INTRALIPID IS STORED IN THE THEATRE ARREST TROLLEY

Immediately

– Give bolus of 20% intralipid – 1.5 ml/kg over 1 minute
– Start infusion of 20% intralipid at 15 ml/kg/hour

After 5 minutes reassess

– Give a maximum of 2 further boluses (5 minutes between each bolus) and
– Double infusion rate to 30 ml/kg/hour if
– Cardiovascular stability not restored
– Cardiovascular status deteriorates
– Continue infusion until stable and adequate circulation restored
– Intralipid dose should not exceed a maximum of 12 ml/kg
# MRI CRITICAL CARE CHECKLIST

## STAFF

| Staff screening | Jewellery, watches, wallets (credit cards), scissors, phones etc should be removed  
- Be guided by MRI staff |

## PATIENT

<table>
<thead>
<tr>
<th>Patient Screening</th>
<th>Jewellery, metal objects (zippers, bra clips), hearing aids, dentures, some medication patches should be removed</th>
</tr>
</thead>
</table>
| Contraindications | - Pacemakers, implantable defibrillators, metal prosthetic valves, metal stents, cochlear implants, Portocaths, Hickman lines, neurostimulators, implanted drug pumps, metal foreign bodies are all contraindications.  
- Coronary stents and intracranial aneurysm clips especially if multiple are contraindicated unless able to check with manufacturer.  
- Wound staples, sternal wires and other surgical clips are generally OK.  
- Internal orthopaedic prostheses are OK – external fixation devices may be a contra-indication (check with hand-held magnet).  
- Each case needs individual assessment as it is impossible to cover every eventuality in a list like this. |
| Respiratory guidelines | Need a secure airway (ie awake or LMA/ETT)  
Not requiring high PEEP (eg >10cm) or high O₂ (> 70%) |
| Circulatory guidelines | Not requiring high inotropic support (eg >10μg/min adrenaline/noradrenaline) |
EQUIPMENT

THE MAGNET IS ALWAYS ON

Most normal equipment is NOT compatible and must not be taken into the scanning room.

<table>
<thead>
<tr>
<th>Equipment</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bed</td>
<td>NOT compatible – must transfer patient to MRI-compatible bed</td>
</tr>
<tr>
<td>Drip-stand</td>
<td>NOT compatible – must transfer fluids etc to MRI-compatible stand</td>
</tr>
<tr>
<td>Oxygen cylinders</td>
<td>NOT compatible – require aluminium cylinders</td>
</tr>
<tr>
<td>IV pumps and syringes</td>
<td>Most are NOT compatible – use outside scanning room or use MRI-compatible units</td>
</tr>
<tr>
<td>IV tubing for pumps and syringes</td>
<td>Need long extensions ie 4.5-6m if pumps outside scanning room</td>
</tr>
<tr>
<td>Anaesthetic machine</td>
<td>Must change to specific MRI-compatible machine</td>
</tr>
<tr>
<td></td>
<td>Even this machine must not be moved near the magnet</td>
</tr>
<tr>
<td>Defibrillator</td>
<td>NOT compatible – must never be taken into scanning room</td>
</tr>
<tr>
<td>Cardiac arrest trolley</td>
<td>Instead, the patient MUST BE REMOVED from the scanning room</td>
</tr>
<tr>
<td>Breathing circuits</td>
<td>Plastic only; avoid PEEP valves with metal springs</td>
</tr>
<tr>
<td>Endotracheal tubes; pilot balloons</td>
<td>Avoid reinforced tubes (artefact)</td>
</tr>
<tr>
<td></td>
<td>Spring of pilot balloon can cause artefact so tape away from scanned region</td>
</tr>
<tr>
<td></td>
<td>Rarely may have to knot pilot balloon tubing and cut off balloon</td>
</tr>
<tr>
<td>Medical Device</td>
<td>Compatibility Notes</td>
</tr>
<tr>
<td>---------------------</td>
<td>------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>LMAs</td>
<td>Pilot balloon problems (as per endotracheal tubes)</td>
</tr>
<tr>
<td>Laryngoscopes</td>
<td>Use MRI-compatible laryngoscope and batteries</td>
</tr>
</tbody>
</table>
| Monitor             | NOT compatible - must change to specific MRI-compatible monitor  
|                     | • Even this monitor must not be moved near the magnet                                                                                                                                                        |
| NIBP cuffs          | Tube connections must be plastic not metal                                                                                                                                                                   |
| Invasive art lines  | Transducer may be not compatible so remove it and bung cannula                                                                                                                                              |
| Pulse oximeter      | Change to specific MRI-compatible probe                                                                                                                                                                        |
| ECG (general)       | Artefact and other problems common – consider removing altogether                                                                                                                                            |
| -ECG dots           | Change to MRI-compatible (to avoid burns)                                                                                                                                                                     |
| -ECG leads          | May cause local heating – avoid loops and protect patient skin                                                                                                                                               |
| Temperature probes  | NOT compatible and must be removed                                                                                                                                                                            |
| Calf compressors    | NOT compatible                                                                                                                                                                                               |
| Forced air warmers  | NOT compatible                                                                                                                                                                                               |
OBSTETRIC ANTICONVULSANT THERAPY FOR ECLAMPSIA AND SEVERE PRE-ECLAMPSIA

The drug of choice is **Magnesium Sulphate**. It is available in 5ml ampoules each containing 2.5g of magnesium. It should be given as a loading dose followed by a maintenance infusion.

**Loading dose:** Use pre-filled syringes of 5g (if available) from Birth Suite.

Alternatively, add 5g (2 ampoules) to **90ml of normal saline** and infuse over 15 minutes (100ml at 400ml/hour). The woman should be warned that she may experience transient hot flushing. ECG monitoring is not required.

**Maintenance infusion:** Add 25g (10 ampoules) to **450ml of normal saline** to make 500ml of solution. Infuse at **1g/hour** initially (20ml/hour), up to 2g/hour (40ml/hour) depending on clinical parameters and magnesium levels.

**Patient monitoring:**

Magnesium may cause muscular weakness, and levels may increase with poor urine output. Consequently, there should be hourly evaluation of:

- **Patellar reflexes** (should be present)
- **Respiration** (should have rate >12)
- **Urine output** (should exceed 100ml in 4 hours)

and 6-hourly measurement of **serum magnesium levels** starting 2 hours after loading dose (2.0-3.5 mmol/l is considered therapeutic). Calcium gluconate 1g slowly IV can help reverse magnesium toxicity.

**In the event of fitting** despite magnesium therapy, the patient should be nursed in the lateral position with attention to Airway, Breathing and Circulation.

An additional “loading” dose of 2.5-5.0g of magnesium (50-100ml of solution) can be given over 7.5-15 minutes. Other anticonvulsants and tracheal intubation may occasionally be required.
Other features of magnesium therapy:

1. Magnesium is a tocolytic so increased doses of oxytocin may be needed.
2. Intrapartum CTG’s may show decreased variability with therapeutic magnesium levels.
ANALGESIA IN BIRTH SUITE

NOTE: This document is not an exhaustive guide, but describes local practices and gives some trouble-shooting advice.

RESPONSIBILITY OF THE ANAESTHETIST

The epidural service is provided by the Acute Pain Service during the day, and by the anaesthetists in theatre after hours.

The anaesthetist inserting the regional block is responsible for the management of it until it is ceased. When that anaesthetist goes off duty the patient should be ‘handed over’ to another.

The anaesthetist should attend the mother regularly throughout the duration of the regional block, so that complications are avoided and analgesia assured. It is not sufficient to attend the mother only when called by a midwife.

LOW-DOSE ‘EPIDURAL’ TECHNIQUES – ADVANTAGES AND OPTIONS

Low-dose techniques are used routinely in the Birth Suite (BS). They minimise motor block and reduce the incidence of instrumental deliveries.

There are essentially two ways of achieving good analgesia using low-dose techniques:

1. EPIDURAL ONLY
   This is the technique of choice if the woman is not too distressed with pain. The doses and dilutions are described in the document ‘Epidural Drug Doses in Birth Suite’.

2. COMBINED SPINAL EPIDURAL (CSE)'
   A CSE can be used if the mother is very distressed and in severe pain, as it may be difficult to establish an epidural block using dilute epidural solutions. Its main advantage is rapid analgesia without muscle weakness.

   Establishing epidural analgesia on the BS with stronger solutions (eg 0.25%-0.5% bupivacaine) causes muscle weakness and consequently, these solutions should only be used if low-dose techniques are ineffective.
NOTE: The following apply to the use of Combined Spinal Epidurals (CSEs) in Birth Suite only - they are not intended as a guide to using CSEs in Theatre.

PREPARATION:

- The initial preparation for a CSE is the same as for any regional technique in obstetrics:
- Contraindications (eg thrombocytopenia and sepsis) must be respected, and informed consent obtained.
- An aseptic technique (mask, surgical scrub, gown and glove) must be used.
- A filter needle should be used to draw up all drugs from glass ampoules for injection into the subarachnoid space.
- The mother may be in the lateral or (preferably) sitting position.

PROCEDURE:

- A needle-through-needle technique is most commonly used.
- When the subarachnoid space is located, 1.25mg bupivacaine (0.5ml of 0.25% plain bupivacaine) plus 25μg of fentanyl (0.5ml) is injected.
- The spinal needle is withdrawn and the epidural catheter is threaded and fixed in place, but no injection of local anaesthetic is made at this stage. However, the catheter should be flushed with 2ml saline and aspirated (to ensure it is not kinked; to prevent it being occluded by a clot; and to check for IV or subarachnoid placement).
- If the mother has been sitting she should then lie on her side as soon as the epidural catheter is taped in place.
- See Patient Controlled Epidural Analgesia (PCEA) for subsequent management of epidural analgesia.

PROBLEMS:

Mother very distressed and unable to cooperate

- Firstly, ensure the syntocinon infusion is turned off. Consider giving her 50-75 μg fentanyl IV prior to the block, and/or insert the spinal first (using a 24 or 25g pencil point needle) and insert the epidural under more favourable circumstances when the mother is better able to cope.

Failure to locate the CSF with the spinal needle
In our experience this occurs in about 2% of cases. In this situation the epidural catheter should be inserted and the block established using epidural top-ups only.

**Inadequate pain relief after spinal dose**

- Give first epidural dose - refer to the document ‘Epidural Drug Doses in Birth Suite’.

**Pros and Cons:**

- The advantages of using a CSE to establish the block (no muscle weakness) must be weighed against the potential disadvantages in each woman.
- Certain clinical circumstances make a CSE less suitable for pain relief in labour:

**Infection**

- As the dura is punctured during a CSE, it may be inadvisable if the mother has a systemic infection, is pyrexial or has prolonged ruptured membranes and is not on antibiotics, because of the theoretical risk of meningitis.

**Foetal bradycardia**

- Foetal bradycardia may occur soon after the spinal component of the CSE, possibly due to increased uterine tone. Consequently it may not be advisable to insert a CSE for pain relief if the foetus has a non-reassuring CTG trace. It is also advisable to routinely stop a syntocinon infusion before doing a CSE, and to monitor the FHR as soon as possible after the spinal block is established.

**Imminent Caesarean Section**

- If a caesarean section is likely in the near future it is better to establish an epidural block and ensure it is functioning properly rather than doing a CSE. The doses used subarachnoid in BS are not sufficient for a CS.

**Previous CSE in the same labour**

- The incidence of headache following an uncomplicated CSE is low - approximately 1:200 at CBH. However, another CSE or spinal increases the chance of a PDPH and should not be performed without good reason.

**TROUBLESHOOTING EPIDURALS IN BIRTH SUITE**

**Failure to locate the epidural space**

- If the epidural space cannot easily be located at one level, a different intervertebral space should be tried. If attempts at two interspaces are unsuccessful, more experienced assistance should be sought. It is not reasonable to subject the mother to repeated needling if more experienced help is available.

**Dural tap**
- In the event of an accidental dural puncture, it is usually advisable to remove the Tuohy needle and insert an epidural catheter at an adjacent interspace. The anaesthetist must then do all the top-ups through the epidural until he/she is satisfied with the position and function of the epidural catheter (an unexpectedly high block may occur from retrograde spread into the CSF).

- If the dural tap occurred after much difficulty in finding loss-of-resistance, insert the epidural catheter into the subarachnoid space and label the catheter clearly as ‘subarachnoid’. Inform the senior anaesthetist on call as well as the mother and the obstetric staff. The anaesthetic staff must do all the top-ups through this catheter for the duration of the block. The recommended dose for analgesia in labour is 1.25mg bupivacaine (0.5ml 0.25% plain bupivacaine) plus 25μg fentanyl (0.5ml), followed by 1ml NSaline as a flush to account for the dead space of the filter and catheter.

Blood in the epidural catheter

- First pull the catheter back until only 3cm remains in the epidural space, then flush the catheter with 5ml of saline. Gently aspirate and observe if blood still fills the catheter.

- If the aspirate is heavily blood-stained the catheter should be removed. If there is no aspirate or it is only slightly blood-stained, an adrenaline-containing test dose should be given, ie 2ml of 2% lignocaine with adrenaline 1:200,000.

- If there is no increase in heart rate (more than 10/min) and the patient does not develop symptoms of dizziness, tingling or dysphoria, the epidural can be used.

Inadequate pain relief

- Refer to the document ‘Epidural Drug Doses in Birth Suite’.

Patient Controlled Epidural Analgesia (PCEA)

- PCEA is the standard way of maintaining epidural analgesia on the BS at CBH.

- Compared to other techniques it is more effective, dose-sparing and gives the mother a sense of control.

- It is provided through the Go Medical mechanical device, which allows a bolus of 4ml with a fifteen-minute lockout. In addition, our protocol allows for a midwife-administered top up of 10ml.

- The solution used is 0.125% levobupivacaine with 2μg/ml fentanyl.

- It is used after initial analgesia is achieved with either an epidural or a CSE.

After epidural only

- PCEA should be commenced once the anaesthetist is happy that the epidural catheter is correctly placed and the patient is comfortable.

After CSE

- Two important issues after the spinal component of a CSE are:
. the untested epidural catheter, and
. the potential for recurrence of severe pain during transition to epidural analgesia.

**After a straightforward CSE insertion:**

- Follow the protocol on the yellow PCEA order sheet:
- The midwife should set up the PCEA device and connect it to the epidural catheter as soon as possible
- The patient should start using PCEA at the first uncomfortable contraction before they become too painful
- The anaesthetist must be informed when the patient starts using PCEA, and review her
- Give additional doses as required (see ‘Epidural Drug Doses in BS’)

**After a complicated CSE insertion (eg possible IV puncture or subarachnoid placement of epidural catheter):**

- The anaesthetist **must** give an epidural test dose before PCEA is commenced but before severe pain returns
- The anaesthetist should give further top ups to fully establish analgesia and confirm safe epidural placement before commencing PCE
EPIDURAL DRUG DOSES IN BIRTH SUITE

Note: This document is not an exhaustive guide, but describes local practices and gives some trouble-shooting advice.

1. Low-dose epidural analgesia

Test Dose

– Use 4ml 0.25% bupivacaine
  OR
  – Use 8ml 0.125% levobupivacaine in divided doses
  – After a bloody tap use 2ml 2% lignocaine plus 1:200,000 adrenaline

Top-up

– Use 10ml 0.125% levobupivacaine plus 50-100μg fentanyl in divided doses
  – If block is not adequate after 15 minutes, give another 5-10ml of 0.125% levobupivacaine

If this is not adequate see “Persistent Pain” section below.

2. Combined Spinal Epidural

Subarachnoid

– Use 1.25mg of bupivacaine (0.5ml of 0.25% plain bupivacaine) plus 25μg of fentanyl (0.5ml)

Epidural first dose

– Use 10ml 0.125% levobupivacaine plus 2μg/ml fentanyl (PCEA solution) as two 5ml doses

OR, if patient has started PCEA (a 4ml dose)

– Give further 6ml 0.125% levobupivacaine plus 2μg/ml fentanyl
Persistent Pain

Plan:

− Ask site of patient’s pain.
− Measure extent of the block with ice.
− Ensure epidural catheter is still in place.
− Give treatment according to the classification below:

i. Patchy Block

Give further 10-15ml 0.125% levobupivacaine ± fentanyl in divided doses
(In this situation, larger volumes of dilute solution work better than smaller volumes of stronger solutions.)

ii. One-sided Block

Pull the epidural catheter back until 3cm left in the epidural space and give 10-15ml 0.125% levobupivacaine ± fentanyl. If this is not effective, or catheter is only 3cm in epidural space to start with, the epidural catheter should be replaced.

(Giving a higher concentration will only make the blocked side even more numb and weak and is unlikely to provide any analgesia on the unblocked side.)

iii. Back Pain

Epidural fentanyl 100μg (diluted to 5ml) often works well, if only low concentration fentanyl has been used before.

iv. Perineal Pain or Breakthrough Abdominal Pain

In this case, with a demonstrable block on both sides but the patient still complaining of pain, give 10ml 0.25% levobupivacaine ± fentanyl

If these measures are not adequate, call for senior help.

Ongoing Analgesia

Refer to the document ‘Analgesia in Birth Suite’.
OBSTETRIC - UTEROTONIC AND RELAXANT DRUGS

Note:

- This document is a reminder of doses only
- Indications, contraindications and side effects need to be understood before using these drugs

UTEROTONIC DRUGS

1. Carbetocin (for use in elective LSCS only)
   Give one ampule (100ug in 1ml) IV over 1min after delivery of the baby. There is no need for an oxytocin infusion, as this is a long-acting oxytocic.

2. Oxytocin (Syntocinon®)
   2-5 Units IV, repeated prn (expect to need higher doses if prolonged labour/grand multip/ >4kg baby/polyhydramnios) and infusion of 40 Units in 1000ml @ 10-80 Units/hour (or more).

3. Ergometrine
   250 ug slow IV, repeated prn
   Relatively contraindicated in P.I.H. / Pre-eclampsia

4. Prostaglandins
   i. Carboprost (Prostin®15M) 250ug/ml
      o 250 ug (1 ml) via deep IM injection. If necessary, this dose can be repeated at intervals of at least 15 minutes for up to 8 total doses (2 mg).
   ii. Misoprostol
      o 400-800μg (2-4 tablets) per rectum

NB If response to uterotonic drugs and uterine massage is inadequate, alternative management strategies will be needed, including:

   o balloon tamponade
   o uterine packing
   o B-Lynch suture
   o uterine artery and internal iliac artery ligation
   o pelvic arterial embolization, or
   o hysterectomy.

RELAXANT DRUGS

IV GTN
• Put 50mg in 1000 ml to make 50 μg/ml
• Start with 2-3 ml IV (100-150 μg)
ORAL INTAKE IN LABOUR

During late pregnancy heartburn is common.
During active labour stomach emptying is slow and food is poorly absorbed.
Opioid drugs (IV, IM or epidural) slow the process further.
Epidural anaesthesia or general anaesthesia may be necessary during labour (approximately 35% of women) and food in the stomach increases the risk of aspiration.

It is wiser for a woman not to eat in labour and to choose only clear fluid.
It is CBH hospital policy to discourage eating in labour and to disallow intake of any solids when the mother is likely to need an operation. However if the mother is requesting food she should be informed of the following guidelines.

Latent labour / Induction of labour

- Spontaneous onset – Light diet as tolerated
- Prostaglandin priming – Light diet as tolerated until active labour commences then clear fluids only
- ARM / Syntocinon induction – Clear fluids only

Active labour

- Women in active labour should have clear fluids only
- Women who insist on eating may have light diet if they have:
  - Spontaneous onset of labour
  - No medical or obstetric problems
  - No known risk of an instrumental or operative delivery
  - Not using nor intend to use any form of pharmacological analgesia (N₂O, opioid or epidural)
  - There is an approximate 10% chance of an operation (LUSCS, retained placenta) in this patient group and eating in labour increases the chance of an adverse outcome for both mother and baby.

---

4 Light diet – Tea, coffee, toast, plain biscuits
5 Clear fluids – Water, cordial, sports drinks, NOT milk or fruit juice
OBSTETRIC PATIENTS WITH KNOWN RHEUMATIC HEART DISEASE - MANAGEMENT OF LABOUR AND DELIVERY

Plan: Assess risk according to maternal risk factors

Advise management as below

Document plan in obstetric notes

Maternal Risk factors are based on history, current symptoms and echocardiography:

- **History**: prior cardiac event (pulmonary oedema, tachyarrhythmia)
- **Current Symptoms**: dyspnoea with minimal exertion (NYHA III)
  (Dyspnoea at rest (NYHA IV) needs immediate evaluation and treatment by cardiology ± ICU)
- **LV dysfunction** (Ejection fraction < 60%)
- **Left heart obstruction** moderate or severe (mitral or aortic valve area ≤ 1.5cm²)
- **Pulmonary hypertension** (systolic PAP > 50mmHg)


<table>
<thead>
<tr>
<th>Low Risk (No risk factors): &lt;5% chance of cardiac complications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Management:</td>
</tr>
<tr>
<td>- Treat on obstetric indications only</td>
</tr>
<tr>
<td>- Epidural beneficial but not essential</td>
</tr>
<tr>
<td>- Avoid excessive IV fluids</td>
</tr>
<tr>
<td>- Antibiotic prophylaxis indicated with prosthetic valves, history of endocarditis or obstetric reasons</td>
</tr>
</tbody>
</table>
## Moderate Risk (One risk factor): 25% chance of cardiac complications

**Management:**

Needs cardiology review and collaboration between obs / anaes / paeds / possibly ICU

**Delivery:**

- In Cairns or other regional centre with relevant experience
- Epidural pain relief early (once labour established)
- Avoid excessive IV fluids
- Assisted vaginal delivery (Vaginal delivery preferred to CS if obstetric considerations allow)
- Anaesthetist present for delivery
- Avoid ergometrine (causes pulmonary oedema)
- Syntocinon bolus (NB *not* syntometrine) 5U IM or 1U slow IV
- Syntocinon infusion 10U in 100ml saline @ 50ml/hour initially
- Antibiotic prophylaxis indicated with prosthetic valves, history of endocarditis or obstetric reasons.

**Post-Delivery:**

- IV fluid to replace blood loss only – cease once bleeding stopped
- Consider frusemide 10-20mg IV
- Observe in obstetric HDU overnight (monitor P, BP, dyspnoea, SpO₂ and blood loss)

## High Risk (More than 1 risk factor): 50% chance of cardiac complications

**Management:**

As for Moderate Risk except for:

- Consider transfer eg for balloon valvotomy if severe stenosis or symptoms not medically controllable
- Consider delivery in monitored situation (OT probably best)
- Avoid bolus syntocinon (may cause ↓↓ BP) *unless* uterus poorly contracted despite syntocinon infusion
- Slow bolus of 1U for poor contraction (ie 10ml of solution)
PAEDIATRIC DAY SURGERY SUITABILITY CRITERIA

A. Clinical Requirements
   1. Babies should be older than 3 months of age if they require general anaesthesia. However, ex-premature babies may still be unsuitable for same day discharge and need individual anaesthetic assessment.
   2. Children should have no organic disease or only mild organic disease, which minimally interferes with their normal activities.
   3. Procedures should be less than 1 hour.
   4. Procedures should cause minimal blood loss.
   5. Postoperative pain can be controlled with oral analgesics.
   6. No special nursing care should be required postoperatively and parents must be able to carry out pre- and post-operative instructions.

B. Social and Logistical Requirements
   1. The child can only go home by private vehicle or taxi.
   2. Another responsible person (apart from the driver) must be present in the vehicle to look after the child.
   3. The distance to be travelled following discharge should be less than 60km.
   4. Parents advised that the child might need to be admitted overnight.

C. Other Procedural Factors
   1. Day case patients should be given priority on the operation list sequence.

The Surgical Team responsible for the patient must be consulted if these guidelines cannot be met. They will then arrange to admit the child overnight.
PAEDIATRIC (ADENO)TONSILLECTOMY
DISCHARGE PLANNING

Day of Surgery discharge is suitable if ALL the following criteria are met:

- Age ≥ 4 years
- History of only mild or no OSA (Obstructive Sleep Apnoea)*
- No ongoing desaturations (<95% on RA) when sleeping in Recovery or DSU
- No significant co-morbidities (including high BMI)
- 4 hours minimum observation since surgery
- Eating and drinking, good pain control
- < 1 hour travel time to hospital (in case of bleeding)
- Good family situation and carer available

ICU Admission if ANY of:

- **History of severe OSA**
- Marked ongoing desaturations (<80%) postoperatively
- Need for high flow nasal oxygen (eg consider if >2ml/kg)
- Major patient co-morbidities or marked obesity (eg >99th centile)

Paediatric Ward Admission:

- Patients outside of Day of Surgery and ICU categories
- Must be stable in recovery for at least 30 minutes before discharge to the ward
- Continuous oximetry and direct nursing care for at least 4 hours on the ward
- Overnight continuous oximetry if likely moderate OSA or higher risk of OSA (significant co-morbidities, high BMI or age <2 years), or if any desaturations or obstructed breathing occurs
Obstructive Sleep Apnoea (OSA)

- 10-12% of children snore, but only 1-2% have OSA.
- Definitive diagnosis with polysomnography (sleep study) is unusual but AHI (apnoea/hypopnoea index) of 6-9/hour is moderate OSA; ≥10 hour is severe
- Nocturnal oximetry with SpO₂ < 80% indicates at least moderate OSA
- STOPBANG OSA acronym checklist (modified for children):
  - Snoring
  - Tiredness (daytime) and Tonsillar enlargement
  - Observed Apnoeas
  - Posture – extended neck sleeping; mouth breathing
  - BMI increased, Breathing difficulties at night
  - Age <3 years
  - Neuromuscular disease
  - Genetic conditions (eg 40% of Down children have OSA)
- ➢ Snoring and large Tonsils are sensitive markers, ie absence = OSA unlikely
- ➢ Apnoeas, Breathing difficulties and daytime tiredness are specific markers, i.e. presence = OSA likely

Selected References

### PAEDIATRIC VENOUS ACCESS DECISION PATH

#### Considerations
- Peripheral vs. central venous access?
- Therapy duration
- Medical history
- Weight
- Age

#### PICC lines
- Typically inserted into either basilic or brachial vein
- PICC lines have high insertion and post insertion failure rates if:
  - children < 20kg
  - inserted into cubital fossa
  - inserted into cephalic or long saphenous vein

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<table>
<thead>
<tr>
<th>&lt; 7 days</th>
<th>7-14 days</th>
<th>&gt; 14 days</th>
</tr>
</thead>
<tbody>
<tr>
<td>Therapy suitable for peripheral infusion</td>
<td>Call for early anaesthetic assessment</td>
<td>Call for early anaesthetic assessment</td>
</tr>
<tr>
<td></td>
<td>Call for early anaesthetic assessment</td>
<td>Consider referral to Tertiary Hospital for surgical cuffed CVC</td>
</tr>
<tr>
<td>Yes</td>
<td>Weight &lt; 20kg* = tunnelled CVC</td>
<td>Otherwise call for early anaesthetic assessment</td>
</tr>
<tr>
<td>No</td>
<td>Weight &gt; 20kg = PICC</td>
<td>Weight &lt; 20kg* = tunnelled CVC</td>
</tr>
<tr>
<td>Potential IV sites</td>
<td></td>
<td>Weight &gt; 20kg = PICC</td>
</tr>
<tr>
<td>Yes</td>
<td>Peripheral IV cannula</td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>Non-tunnelled CVC</td>
<td></td>
</tr>
</tbody>
</table>

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* As this number is only a recommendation, it is up to the anaesthetist performing the procedure to decide the most appropriate approach on a case-by-case basis.
Consent for the insertion of Central Venous Access Device (CVAD)

General considerations
- The child, the child’s parent/guardian should be explained the benefits and risks associated with the CVAD insertion
- The person inserting the line should ideally be the person gaining the consent for it and ensure the risks have been understood
- It is inappropriate for a person unfamiliar with the risks of a CVAD to gain consent

CVAD complications at the time of insertion
- Pain, bruising or bleeding at the insertion site afterwards
- Difficulty inserting the catheter
- Temporary nerve damage or pain
- An irregular of fast heart beat sometimes requiring treatment
- Very rarely damage to nearby structures such as blood vessels or heart during insertion

CVAD complications whilst the line is in situ
- Life-threatening
  - Tamponade
  - Pleural effusion
  - Pericardial effusion
- Other
  - The catheter may block, bend or move out of place, requiring treatment or removal
  - Blood clot blocking the vein requiring treatment or removal
  - Very rarely the blood clot can move out of the vein and can travel to the lungs or brain
  - Infection at the skin puncture site requiring antibiotics or further treatment
  - Infection in the catheter requiring antibiotics or removal
  - Medications leaking outside the vein causing pain, swelling or tissue damage, requiring treatment
  - Movement of the tip of the catheter requiring repositioning
PERIOPERATIVE METARAMINOL INFUSION

Description:

Metaraminol is a sympathomimetic vasopressor that increases blood pressure mainly through peripheral vasoconstriction ($\alpha$-agonist effect), though it also has some stimulatory effect on the heart.

Use:

Metaraminol is used as an adjunct in the treatment of hypotension, especially from vasodilation due to epidural or spinal anaesthesia/analgesia. Other causes of hypotension (eg hypovolaemia, sepsis, cardiogenic) must also be considered and treated appropriately.

It should be commenced only on the direction of Anaesthetic or Intensive Care medical staff, familiar with the use of vasopressor agents. Consideration should be given to transfer to a High Dependency situation, depending on patient circumstances and acuity.

Patients receiving a post-operative Metaraminol infusion are the responsibility of the APS team regardless of whether an APS modality is being used.

Contra-indications:

Allergy to metabisulfite preservative.

Interactions:

Mono-amine oxidase inhibitors and digoxin increase the risk of arrhythmias.

Antihypertensive drugs and diuretics should generally be withheld while on a metaraminol infusion.

Precautions:

Hypertension, headache, chest pain & pulmonary oedema may occur with excessive dose.
**Dose and administration:**

Standard: 10 mg metaraminol to 100ml 0.9% saline.

Infuse via infusion pump. To prevent reflux and inconsistent drug delivery, other fluids must be given either via an infusion pump or a giving set with a non-return valve.

Rate is usually prescribed as 0-20ml hour (0-2mg/hour), with adjustments (eg of 2-5ml/hour) according to blood pressure. A target level must be stipulated (eg >90 mmHg). A common starting dose is 5 or 10ml/hour; it takes about 10 minutes for a new rate to reach equilibrium.

For marked hypotension, an initial IV bolus of 0.1-0.25 mg can be given, repeated every 3-5 minutes if necessary. If a rate of 20ml/h is required higher level care is needed.

**Monitoring:**

Enquire about symptoms of hypotension (nausea, dizziness) and of excessive dose (see precautions above).

Check blood pressure and pulse rate after dose adjustment (whether increasing, decreasing or stopping): every 15 minutes for 30 minutes, then hourly if stable.
ANAESTHETIC FACTORS AND RESPONSIBILITIES

1. Anaesthetic review on Orthopaedic ward
   - All patients should be referred to APS pre-op
   - Consider Fascia Iliaca block if not already done by ED – generally place a Fascia Iliaca catheter not a single shot block – See Fascia Iliaca Section Below
   - All patients should have a pre-operative assessment
     - APS PM Registrar
     - If patient 2nd on trauma list and not yet reviewed Trauma AM Registrar
     - Check
       - FBC / U&E / Coags (if liver disease or on warfarin) / G&H / ECG
     - These are often complex patients and should be discussed with the Trauma list anaesthetist

2. Anti-coagulated patients (general plan - refer also to perioperative anti-coagulant and antiplatelet protocols)
   a. Warfarin:
      - Check INR; if > 1.5 give vit K 3mg IV (in 100ml saline)
      - Repeat INR next day; consider Prothrombinex
      - Surgery (and neuraxial block OK) if INR<1.5
      - Clexane 20mg sc daily, start >12 hours post-op
   b. NOACs:
      - Wait 24h from last dose unless neuraxial anaesthetic considered optimal
      - If neuraxial anaesthetic required follow standard NOAC protocols
      - Check renal function
   c. Clopidogrel:
      - Wait 24h from last dose unless neuraxial anaesthetic considered optimal
      - Wait 5 days if neuraxial anaesthetic required

3. Fasting guidelines
   - No food after 0200 day of surgery
• No fluids after 0600 day of surgery
• Review emergency booking at lunchtime re fasting (through APS)

4. **Trauma list management**
• Ideally 2\textsuperscript{nd} patient on Trauma list
• Avoid prolonged & repeated fasting if surgery delayed

5. **Anaesthetic Choice**
• No recommendation about particular anaesthetic technique
• Tailor to patient requirements
• Senior anaesthetic should be involved

6. **Post-op Care**
• Hb in PACU before discharge to ward (i-STAT or formal)
• Acute Pain Service Follow-up
• Analgesia
• Fluids
FASCIA ILIACA CATHETERS
LANDMARK-BASED INSERTION GUIDE

Introduction

Single shot fascia iliaca or femoral nerve blocks provide good analgesia, however, the block can wear off long before the patient receives surgery. Instead, a fascia iliaca catheter facilitates ongoing analgesia until the patient receives surgery. In contrast to a femoral nerve block, the fascia iliaca catheter is inserted lateral to (not on) the femoral nerve, thereby reducing the potential for femoral nerve injury.

<table>
<thead>
<tr>
<th>Indications</th>
<th>Contraindications (when in doubt, discuss with a consultant)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Imaging-confirmed fracture of neck of femur (all subtypes except isolated acetabular fractures)</td>
<td>Patients on clopidogrel (or other antiplatelets in same class)</td>
</tr>
<tr>
<td></td>
<td>INR &gt; 1.5</td>
</tr>
<tr>
<td></td>
<td>Previous femoral vascular bypass surgery (scar + altered anatomy)</td>
</tr>
<tr>
<td></td>
<td>Allergy to local anaesthetic</td>
</tr>
<tr>
<td></td>
<td>Local infection in groin</td>
</tr>
<tr>
<td></td>
<td>Systemic infection (single shot block is OK)</td>
</tr>
<tr>
<td></td>
<td>Very obese patients (impalpable landmarks. Ultrasound advised)</td>
</tr>
</tbody>
</table>

Local anaesthetic safety

- Max safe dose of ropivacaine is 3mg/kg (up to max 200mg)
- Each 10mL of 0.75% ropivacaine contains 75mg ropivacaine
• Patients less than 50kg should be administered reduced concentration or volume of local anaesthetic

**Equipment required**

• Take a ready-made Fascia Iliaca kit. If unavailable, refer to the equipment list “drop sheet”.

**Preparing the ropivacaine solution**

• In each 20mL syringe draw up 10mL of ropivacaine 0.75% PLUS 10mL of saline (resulting in 2 syringes, each containing 20mL of 0.375% ropivacaine).

**Performing a fascia iliaca catheter insertion (aseptic procedure)**

• Palpate landmarks (ASIS and pubic tubercle)
• Mark the insertion point: 2cm caudad to the junction between lateral and middle 1/3rd of line joining the ASIS to the pubic tubercle
• Check that the marked injection point is 1.5 – 2cm lateral to the pulsation of the femoral artery
• Prepare the skin and apply a windowed drape
• Infiltrate skin and deeper tissues with 5mL of 1% lignocaine along the expected path of the FI catheter
• Pierce the skin with the Touhy needle at right angles. Once just through the skin, adjust the needle angle to about 45degrees directing the tip cranially, keep the needle in the sagittal plane.
• Advance the needle through 2 distinct “pops” as it perforates first the fascia lata, then the fascia iliaca
• Flatten the angle of the needle and skin to about 30degrees and advance the needle a further 1-2 millimeters
• Take note of the depth of the needle at skin (“NEEDLE DEPTH”). Black marks the 4th, 6th and 8th cms.
• Secure the needle with your non-dominant hand and remove the trocar from within the Touhy needle
• Attach the first 20mL syringe of 0.375% ropivacaine to the Touhy needle
• If aspiration is negative for blood, start injecting. **There should be very little resistance to injection.**
• Excessive resistance to injection indicates the needle tip may be within iliacus muscle. In this case, withdraw slightly until injection is easy.
• Inject 20mL slowly, aspirating every 5mL, then detach the syringe from the needle. You have now created a plane filled with local anaesthetic under the fascia iliaca. This facilitates passage of the catheter. It is normal to observe some of the injected
fluid coming back through the needle during syringe change.

- Thread the catheter through the Touhy needle. The catheter tip will start protruding from the tip of the Touhy needle once it passes the 10cm marker (double blue line). You may feel mild resistance at this point, but push through it.
- Continue threading the catheter until you have passed at least 15cm. Stop when you encounter significant resistance or have reached the 20cm marker (quadruple blue line), whichever is reached first.
- Withdraw the Touhy needle, continuing to thread the catheter down the needle at the same rate that the needle is withdrawn, so that the catheter does not come out with the needle.
- Check the CATHETER DEPTH at skin - you will need to record this.
- Attach the yellow connector to the catheter, and connect the antibacterial filter to the yellow connector.
- Connect the 2nd 20mL syringe of ropivacaine and aspirate before injecting.
- Inject the remaining 20mL, aspirating every 5mL. Since you are using a large syringe to inject down a long, fine-bore catheter, expect significant resistance to injection. If you cannot inject at all, the catheter may be kinked or up against tissue. Withdraw the catheter slowly as you continue to inject. But remember: the catheter should not be less than 3cm under fascia iliaca.
- Apply a drop of SurgiSeal tissue sealant to the catheter entry point, allow a few minutes to dry.
- Remove the yellow connector (disengage it by inserting the tip a non-Leuer lock syringe into the connector’s side hole, and lever it open).
- Attach Epi-lock catheter securing patch.
- Trim the catheter (using sterile scissors) to around 20cm above skin.
- Re-attach the yellow connector.
- Cover the filter-connector complex with a Tegaderm “Taco” dressing.

**Documentation: fill out these forms**

1. APS referral form (place in APS tray)
2. Yellow non-neuraxial nerve block audit form (place in APS tray)
3. Regional block catheter infusion order form (place in patient’s notes – Ward/PACU nurses will initiate)

**Re-dosing of local anaesthetic in the Emergency Department**

If a fascia iliaca catheter is inserted in the Emergency Department, as long as the patient remains in the Emergency Department, they will require manual re-dosing by a Medical Practitioner as per the protocol in the infusion order form (re-dose using 20mL of 0.2% ropivacaine every 3 hours).

Infusion pumps will be established once the patient is admitted to the wards.
Useful tips

1. Anatomy: Lateral to medial NAVL (nerve, artery, vein, lymphatics)
2. Create a superficial dermis-level weal of 1% lignocaine at the insertion point to reduce the pain of subsequent skin entry with the larger Touhy needle
3. When advancing the Touhy needle, rest your wrist on the patient’s thigh and “dart-grip” the needle at about the 5cm mark to avoid suddenly overshooting with the loss of resistance
4. Don’t impale the femoral nerve! Stay 1.5-2cm away from femoral pulsation. There should be no pain or paraesthesia on injection.
5. Don’t shear off the catheter tip! If the catheter has been threaded more than 10cm but less than 13cm before you encounter significant resistance, YOU MUST remove the needle and catheter as one unit, and start again. Withdrawing the catheter from the needle once it has already passed beyond the tip of the Touhy needle can result in the sharp tip of the Touhy needle cutting off the tip of the catheter, leaving foreign body within the patient.
6. Success of the block relies on a high volume of local anaesthetic spreading under the fascia iliaca, to bathe the femoral nerve and other nerves. Note that other nerves supplying the hip are not blocked, so some opioid requirement is expected.
7. [Catheter depth] - [Needle depth] = [Length of catheter under the fascia iliaca], which should be between 5 and 10cm (less than 3cm predicts block failure).
8. Obese patient with apron – an assistant can retract the apron cephalad to facilitate access to the groin

Further Reading

- Anaesthetic tutorial of the week 193. Fascia iliaca compartment block: landmark and ultrasound approach
  http://www.frca.co.uk/Documents/193%20Fascia%20iliaca%20compartment%20block.pdf
- New York School of Regional Anaesthesia. Ultrasound guided fascia iliaca block.
Site of injection (Figure A):

This is 1 cm caudal to the inguinal ligament at the junction of the lateral one third and the medial two thirds of a line that joins the pubic spine (1) to the anterior superior iliac spine (2).

Transverse view at the mid-inguinal ligament level. (Figure B):

(3) Femoral vein; (4) femoral artery; (5) femoral nerve; (6) needle insertion for a femoral or three-in-one nerve block; (7) fascia lata; (8) fascia iliaca; (9) needle insertion for a fascia iliaca compartment block; (10) lateral femoral cutaneous nerve.
FASCIA ILIACA CATHETER INSERTION - EQUIPMENT LIST
DROP SHEET

Equipment list

A. Skin marker pen
B. 2x chlorhexidine-alcohol prep sticks (“pink lollipops”)
C. Adhesive drape with a window
D. Basic dressing pack
E. Sterile gloves
F. 5mL syringe
G. 23G (blue) hypodermic needle
H. 18G (pink) blunt drawing up needle
I. 5mL 1% lignocaine
J. 2 x 20mL syringes
K. 20mL of 0.75% ropivacaine
L. 2 x 10mL vials of 0.9% sodium chloride
M. 16G Touhy epidural kit
N. Tissue glue (SurgiSeal or DermaBond)
O. Sterile scissors
P. 2 x large Tegaderm
Q. Documentation:
   a. APS referral form (white single A4)
   b. Epidural/Regional infusion order form (white double-spread sheet)
   c. Yellow non-neuraxial nerve block audit form
PERIOPERATIVE MANAGEMENT OF ANTICOAGULANTS

Changes: Recent studies have shown that bridging anti-coagulation is unwarranted in patients at low or moderate Thrombo-Embolic (TE) risk, and have further established the place of more rapid warfarin reversal with Vitamin K and Prothrombinex. Pre-operative bridging therapy is no longer recommended for NOACs (New Oral AntiCoagulants), and the time of abstinence has been shortened for Dabigatran.

Disclaimer: There are inconsistencies between published guidelines, reflecting the lack of good clinical data. Therefore these should be seen a practical guide rather than a strict protocol. Good communication, documentation and clinical judgement are imperative.

General Instructions

1. Make a clear plan for each patient:
   • If possible, anticoagulated patients should be seen in Anaesthetic clinic at least 1 week before surgery.

2. Determine the need to stop anticoagulants:
   • Continuation may be acceptable for specific procedures such as cataract extractions and endoscopies without intended biopsy – if any doubt check with the surgeon.

3. Stratify the Patient’s Thrombo-Embolic (TE) Risk (Table 1):
   • Patients with Atrial Fibrillation (AF), Mechanical Heart Valves (MHVs) or Venous Thrombo-Embolism (VTE) who meet the criteria in Table 1 should be managed as High TE Risk in the perioperative period.
   • All other patients with MHVs, AF or VTE may be managed as Low TE Risk. Some borderline patients may reasonably be managed as High Risk based on clinical judgement.
Table 1. High Thrombo-Embolic (TE) Risk Factors

- **AF:**
  - With CHADS\textsubscript{2} Score of 5-6 (see Table 2)
  - With recent (<3 months) stroke/TIA/systemic embolus
  - attributable to valvular heart disease

- **MHVs:**
  - Mitral valve
  - Older aortic valve (caged ball/tilting disc); bi-leaflet aortic valve with any CHADS\textsubscript{2} risk factors
  - Any mechanical valve with previous stroke, TIA, or systemic embolic event

- **VTE:**
  - Recent (<3 months ago) DVT or Pulmonary Embolism
  - High Risk Thrombophilia (deficiency in Antithrombin, Protein C, Protein S, Antiphospholipid syndrome, Homozygous Factor V Leiden and Prothrombin variant) or VTE due to active cancer (<6 months since diagnosis)

Table 2. CHADS\textsubscript{2} Score
(establish by totalling points for patients with non-valvular AF)

<table>
<thead>
<tr>
<th>C</th>
<th>Congestive Heart Failure</th>
<th>1</th>
</tr>
</thead>
<tbody>
<tr>
<td>H</td>
<td>Hypertension</td>
<td>1</td>
</tr>
<tr>
<td>A</td>
<td>Age &gt; 75</td>
<td>1</td>
</tr>
<tr>
<td>D</td>
<td>Diabetes</td>
<td>1</td>
</tr>
<tr>
<td>S\textsubscript{2}</td>
<td>Stroke/TIA</td>
<td>2</td>
</tr>
</tbody>
</table>

4. Implement plan for the patient’s TE Risk for their specific medication and surgery
   - See relevant medication section below
   - Consider guidelines for neuraxial anaesthesia (Section 4) if relevant

5. Document the management plan:
   - On the Anaesthetic assessment sheet
   - In the patient’s notes (ieMR)
   - Give written instructions to the patient
Specific Anticoagulant Medications

1. WARFARIN – Vitamin K antagonist

Pre-operative Warfarin Management – High TE Risk Patients (Table 3)

- **Two days** before surgery take last dose of warfarin
- **One day** before surgery give Vitamin K1 (Konakion) - 5 mg oral or 3 mg IV (eg at Preadmission Clinic or DSU)
- **Check INR on the day of surgery** (i-stat). Give Prothrombinex if INR ≥ 1.5 (see Table 5) and repeat INR to ensure < 1.5.

<table>
<thead>
<tr>
<th>Table 3. Preop Warfarin for High Thrombotic Risk</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-op</td>
</tr>
<tr>
<td>------</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Normal Warfarin</td>
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<td></td>
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</tbody>
</table>

Post-operative Warfarin Management – High TE Risk Patients

- Recomence regular warfarin dose on the night of surgery unless there are bleeding concerns (discuss with surgical team).
- Unless there are bleeding concerns, start either IV UFH infusion (without loading dose) at 12-24 hours post-op aiming for 1.5X APTT; or LMWH at prophylactic dose for 24-72 hours (depending on bleeding risk), then treatment dose (eg enoxaparin 1.5mg/kg daily or 1mg/kg bd).
- Continue UFH or LMWH for 2 days after INR is therapeutic

Pre-operative Warfarin Management – Low TE Risk Patients (Table 4)

- Give last warfarin dose 5 days pre-operatively
- Check INR on the day of surgery (i-stat). Give Prothrombinex if INR ≥ 1.5 (see protocol on reversal of Warfarin) and repeat INR to ensure <1.5.
Table 4. Preop Warfarin for Low Thrombotic Risk

<table>
<thead>
<tr>
<th>Pre-op Day 5</th>
<th>Pre-op Day 4</th>
<th>Pre-op Day 3</th>
<th>Pre-op Day 2</th>
<th>Pre-op Day 1</th>
<th>Day of op</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal Warfarin</td>
<td>Rest Day (No warfarin)</td>
<td>Rest Day</td>
<td>Rest Day</td>
<td>Rest Day</td>
<td>Check INR (i-stat) Prothrombinex as required</td>
</tr>
</tbody>
</table>

Post-operative Warfarin Management – Low TE Risk Patients

- Recomence regular warfarin dose on the night of surgery unless there are bleeding concerns.
- Bridging anticoagulant therapy is not required (but VTE prophylaxis as indicated).

URGENT SURGERY ON WARFARIN

a. Immediate reversal required, but no active bleeding

- Give Prothrombinex-VF. This contains factor II, IX and X., with only very small amounts of factor VII. Despite this, adequate reversal of warfarin can be achieved without the need for additional FFP in most cases.
- Prothrombinex-VF can normalise the INR in 15 minutes in appropriate doses (see Table 5)
- The infused clotting factors have a half-life of about 24 hours. Therefore, vitamin K IV eg 1-3 mg will need to be given for sustained effect.
- If Prothrombinex is unavailable administer FFP 15ml/kg

Table 5. Suggested Prothrombinex Dose to achieve Target INR of < 1.5

<table>
<thead>
<tr>
<th>Initial INR</th>
<th>1.5-2.5</th>
<th>2.6-3.5</th>
<th>≥3.6</th>
</tr>
</thead>
<tbody>
<tr>
<td>25 IU/kg</td>
<td>35 IU/kg</td>
<td>50 IU/kg</td>
<td></td>
</tr>
</tbody>
</table>

b. Immediate warfarin reversal for life-threatening bleeding

Give:

- Vitamin K 5-10mg IV
• Prothrombinex –VF 50 IU/kg
• FFP 150-300ml
• If Prothrombinex is unavailable administer FFP 15ml/kg
2. DABIGATRAN (Pradaxa®) – Direct Thrombin Inhibitor

General Notes

- Popular because of rapid anticoagulation and no need for routine monitoring
- Not currently indicated for Mechanical Heart Valves or Valvular AF
- Mostly (80%) renally excreted; $T_{1/2}$ varies accordingly: **14h with normal eGFR**, 20 hours with eGFR 30-50ml/min; 30h eGFR <30 ml/min
- Contra-indicated with eGFR < 30ml/min

Pre-operative Dabigatran Management – both Low and High TE Risk

- Assess patient’s renal function. If eGFR < 30, then cease Dabigatran immediately
- Timing of last dose of Dabigatran depends on eGFR ([Table 6](#))
- Check Thrombin Time (TT) on admission or prior to surgery IF considering neuraxial blockade or very high bleeding risk; not routinely required. If normal, no Dabigatran present.
- Bridging therapy is not required due to short period of abstinence

<table>
<thead>
<tr>
<th>Day of surgery</th>
<th>Pre-op Day 5</th>
<th>Pre-op Day 4</th>
<th>Pre-op Day 3</th>
<th>Pre-op Day 2</th>
<th>Pre-op Day 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal doses (for most)</td>
<td>Normal doses (for most)</td>
<td>Normal doses (for most)</td>
<td>Rest Day (omit)</td>
<td>Rest Day</td>
<td>Rest Day</td>
</tr>
<tr>
<td>Rest Day if: eGFR &lt; 30ml/min</td>
<td>Rest Day if: eGFR &lt; 50ml/min</td>
<td>Rest Day if: eGFR &lt; 80ml/min</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Post-operative Dabigatran Management – Low and High Thrombotic Risk

- Re-starting must involve discussion with the surgical team re bleeding risk
- Do not restart Dabigatran if eGFR < 30ml/min; discuss with treating physician re alternative treatment.
- If haemostasis satisfactory then Dabigatran may be started at usual dose 12-24 hours post-op (low bleeding risk) or 48-72 hours (higher bleeding risk)
- Bridging therapy is generally not required due to rapid onset of anti-coagulant effect.
• If commencement of Dabigatran is delayed, and the patient is High TE Risk, then consider either IV UFH infusion **without** a bolus dose, or SC LMWH (prophylactic dose for 24-72 hours, depending on bleeding risk, then treatment dose).

**URGENT SURGERY ON DABIGATRAN**

• Consider oral activated charcoal if Dabigatran ingested in last 2 hours
• Delay surgery for 4-5 half-lives if possible (eg 3 days, or Table 6)
• Check Thrombin Time, renal function
• Neuraxial anaesthesia contraindicated unless TT normal
• Cross match blood and see advice for Management of Bleeding

**Management of Bleeding on Dabigatran**

• Supportive measures
• Identification and management of bleeding source
• Consider Tranexamic acid IV 15 mg/kg, followed by infusion of 1mg/kg/hr
• Consider bolus dose of Factor VIIa (50 mcg/kg) and repeat if severe haemorrhage.
• Haemodialysis for 4-6 hours is effective and can remove up to 60 % of Dabigatran
• Prothrombinex, Vitamin K and FFP are NOT effective. The effect of Factor VIIa is currently unknown.
• (Idarucizumab is a Dabigatran-specific (Fab) antibody which rapidly reverses the effect of Dabigatran, but is not yet commercially available in Australia)
3. RIVAROXABAN (Xarelto®) (t ½ 8h) and APIXABAN (Eliquis®) (t ½ 12h) - Direct Factor Xa Inhibitors

General Notes

- Popular because of rapid dosing and no need for routine monitoring
- Not currently indicated for Mechanical Heart Valves or Valvular AF
- Although the half-lives are slightly different, recommended time intervals for abstinence are currently the same for the different agents
- Excretion is approximately 30% renal and 70% hepatic.
- Contra-indicated with eGFR <30ml/min or hepatic disease with coagulopathy

Pre-operative Riv/Apixaban Management – both Low and High TE Risk

- Check renal and hepatic function (and coags if likely hepatic disease)
- Give last pre-operative dose Riv/Apixaban according to Table 7.
- A shorter period of abstinence (eg 2 days) is adequate for low-moderate bleeding risk procedures in patients without hepato-renal disease, esp for low dose (eg thromboprophylaxis) Riv/Apixaban.
- No pre-op bridging therapy is required due to the short period of abstinence
- Pre-operative coagulation studies are generally NOT recommended. However, establishing that PT (and esp anti-Xa levels if available) are normal may be reasonable if absolute haemostasis is required, especially if the period of abstinence is shorter than desired.

<table>
<thead>
<tr>
<th>Table 7. Pre-op Riv/Apixaban Management</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-op Day 5</td>
</tr>
<tr>
<td>Normal dose (for most)</td>
</tr>
<tr>
<td>Rest Day if: Child-Pugh C</td>
</tr>
</tbody>
</table>
Post-operative Riv/Apixaban Management

- Re-starting must involve discussion with surgical team re bleeding risk
- **Do not** restart Riv/Apixaban if eGFR < 30ml/min or Child-Pugh B or C. Discuss with treating physician regarding alternative treatment.
- If haemostasis is satisfactory then Riv/Apixaban may be re-started at usual dose 12-24 hours post-op
- Bridging therapy is generally not required due to rapid onset of anti-coagulant effect.
- If higher bleeding risk, re-start Riv/Apixaban 48-72 hours postoperatively
- If commencement of Riv/Apixaban is delayed (eg ileus), AND the patient is High TE Risk, then consider either IV UFH infusion **without** a bolus dose, or SC LMWH (prophylactic dose for 24-72 hours, depending on bleeding risk, then treatment dose).

**URGENT SURGERY ON RIV/APIXABAN**

- Consider oral activated charcoal if Riv/Apixaban was ingested in the last 2 hours
- Consider delaying surgery for 4-5 half-lives (eg 2-3 days, or Table 7)
- Cross match blood, check PT +/- anti-Xa levels, renal and hepatic function
- Neuraxial anaesthesia contraindicated unless anti-Xa levels normal

Management of Bleeding in Riv/Apixaban

- Supportive measures
- Identification and management of bleeding source
- In severe bleeding consider:
  - Prothrombinex 50 IU/kg (shows benefit in experimental studies)
  - Tranexamic acid 1g then infusion 1mg/kg/hr
  - Factor VIIa 50mcg/kg and repeat if critical bleeding
- (Andexanet alpha is a binding reversal agent for Xa inhibitors that is under development but not yet commercially available)
4. Neuraxial Blockade

- Neuraxial blockade should only be undertaken:
  - with a normal (<1.5) INR – Warfarin
  - after the time period in Table 6 or normal TT – Dabigatran
  - after the time period in Table 7 or normal PT/anti-Xa – Riva/Apixaban.

- Epidural catheters are contraindicated with treatment dose Dabigatran or Riva/Apixaban. If treatment doses are given inadvertently, epidural catheter removal should be delayed for a time period according to Tables 6 and 7.

- Removal of an epidural catheter should be delayed for >24 hours after low dose once daily (DVT prophylaxis) Dabigatran or Riva/Apixaban.

- Dabigatran or Riva/apixaban should not be administered until at least 6 hours after spinal anaesthesia or epidural catheter removal.

5. References:


3. UpToDate®. Perioperative thrombotic risk; Perioperative management of direct thrombin inhibitors and factor Xa inhibitors; Timing of neuraxial anesthesia during antithrombotic therapy; all accessed Dec 2015


PERIOPERATIVE MANAGEMENT OF DIABETES MELLITUS IN ADULTS

General Considerations

- Ensure optimal glycaemic control prior to surgery.
- Frequent monitoring of Blood Glucose Level (BGL) is the key to good control.
- Patients with diabetes, especially type I (IDDM) and insulin requiring type II should be first on the list if possible.
- People with type I diabetes require a constant supply of background insulin to prevent ketoacidosis. However, an insulin infusion can be temporarily ceased when BGL <7 mmol/l.
- IV Dextrose infusion is required for all patients with IDDM and all patients on an insulin infusion. A minimum of 100-150g exogenous glucose (2-3 L of 5% Dextrose) per day is needed for protein sparing and to prevent ketosis.
- BGL’s >12 mmol/l are associated with poor wound healing, infections and osmotic diuresis.
- The patient’s fluid and cardiovascular status should be reviewed at least daily. Additional N/Saline ± KCl is often required for optimal fluid and electrolyte balance. Electrolytes should be measured every 24 hours in patients on a Dextrose infusion.
- The following management plan and insulin regimens are guidelines only, and experienced medical staff may choose to vary management in specific situations.
- Cease Metformin 1 day prior to any investigation using potentially nephrotoxic IV contrast agent, and recommence 1 day after investigation.
- All treatment orders should be clearly prescribed.

Diabetics normally on drug treatment should be discussed with the relevant anaesthetist preoperatively. The endocrine unit is available for consultation and should be notified of all unstable patients.
1 DIET TREATED

Blood Glucose Monitoring

- 6 hourly preoperatively
- 1-2 hourly intra-operatively
- 4 hourly postoperatively until stable

Preoperative Management

1 Well Controlled (BG consistently <12 mmol/l)
   No insulin or IV Dextrose required.

2 Poorly Controlled (BG consistently >12 mmol/l or fluctuating widely)
   Increase BGL monitoring to 4 hourly.
   Will need stabilisation preoperatively.

   Commence insulin therapy:
   - insulin infusion and IV Dextrose infusion
     OR
   - sliding scale SC insulin with Dextrose 5% at 80-100 ml/hour.

Postoperative Management

Commence or continue insulin therapy (as above) if BG consistently >12 mmol/l.

Resume usual diet when able.
2 OHA TREATED (Oral hypoglycaemic Agent)

Blood Glucose Monitoring

- 6 hourly preoperatively
- 1-2 hourly intra-operatively
- hourly postoperatively until stable

Preoperative Management

Omit all oral hypoglycaemic agents on the morning of surgery

Well Controlled (BG consistently <12 mmol/l)

No insulin or IV Dextrose required initially

However, insulin will often be required for major surgery

Poorly Controlled (BG consistently >12 mmol/l or fluctuating widely)

Increase BGL monitoring to 4 hourly.

Will need stabilisation preoperatively.

Commence insulin therapy:

- insulin infusion and IV Dextrose infusion

  OR

- sliding scale SC insulin with Dextrose 5% at 80-100 ml/hour.

Postoperative Management

- Commence or continue insulin therapy (as above) if BG consistently >12 mmol/l.
- Resume usual OHA treatment once eating resumed or when insulin no longer required.
3 INSULIN TREATED

Blood Glucose Monitoring

- 4-6 hourly preoperatively.
- 1-2 hourly intraoperatively.
- 1-2 hourly postoperatively for at least 6 hours.
- 4-6 hourly once BG stable and insulin infusion not required.

Preoperative Management

Well Controlled (BG consistently >5 and <12 mmol/l)

Minor Surgery

- Give HALF the normal morning dose of intermediate/long acting insulin SC and OMIT short-acting insulin, and at 8am start IV 5% Dextrose infusion at 80-100 ml/hour via infusion pump.

[Examples: If on pre-mixed insulin (such as MIXTARD, HUMULIN 30/70) give half the total daily dose in the form of ISOPHANE insulin (eg. Protaphane or Humulin NPH) SC. Alternatively for afternoon surgery give half the usual morning pre-mixed insulin dose with a light breakfast.]

OR

- Withhold normal insulin; commence IV insulin infusion and Dextrose infusion.

Major Surgery

- Withhold normal insulin. At 8am start IV insulin infusion and Dextrose infusion.

Poorly Controlled (BG consistently >12 mmol/l or fluctuating widely)

- Will need stabilisation preoperatively.
- Commence insulin therapy:
  - IV insulin infusion and Dextrose infusion.

Postoperative Management

- Continue Dextrose infusion (and insulin infusion if used preoperatively) until eating resumed.
- If BGL satisfactory revert to usual therapy.
- If BGL consistently >12 mmol/l
  - increase insulin infusion rate

OR
• increase dose of SC insulin.

IV INSULIN INFUSION

----- Indications

Optimal perioperative management of diabetes

1. Insulin Solution
   Actrapid insulin 50 units in 50 ml to be delivered by a syringe driver.
   
   [0.5 ml of 100 U insulin + 49.5 ml NaCl]

   NB. Use Qld Govt Infusion Order and Blood Glucose Record – Adult

2. Dextrose Solution
   IV Dextrose 5% at 80-100 ml per hour by infusion pump.
   
   NB. Use standard fluid order chart.

   If fluid restriction is an issue, 10% Dextrose at 40-50 ml/hr via a large peripheral cannula can be used.

   Postoperative fluids should be dealt with separately from the Dextrose infusion.

   Both infusions must run via the same cannula (with Dextrose as the main line and insulin as the secondary “piggy back” line).

3. Blood Glucose Monitoring
   Monitor HOURLY for the first 6 hours. If stable (consistently 5-10 mmol/l), then 2 HOURLY while the patient remains on IV insulin infusion.

4. Recommended Initial Infusion Rate
   (Qld Government Standard Order recommendations)

<table>
<thead>
<tr>
<th>BGL (mmol/l)</th>
<th>Insulin (unit/hour)</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 4.0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Give 30 ml of 50% Dextrose IV and check BGL after 15 min</td>
</tr>
<tr>
<td>0 - 5.0</td>
<td>0</td>
</tr>
<tr>
<td>BGL Range</td>
<td>Adjustment</td>
</tr>
<tr>
<td>-----------</td>
<td>------------</td>
</tr>
<tr>
<td>5.1 - 7.0</td>
<td>0.5</td>
</tr>
<tr>
<td>7.1 - 10.0</td>
<td>1</td>
</tr>
<tr>
<td>10.1 - 15.0</td>
<td>2</td>
</tr>
<tr>
<td>15.1 - 20.0</td>
<td>3</td>
</tr>
<tr>
<td>&gt;20</td>
<td>4</td>
</tr>
</tbody>
</table>

If BGL < 5 or > 15 mmol/l, notify MO

- CONTINUE the Dextrose infusion if insulin infusion is ceased (BGL < 7.0).
- If BGL < 5.0 mmol/l, BG measurements must continue at an HOURLY rate.
- RECOMMENCE insulin infusion once BGL > 7.0 mmol/l.
- If BGL consistently < 5.0 mmol/l, decrease scale by 0.5-1.0 unit/hour or increase Dextrose.
- If two consecutive BGL’s > 15.0 mmol/l, increase dose by 0.5-1.0 unit/hour.
- If unsure, seek Senior advice or ask Endocrine team.

5. Review of BGL

Should be made by MEDICAL STAFF frequently (at least twice a day) for safety reasons and to allow review of insulin infusion rate.

6. Insulin Administration

No other form or route of insulin should be given whilst having insulin infusion.

7. Normal Regimen of Insulin

Start approximately 1 hour prior to ceasing the infusion.
SLIDING SCALE INSULIN (Subcutaneous)

This may be used peri-operatively when insulin requirements are unpredictable, but when intensive IV treatment is not required (eg satisfactory control, likely short duration without normal diet).

It should only be used temporarily, as wide swings in BGL may occur.

Short-acting insulin (Actrapid or Humulin R) should be used 6 hourly and prescribed in ‘Supplemental Insulin Orders’ on the Queensland Government Insulin Subcutaneous Order and Blood Glucose Record sheet.

Initial dosing can be weight-based, but adjusted according to BGLs.

**Suggested initial dose of short acting insulin**

<table>
<thead>
<tr>
<th>BGL (mmol/l)</th>
<th>Weight 50 - 100kg</th>
<th>Weight 100.1 - 150kg</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;8.1-12</td>
<td>2 units</td>
<td>3 units</td>
</tr>
<tr>
<td>12.1-16</td>
<td>4</td>
<td>6</td>
</tr>
<tr>
<td>16.1-20.0</td>
<td>6</td>
<td>9</td>
</tr>
<tr>
<td>&gt;20.0</td>
<td>8</td>
<td>12</td>
</tr>
</tbody>
</table>

The above Queensland Government sheet should be consulted for ongoing management and further information
1. General Guidelines

- Antiplatelet Agents (APAs) are used increasingly to prevent arterial thrombosis. Dual antiplatelet therapy (DAPT) is usual for patients at high risk, especially after placement of coronary artery stents or after acute coronary syndromes (ACSs).

- The risk of thrombosis versus haemorrhage should be determined for each patient.

- At present, platelet function tests are not widely available for routine use. Consequently, decisions usually need to be based on drug pharmacology and the available outcome data.

- Table 1 provides a schema for decision making for APAs. Frequently, the final decision will require a judgement regarding the balance of risks.

- Please be aware:
  - For patients at the highest risk of thrombosis (eg new coronary artery stent plus a recent acute coronary event), the risk of death or further coronary events is extreme (eg>50%).
  - Combinations of anticoagulant drugs with different actions (eg combinations of APAs and/or heparin) greatly potentiate the anti-thrombotic effect and risk of bleeding.
  - For some surgical patients bleeding from continued APA therapy can result in death or severe morbidity.

- Considerations re postponing surgery: Depending on the surgical condition, surgery should be delayed until the thrombotic risk is less, preferably until DAPT (dual antiplatelet therapy) is no longer required. If this is not possible, delaying until after 6 months after stent placement or ACS greatly reduces the risk. Stopping DAPT within 6 weeks of stent placement should be avoided if at all possible.

- Patient transfer: Depending on the adjudged risk of thrombosis, possible transfer for surgery to a centre with at least daytime or even 24-hour re-stenting capacity should be considered. However, as a possible thrombosis is unpredictable in its timing, the duration of stay in that location (eg for surgical recovery; 3 or 7 days) is unclear.

- Epidural/spinal anaesthesia and other nerve blocks: Neuraxial blockade is acceptable on Aspirin and other NSAIDs. However neuraxial blockade, and other blocks where control of bleeding from vascular injury is difficult, should generally NOT be performed for 5-7 days after clopidogrel, 7-10 days after prasugrel and 3-5 days after Ticagrelor. The risk is probably higher for an epidural (esp with a catheter) than a single shot spinal. An epidural catheter should be REMOVED at least 2 hours before potent APAs are started.
• For patients on both APAs and warfarin (eg for atherosclerosis and AF), try to determine the major risk factor and manage according to the relevant perioperative protocol (APA or warfarin).
• APAs should be re-started once the risk of major bleeding is minimal. This may vary from 1 to 7 days post-op. A loading dose should be considered.
• Multi-disciplinary consultation (and careful discussion with the patient) and clear documentation is necessary for complex patients.
• As duration of required DAPT is variable depending on patient and stent-related factors (eg branching, length), consultation with the treating cardiologist is recommended for all such patients.

2. Different Antiplatelet Agents
• **Aspirin** and **ADP P2Y12 receptor antagonists** (Clopidogrel, Prasugrel, Ticagrelor) are inhibitors of platelet function through different mechanisms. The P2Y12 antagonists are more potent than Aspirin; Prasugrel and Ticagrelor are more potent than Clopidogrel. The clinical effect is longest for Prasugrel (7d) and shortest for Ticagrelor (3d), which is a competitive antagonist.
• **Dipyridamole** (Persantin) is used in CVA prophylaxis in combination with aspirin. Its duration of effect is only 12 hours.
• **GPIIb/IIIa inhibitors** are intravenously administered in acute coronary settings. The effect of **Abciximab** lasts 12-24 hours; **Tirofiban** lasts for only 2-4 hours.
• **Non-selective NSAIDs** have a reversible effect, with a duration of action ranging from hours (eg ibuprofen) to a couple of days (eg naproxen).

3. Emergency Surgery
• For an irreversible APA (eg Aspirin, Clopidogrel, Prasugrel) no obvious improvement in platelet function can be expected within 24 hours, whereas significant improvement occurs by 48-72 hours from platelet regeneration.
• The use of **platelet function tests** (PFTs) has been validated in emergency situations: >50% platelet function indicates that surgical bleeding due to platelet dysfunction is very unlikely. So consider cessation of APAs for 48-72 hours then PFTs.
• **Platelet transfusion** may be helpful for treatment of excessive bleeding due to Aspirin and P2Y12 antagonists, as is factor VIIa. The place of prophylactic platelet transfusion is unclear.
• For the GP IIb/IIIa inhibitors, it is preferable to wait 12-24 hours after stopping Abciximab and 2-4 hours after Tirofiban, rather than transfusing platelets with a large amount of active drug present.
References


- Double antiplatelet therapy after Drug-eluting stent implantation. Risks associated with discontinuation in the first year. Ferreira-Gonzalez I et al. JACC 2012; 60:1333-1339


- Regional Anaesthesia in the patient receiving antithrombotic and antiplatelet medication. Horlocker T. Br J Anaes 2011;107(S1) i96-i106
Table 1: Management of Aspirin and Clopidogrel in Elective Surgical Patients

<table>
<thead>
<tr>
<th>Category</th>
<th>Examples</th>
<th>Management</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Extreme</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Death 5-15%</td>
<td>*DES or **BMS with 6 weeks</td>
<td>• Postpone surgery¹; If impossible, NSubstitute short-acting anti-platelet drug eg tirofiban infus’n until 4/24 preop</td>
</tr>
<tr>
<td></td>
<td><strong>ACS within 6 weeks</strong></td>
<td>• Consider transfer to centre with re-stenting capacity², AND Continue aspirin only from 5-7 d pre-op</td>
</tr>
<tr>
<td></td>
<td>DES and/or ACS &gt; 6 weeks but within 1 year still requiring DAPT*</td>
<td>• Continue or stop APAs 5d preop</td>
</tr>
<tr>
<td>High</td>
<td>DES and/or ACS &gt; 6 weeks but within 1 year still requiring DAPT*</td>
<td>• Postpone surgery¹; If impossible, NSubstitute short-acting anti-platelet drug eg tirofiban infus’n until 4/24 preop</td>
</tr>
<tr>
<td></td>
<td>Other DES or BMS patients</td>
<td>• Postpone surgery¹; If impossible, NSubstitute short-acting anti-platelet drug eg tirofiban infus’n until 4/24 preop</td>
</tr>
<tr>
<td></td>
<td>Ischaemic Heart Disease (chronic); TIA/CVA (previous)</td>
<td>• Continue or stop APAs 5d preop</td>
</tr>
<tr>
<td></td>
<td>Stop APAs 7-10d pre-op</td>
<td>Stop APAs 7-10d pre-op (except continue single APA for carotid or peripheral vascular surgery)</td>
</tr>
<tr>
<td>Moderate</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Death + MI/repeat 1-5%; CVA 0.2-1%</td>
<td>Other DES or BMS patients</td>
<td>Stop APAs 5-7 d pre-op OR Continue aspirin only from 5-7 d pre-op</td>
</tr>
<tr>
<td></td>
<td>Ischaemic Heart Disease (chronic); TIA/CVA (previous)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Stop APAs 5-7 d pre-op</td>
<td></td>
</tr>
<tr>
<td>Minor</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Death + MI/repeat &lt;1%</td>
<td>HT/DM etc alone without proven IHD</td>
<td>Stop APAs 5-10d preop</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*DAPT – dual antiplatelet therapy; **APAs – antiplatelet agents; *DES – Drug-eluting stent; **BMS – Bare metal stent; **ACS – acute coronary syndrome; ¹see notes re postponing surgery; ²see notes re patient transfer

Version 4.1 Dec 2014
POSTOPERATIVE VENOUS THROMBOEMBOLISM (VTE)

Introduction:

The management of patients with suspected or proven thromboembolism in the postoperative period is problematic. The risk of death or major morbidity from pulmonary embolus or venous thrombosis must be balanced with the risk of bleeding from the operative site, the gastro-intestinal tract, or at the site of other invasive procedures (such as epidurals or arterial lines).

Guidelines:

- Confirmation of the diagnosis with appropriate radiological imaging is essential, as the symptoms and signs of thromboembolism are non-specific. Urgent imaging is required in unstable patients who are also at high risk of bleeding complications. There is no place for the measurement of D-dimer, which is raised in most postoperative patients with or without VTE.

- Heparinisation should not be commenced in the postoperative patient before the diagnosis is proven, unless there is a high clinical suspicion of pulmonary embolism. Initial management should focus on simple resuscitative measures (ABC) and determining the diagnosis.

- Patients who have been significantly hypoxic or haemodynamically unstable should initially be managed in a Critical Care environment (ICU or CCU). Early involvement of relevant staff is required for these patients.

- Senior consultation between surgeon, physician and anaesthesia/intensive care is necessary. The risk of death from pulmonary embolism varies, depending chiefly on cardiorespiratory reserve and the site and extent of embolism (determined by imaging). The risk of bleeding will also vary, depending on the nature of surgery and time elapsed. Management therefore must be individualised, with consideration of the relative merits of heparinisation or a vena caval filter.

- If heparinisation is indicated, un-fractionated heparin (and monitoring of APTT) should be used within the first two weeks of major surgery, as low molecular weight heparins (eg Clexane) are difficult to reverse in the event of bleeding.

- Before heparinisation, epidural catheters should be removed, if possible at least 1-2 hours beforehand, to minimise the risk of an epidural haematoma.

References:


PREOPERATIVE ASTHMA AND REFLUX THERAPIES

Asthma

i. Asthmatics are at higher risk of perioperative respiratory complications, including bronchospasm.

ii. Optimal control of asthma in the preoperative period is important to minimise this risk.

iii. Patients should continue their usual therapy (especially ‘preventers’).

iv. Nebulised salbutamol immediately pre-operatively is usually warranted.

v. Consider oral prednisolone 0.5 – 1.0mg/kg for three days preoperatively in the following asthmatic patients:
   • Currently wheezy
   • FEV1 <60%
   • Admitted to ICU with asthma in the past
   • Inpatient with asthma in the past year
   • Visit to Emergency Department in the past 6 months
   • Normally on oral prednisolone
   • Have taken oral prednisolone in the past 6 months.
   (Oral prednisolone is available ‘pre-packed’ in the Anaesthetic Clinic)

vi. Explain to the patient the reason for these measures, to improve compliance.

Reflux

i. Patients with gastro-oesophageal reflux are at higher risk of pulmonary aspiration during anaesthesia.

ii. The following is advised for such patients:
   • Attention to fasting guidelines and consideration of regional anaesthesia
   • Continuation of any current anti-reflux treatments (ie PPIs or H₂ blockers)
   • Advise patient to take their PPI/H₂ blocker on the morning of surgery
   • If symptoms are poorly controlled despite treatment, prescribe sodium citrate (30ml of 0.3M solution), to be taken just before coming to theatre
   • If not on treatment, give famotidine 40mg tablet the night before and the morning of surgery (‘pre-packed’ in anaes clinic), or prescribe a PPI (eg omeprazole 20 mg).

iii. Patients for elective CS should receive famotidine as above; sodium citrate should be given for emergency CS.

iv. Explanation of the reason for these measures (‘to avoid food or acid going into the lungs’) seems to improve compliance.
PREOPERATIVE FASTING FOR ADULT INPATIENTS

- General anaesthesia (GA) depresses protective upper airway reflexes, predisposing patients with significant residual gastric contents to the dangerous complication of pulmonary aspiration.
- Patients for GA should therefore be fasted for sufficient time to minimise gastric contents.
- Patients for sedation are also vulnerable, and patients for regional anaesthesia sometimes require conversion to GA. Consequently, both of these groups should also be fasted.
- Lengthy fasting is, however, uncomfortable for many patients, and can result in dehydration, ketosis and hypoglycaemia.
- This protocol is intended to minimise both the risk of aspiration and the physiological impact of fasting.

Recommendations for Patients Undergoing Elective Surgery

- Water may be consumed up to 2 hours prior to the scheduled surgery.
- Solids, or fluid other than water may be consumed up to 6 hours preoperatively
- After a particularly heavy or fatty meal an overnight fast is warranted.
- It is strongly suggested that surgery should be postponed for 12 hours in patients who have recently drunk alcohol, taken hallucinogenic drugs, or smoked.
- Routine medication should usually be taken at the prescribed time, with a sip of water if needed.
- Each patient should be individually assessed to exclude co-morbidities that may necessitate variation in fasting times, or the use of prokinetic or alkalinising agents. (see below)

Special Situations

The following specific groups of patients may be at increased risk of aspiration and their fasting requirements should be discussed with the attending anaesthetist:

<table>
<thead>
<tr>
<th>Those who are:</th>
<th>or those with:</th>
<th>and those who are:</th>
</tr>
</thead>
<tbody>
<tr>
<td>– Morbidly obese</td>
<td>– Ileus or gastric stasis</td>
<td>– Receiving opioids</td>
</tr>
<tr>
<td>– Pregnant</td>
<td>– Significant oesophageal reflux</td>
<td>– Having an emergency procedure</td>
</tr>
<tr>
<td>– Diabetic</td>
<td>– A potentially difficult airway</td>
<td></td>
</tr>
</tbody>
</table>
PREOPERATIVE FASTING FOR PAEDIATRIC INPATIENTS (ELECTIVE SURGERY)

General Rules:

- Children must fast for six hours from food or milk drinks before their operation.
- Babies less than six months of age (breast or bottle-fed) must fast for four hours.
- Clear fluids (cordial or water) may be given until two hours before the scheduled time of the operation.

Further Points:

- Parents or ward staff should time the fasting period for 8.00 am surgery if the child is on a morning or all day operating list, and 1.00 pm surgery if the child is on an afternoon list.
- If surgery is in the AFTERNOON then a light breakfast of toast and milk fluids may be given until 7.00 am.
- Regular medications, analgesics and pre-medication ordered by the Anaesthetist should be given, even within 2 hours before the procedure. IF THERE IS ANY UNCERTAINTY, the attending Anaesthetist (or the Anaesthetist on call) SHOULD BE CONTACTED for advice.
- Any variation to these guidelines can only be authorised by the Anaesthetist.
- FAILURE TO OBSERVE THESE GUIDELINES MAY RESULT IN THE PROCEDURE BEING DEFERRED OR CANCELLED.
PREOPERATIVE FASTING FOR DAY SURGERY PATIENTS

- General anaesthesia (GA) depresses protective upper airway reflexes, predisposing patients with significant residual gastric contents to the dangerous complication of pulmonary aspiration.
- Patients for GA should therefore be fasted for sufficient time to minimise gastric contents.
- Patients for sedation are also vulnerable, and patients for regional anaesthesia sometimes require conversion to GA. Consequently, both of these groups should also be fasted.
- Lengthy fasting is, however, uncomfortable for many patients, and can result in dehydration, ketosis and hypoglycaemia.
- Patients are occasionally called to theatre earlier than anticipated due to changes in list order, shorter than planned operating times and unexpected cancellations. When these patients are not fasted when called to theatre it results in disruption to the theatre schedule. This can lead to delays and/or cancellations to the elective list. Fasted patients from other lists (e.g. emergency list) will be called for to avoid wasting theatre time and resources.
- This protocol is intended to minimise both the risk of aspiration and the physiological impact of fasting.

General Rules:

- Patients must fast for SIX hours from food and all fluids other than water before their operation.
- Patients booked on MORNING and ALL-DAY operating lists must fast from MIDNIGHT.
- ONLY patients booked on operating lists STARTING AFTER 12:30 PM may have a light breakfast BEFORE 06:30 AM. A light breakfast may include toast/cereal/milk products, and excludes fried food/meat/egg.
- Patients should be ENCOURAGED TO DRINK WATER up until 2 hours prior to surgery. Day surgery staff should consult with the team leader for each theatre to determine how long it will be before the patient is called to theatre.
- Patients who have persistent symptoms or signs related to prolonged fasting should receive treatment. The attending anaesthetist should be consulted, and will make necessary arrangements.
- Patients who have a reduced capacity to fast prior to surgery should be identified prior to booking and scheduled at the beginning of the operating list. This includes children, the elderly, diabetics, pregnant and mentally disabled patients.
Patients who have fasted on successive days should also be scheduled at the beginning of the list.

**Further Points:**

- Regular medications, analgesics and pre-medication ordered by the Anaesthetist should be given, even within 2 hours before the procedure. **IF THERE IS ANY UNCERTAINTY**, the attending Anaesthetist (or the Anaesthetist on call) **SHOULD BE CONTACTED** for advice.
- Any variation to these guidelines can only be authorised by the Anaesthetist.
- **FAILURE TO OBSERVE THESE GUIDELINES MAY RESULT IN THE PROCEDURE BEING DEFERRED OR CANCELLED.**

**Special Situations:**

The following specific groups of patients may be at increased risk of aspiration and their fasting requirements should be discussed with the attending anaesthetist.

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</tr>
<tr>
<td>– Diabetic</td>
<td>– A potentially difficult airway</td>
<td></td>
</tr>
</tbody>
</table>


# ROUTINE PREOPERATIVE INVESTIGATIONS

## AGE

<table>
<thead>
<tr>
<th>Age</th>
<th>Investigations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Over 60</td>
<td>ECG, FBC, UEC</td>
</tr>
</tbody>
</table>

## PROPOSED OPERATION

These investigations should be ordered no matter how young or fit the patient

<table>
<thead>
<tr>
<th>Proposed Operations</th>
<th>Investigations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bowel Surgery, Hysterectomy, Major Joint Surgery, Major Back Surgery, TURP, Major Vascular Surgery</td>
<td>FBC, Iron Studies (IS), UEC</td>
</tr>
</tbody>
</table>

## HEALTH QUESTIONNAIRE

These investigations should be ordered no matter how minor the surgery

<table>
<thead>
<tr>
<th>Health Questionnaire</th>
<th>Investigations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heart Disease (including HTN)</td>
<td>ECG, FBC, UEC</td>
</tr>
<tr>
<td>Respiratory Disease (except mild asthma)</td>
<td>ECG (&gt;40 years old), FBC, UEC</td>
</tr>
<tr>
<td></td>
<td>Chest X-ray or PFT are not routine investigations for patients with respiratory disease, these should only be ordered depending on the clinical findings</td>
</tr>
<tr>
<td>Diabetes mellitus</td>
<td>ECG (&gt;40), FBC, UEC, Glu, HbA₁C</td>
</tr>
<tr>
<td>Renal Disease</td>
<td>ECG (&gt;40), FBC, UEC, Mg, Ca, PO₄</td>
</tr>
<tr>
<td>Liver Disease</td>
<td>ECG (&gt;40), FBC, UEC, LFT, Coags</td>
</tr>
<tr>
<td>Thyroid Disease</td>
<td>ECG (&gt;40), FBC, UEC, TFT</td>
</tr>
<tr>
<td>Rheumatoid Arthritis</td>
<td>Flex/Ext Neck X-ray</td>
</tr>
<tr>
<td>Bleeding disorder including anticoagulants</td>
<td>FBC, Coags</td>
</tr>
</tbody>
</table>
NOTE

Organising a group and hold or a cross match is the responsibility of the surgical team.
IRON DEFICIENCY ANAEMIA PRE-OP

Determine cause.

- If no obvious cause consider gastroscopy / colonoscopy.
- Consider deferring operation.
- Treat with oral iron.

Consider IV iron transfusion pre-op:

- If a patient is anaemic (Males <130g/L, Females <120g/L)
- And iron deficient (Ferritin <30mcg/L)
- And the operation is not deferrable and has the potential for substantial blood loss (and thus transfusion) eg: Colectomy.

IV Iron therapy:

- Prescribe Ferric Carboxymaltose 1000mg (in 250ml NSaline, over 15 mins), on a fluid prescription chart
- Refer to Patient Blood Management (PBM) Anaemia Clinic (Tel 69868)
- They will organise for the patient to be admitted through the Minor Procedures Unit and organise the infusion.
- They will repeat the iron studies and will come to the anaesthetic clinic for another prescription if the patient would benefit from further iron transfusion.
Iron Therapy

**Oral iron** in divided daily doses. Evaluate response after 1 month. Provide patient information material.

**IV iron** if oral iron contraindicated, is not tolerated or effective; and consider if rapid iron repletion is clinically important (e.g. <2 months to non deferrable surgery).

**NOTE:** 1 mcg/L of ferritin is equivalent to 8–10 mg of storage iron. It will take approximately 165 mg of storage iron to reconstitute 10 g/L of Hb in a 70 kg adult. If preoperative ferritin is <100 mcg/L, blood loss resulting in a postoperative Hb drop of ≥30 g/L would deplete iron stores. In patients not receiving preoperative iron therapy, if unanticipated blood loss is encountered, 150 mg IV iron per 10g/L Hb drop may be given to compensate for bleeding related iron loss (1 ml blood contains ~0.5 mg elemental iron)

Preoperative haemoglobin assessment and optimisation template

This template is for patients undergoing procedures in which substantial blood loss is anticipated such as cardiac surgery, major orthopaedic, vascular and general surgery. Specific details, including reference ranges and therapies, may need adaptation for local needs, expertise or patient groups.

Preoperative tests
- Full blood count
- Iron studies including ferritin
- CRP and renal function

Is the patient anaemic? Hb <130 g/L (male) or Hb <120 g/L (female)

NO
- Ferritin <30 mcg/L
  - Consider iron therapy if anticipated postoperative Hb decrease ≥30 g/L
  - Determine cause and need for GI investigations if ferritin is suggestive of iron deficiency <30 mcg/L

YES

Ferritin <30 mcg/L
- Evaluate possible causes based on clinical findings
- Discuss with gastroenterologist regarding GI investigations and their timing in relation to surgery
- Commence iron therapy

Ferritin 30–100 mcg/L
- Possible iron deficiency
  - Consider clinical context
  - Review renal function, MCV/MCH and blood film
  - Check B12/folate levels and reticulocyte count
  - Check liver and thyroid function
  - Seek haematology advice or, in the presence of chronic kidney disease, renal advice

Ferritin >100 mcg/L
- Possible anaemia of chronic disease or inflammation, or other cause
  - Consider clinical context
  - Review renal function, MCV/MCH and blood film
  - Check B12/folate levels and reticulocyte count
  - Check liver and thyroid function
  - Seek haematology advice or, in the presence of chronic kidney disease, renal advice

CRP
- Raised
- Normal
PREOPERATIVE MEDICATION IN FASTING PATIENTS

Introduction

It is important that most prescribed medication is given to patients, even during a designated period of fasting before an operation. Surgery may be delayed if appropriate medication has not been given.

Unless instructions to the contrary are given for a particular patient, the following guidelines apply.

A. Medication to Give:

1. Premedication prescribed for the operation;
2. Analgesia;
3. An insulin regimen specifically prescribed for the operation;
4. The patient’s usual medication. This is particularly important in the case of:
   a) **Cardiovascular** drugs, i.e. for hypertension, angina, arrhythmias and heart failure, and
   b) **Respiratory** drugs (including inhalers), to prevent deterioration in the patient’s condition over the operative period,
      and
   c) **Anti-reflux** therapy, to minimise the risk of pulmonary aspiration of gastric acid.

Points to note:

i. Patients with vomiting or peritonitis should receive medication by a non-oral route.
ii. It is reasonable to give important tablets with a small sip of water up to half an hour before theatre, though an hour or more beforehand is preferable.
B. Medication to Withhold:

1. **Oral hypoglycaemic drugs**, which may cause hypoglycaemia in fasting patients.

2. **Anticoagulants** such as aspirin, clopidogrel, warfarin and heparin. Non-steroidal anti-inflammatory drugs (eg. Brufen), may also result in increased haemorrhage during surgery or epidural/spinal anaesthesia.

   These drugs should initially be withheld, pending discussion with the surgeon and anaesthetist responsible for the patient.

**Points to note:**

i. A plan of management should be made for each diabetic patient.

ii. All patients on anticoagulants require specific management plans. They should all be referred to the Anaesthetic Clinic or the Anaesthetist on call, preferably at least 1 week prior to surgery, to minimise the chance of cancellation or delay.

iii. Heparin DVT prophylaxis should generally be withheld if a spinal or epidural anaesthetic is intended. Low dose (ie 20 – 40mg daily) Clexane can be given at 1800 hrs the day before surgery.

iv. On occasions it may be preferable to withhold other medications, such as oral contraceptives or anti-depressants, but this should be done in consultation with the treating medical staff.
PACU INTRAVENOUS PAIN PROTOCOL

**Sedation Score**
- 0 = Nil  Awake, alert
- 1 = Mild  Sometimes drowsy, easily roused
- 2 = Moderate  Very drowsy, easy to rouse
- 3 = Severe  Somnolent, difficult to rouse.
- A = Asleep  Normal sleep, easy to rouse

**Opioid Order as per Anaesthetist**
Dilute to 10ml with saline:
- Morphine 10mg.
- Oxycodone 10mg.
- Fentanyl 200μg.
- Tramadol 100mg as ordered.

Continue Routine observations

Yes

Opioid and “Pain Protocol” ordered?

No

Obtain Order from Anaesthetist (see below)

Yes

Sedation Score < 2?

No

Check with anaesthetist

Yes

Resp volume ok
resp rate >8/min?

No

Check with anaesthetist

Yes

Under 70 yrs and > 40 kg?

No

Over 70 yrs?

No

Weight <40 kg?

Yes

Severe pain?

Yes

Severe pain?

Yes

Check with anaesthetist for paediatric order

Give 1ml

Give 2ml

Give 0.5ml

Give 1ml

Wait 3 minutes

No

Pain?
Paediatric IV Pain Protocol FOR PACU (Children <40kg)

1. Ensure that patient has an Opioid Pain Protocol ordered.
2. First make up the Recovery Pain Protocol *Adult Opioid Solution*:
   a. Morphine 10 mg into 10ml with saline, to make 1mg/ml, or
   b. Fentanyl 200 mcg into 10ml with saline, to make 20mcg/ml, or
3. **Round off** the patient’s weight to the nearest 5kg
   (eg 20 kg for a 22 kg child)
4. **Discard some** of the Adult Opioid Solution *to leave the Residual Amount*
   in the syringe according to the table below, then
5. **Add further saline** to make up to 10 ml (Final concentration is given in the table).

<table>
<thead>
<tr>
<th>Approx Weight</th>
<th>Residual Amount</th>
<th>Morphine (mg)</th>
<th>Fentanyl (mcg)</th>
<th>Pethidine (mg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>10 kg</td>
<td>2 ml</td>
<td>0.2</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>15 kg</td>
<td>3 ml</td>
<td>0.3</td>
<td>6</td>
<td>3</td>
</tr>
<tr>
<td>20 kg</td>
<td>4 ml</td>
<td>0.4</td>
<td>8</td>
<td>4</td>
</tr>
<tr>
<td>25 kg</td>
<td>5 ml</td>
<td>0.5</td>
<td>10</td>
<td>5</td>
</tr>
<tr>
<td>30 kg</td>
<td>6 ml</td>
<td>0.6</td>
<td>12</td>
<td>6</td>
</tr>
<tr>
<td>35 kg</td>
<td>7 ml</td>
<td>0.7</td>
<td>14</td>
<td>7</td>
</tr>
<tr>
<td>40 kg</td>
<td>8 ml</td>
<td>0.8</td>
<td>16</td>
<td>8</td>
</tr>
<tr>
<td>&gt;40 kg</td>
<td>10 ml</td>
<td>1.0</td>
<td>20</td>
<td>10</td>
</tr>
</tbody>
</table>

6. Give 1 or 2 ml increments according to the Recovery IV Pain Protocol,
   monitoring Pain and Sedation scores
PACU ANTIEMETIC STANDING ORDERS

Introduction

- Nausea in the postoperative period is common, and effective treatment often requires more than one drug.
- The Antiemetic Protocol is designed to facilitate this process, which can usually follow a standard format.
- Attention must first be paid to more critical aspects of the recovery process, specifically care of the airway, breathing and circulation.

Management (for adults 18-70 years)

A. Verify that the patient has an “Antiemetic Protocol” prescription (either on Winchart or paper Anaesthetic Record).
B. Give drugs in the order below until nausea is relieved.
C. If nausea persists after 10 minutes, give the next drug.
D. Record each drug and dose given on the Recovery record sheet.
E. If all four drugs are ineffective, or nausea recurs, notify the anaesthetist.

<table>
<thead>
<tr>
<th>Antiemetic Protocol Drugs</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Metoclopramide 10mg IV</td>
</tr>
<tr>
<td>2. Ondansetron 4mg IV</td>
</tr>
<tr>
<td>3. Droperidol* 1mg IV</td>
</tr>
<tr>
<td>4. Cyclizine 50mg IV</td>
</tr>
</tbody>
</table>

*Draperidol preparation: dilute 2.5mg (1 amp) into 2.5ml total with saline and give 1ml
PACU DISCHARGE CRITERIA GUIDELINES

GENERAL REMARKS
- The Post-Operative Care Unit (PACU) is a Critical Care Area with a high potential for immediate life-threatening problems.
- The relevant Anaesthetist is ultimately responsible for his/her patients in the PACU.
- Care may be delegated, when appropriate, to the care of nursing staff experienced and skilled in the care of unconscious and surgical patients.
- The Discharge Criteria Guidelines are intended to ensure that patients are in a safe and satisfactory condition before returning to a general postoperative ward.
- Variations from the stated parameters may be allowable for many reasons. However, patients who do not meet the guideline criteria must not be discharged from the PACU without consultation with the relevant anaesthetic medical staff.
- The PACU nurse should always contact the anaesthetist:
  a. if there is doubt regarding a patient’s fitness for discharge, or
  b. if the anaesthetist has asked to be contacted prior to the patient’s discharge.

DISCHARGE CRITERIA

1. Airway and Breathing
   - Airway must be clear without assistance.
   - Respiratory rate: adults >8/min; children: <6 months >30/min; 6-12 mo > 25/min; >1 year: >20 – age/2.
   - Able to deep breathe on command (adults).
   - Oxygen saturation ≥ 95%.

2. Circulation
   - Pulse regular.
   - Heart Rate appropriate for age:
     - Adult or large child: 60-100/min
- Small child: 80-120/min
- Infant (< 1 year): 100-140/min

- Systolic Blood Pressure:
  - Adult or large child > 100 mmHg and within 30% of pre-op level.
  - Small child (if req’d) > 85 mmHg
  - Infant < 1 year (if req’d) > 70 mmHg

- Perfusion: hands and feet should be warm and pink.

- IV cannula (IV fluids not running):
  If required on the ward it must be flushed in the RR.

3. Neurological

4. Sedation score: 2 or better.
   - Able to lift head off pillow and/or firmly squeeze hand.
   - Epidurals and spinals
     - Spinal anaesthetic: Block receded by 2 dermatomes and below T4.
     - Lumbar epidural: Block below T6.
     - Thoracic epidural: Block below T4.

5. Metabolic
   - Temperature on discharge > 36.0°C and <38.0°C.
   - Diabetic patients: BGL between 5 and 10 mmol/l.

6. Renal
   - Fluid input and output must be documented.
   - If IDC in situ output > 1ml/kg/hour.

7. Comfort
   - Pain must be adequately controlled (moderate or less).
   - Nausea/vomiting must be adequately controlled.
   - The patient should be clean and dry.
   - Cot bumpers are required for all small children and restless patients.

8. Specific Surgical Observations
   - As appropriate, such as:
     - Wound dry
     - Drains secure and functioning
     - Minimal blood loss
9. **Minimum Length of Stay**
   a. All other discharge criteria must be met before discharge is considered
   b. Many patients will therefore require a longer period in the PACU
   c. Patients must not be discharged before this length of time unless signed out by an anaesthetist

   - **LA only (no sedation):**
     Discuss with the surgeon if PACU observation is required

   - **Minor surgery:**
     GA, Sedation, Bier’s Block, major nerve blocks: 20 minutes

   - **Major surgery:**
     One hour. Knee replacement with a tourniquet: Two hours

   - **After opioid pain relief:**
     30 minutes after IM or epidural bolus; 10 minutes after IV bolus

   - **Children less than 1 year of age:**
     All must be reviewed by an anaesthetist before discharge from the PACU

10. **Documentation is complete**
   - Most observations should be recorded on the WinChart record
   - Fluids should also be recorded on the fluid balance sheet
   - Orders for oxygen, fluids, analgesia and anti-emetics as appropriate

11. **Transportation**
   - Nurse and wardsperson/USO present
   - Portable oxygen, Hudson mask, pocket mask, tubing, sucker and suction with patient
   - Additional equipment for ventilated patient
AIRWAY MANAGEMENT

A. General responsibilities.

1. Airway assessment

- Look for suspected problems with
  1. Pre-oxygenating
     - Difficult mask seal or cooperation
     - Reduced size of FRC
     - Increased oxygen consumption
  2. BMV
     - BMI > 30
     - Edentulous
     - Facial hair
     - OSA or history of snoring
     - Mallampati III or IV
  3. Laryngoscopy
     - History
     - Mallampati III or IV
     - Reduced thyromental distance
     - Limited neck extension
     - Restricted mouth opening (and unfavourable dentition)
     - Gross face or neck abnormalities
  4. LMA placement
     - Male
     - Poor dentition
     - BMI > 30
  5. Anterior neck anatomy

2. Communication
- If you are in any doubt about your airway plan or your ability to execute it, you should communicate with your consultant.
- You are not expected to manage situations that are beyond your level of experience or expertise.
- You will not be criticised if you ask for help.

3. Trauma and MET calls
- As the duty anaesthetic registrar you will not be included in MET calls.
• The duty anaesthetist is included in Trauma Team Activation calls. Primarily your role in Airway Management for Trauma is supportive to the Emergency Department staff as described in the Trauma Team Chapter.

• If there is an anticipated need for anaesthetic airway assistance you will be phoned directly.

• You may occasionally be asked to provide airway assistance in ICU, ED, radiology, cath lab, or the ward. If you are able to do so you should attend as requested.

• Your primary responsibility is always with the patient you are currently looking after. If you get asked to assist somewhere else in the hospital while you are busy in theatre, you simply can’t go.

• If you can’t attend or are out of your depth, the other options for help are the ICU registrar or the consultant on for ICU or anaesthetics.

B. Unexpected airway emergencies.

• Ultimately there are only four ways to oxygenate a patient:
  1. Through the face – BMV.
  2. Supraglottic – LMA.
  3. Infraglottic from above – ETT.
  4. Infraglottic through the neck.

• Have an initial attempt, optimise, have another go, then abandon – you must move on.
• 1, 2 and 3 can be done in any order.
• Have no more than three attempts at each of 1, 2 and 3 (preferably only two).
• Don’t keep repeating unsuccessful things.
• If necessary the patient ends up with a hole in their neck, and you should do this BEFORE they die.

• A useful model for emergencies is the Airway Vortex (Nicholas Chrimes 2013).
Imagine you are looking down into a funnel and rolling a marble around the edge. You can start in any of the three regions and go in either direction, but if they all fail you put a hole in the patient’s neck.

http://vortexapproach.com/Vortex_Approach/Vortex.html

C. Advanced airway equipment.

1. Video-laryngoscopes
   - Each operating theatre has a video-laryngoscope with size 3 and 4 Macintosh shaped blades, as well as “difficult” blades.
   - The blades are cheap and disposable, so there are no restrictions on their use.

2. Cricothyroidotomy kit
   - A Cook Enk Flow Modulator kit can be found on the right hand side of the second drawer of all anaesthetic drug trolleys.
   - They attach directly to any oxygen outlet. The flow should be 1L/min/year of age (up to 15 L/min).
   - The needle can be placed through the cricothyroid membrane or trachea.

3. Difficult airway trolley
   - This lives in the technician storage area.
   - Items found on this trolley include:
     - Drugs and equipment for airway topicalisation.
     - Adjuncts for awake intubation.
     - Sugammadex 8 x 200mg ampoules for reversal of rocuronium (and vecuronium)
Doses are 2, 4 and 16 mg/kg for standard, deep and immediate reversal respectively. Recovery also stocks a small supply of sugammadex. If you use it you must fill out the form to have it replaced.

- McCoy, Miller, Kessel, left handed and short handle laryngoscopes.
- Cricothyroidotomy/tracheostomy gear.
- Manujet jet ventilator.
- Airway exchange catheter, Aintree catheter, staged extubation kit, endobronchial blocker and bougies.

4. Bronchoscopes
   - All our bronchoscopes are the disposable “AMBU-scope” video-bronchoscope system.
   - The “Ambu-sscopes” connect to a small rechargeable monitor that is attached to a drip pole. This system is compact, cheap and mobile (doesn’t require electricity). If you are inexperienced with bronchoscopy you should use this scope in preference to our Olympus ones.

D. Airway grab bag

- This bag lives at the bottom of our difficult airway trolley, and contains standard equipment for managing airways in off site locations.

E. Difficult airway documentation

- The general consensus is that should a patient require specialised equipment or techniques to safely manage their airway this needs to be clearly documented and communicated.
- QHEPS has a form that should be completed in this instance
- Copies should go to the patient, their general practitioner and into the notes.
- An alert should be entered into ieMR and AARK
TRAUMA TEAM ACTIVATION

Criteria for Trauma Team Activation

Trauma Teams are activated by ED when a patient presents or is expected (QAS or Lifeflight) with:

- Significant penetrating injuries (head, neck, chest, abdomen)
- Major head injuries (dilated pupil(s), open injury, severe facial injury)
- Systolic BP <90 mmHg
- Request by Retrieval Physician
- Discretion of ED Team Leader

Trauma Team Members (Medical)

1. ED
   a. Team Leader
   b. Airway
   c. Circulation & Procedure
   d. Primary Survey
2. Duty Anaesthetist
3. ICU Registrar
4. Surgical Registrar

Role of Duty Anaesthetist

1. Provide airway assistance as required by the ED Team Leader. Usually airway management will be undertaken by ED Airway Doc in the first instance. The anaesthetist provides assistance and oversight. Out-of-hours the anaesthetist may be asked to be the primary airway doctor if ED skill mix reduced.
2. Facilitate movement to OT if required expediently. The anaesthetist will liaise with the Team Leader in theatre - 66924 and the Emergency OT Anaesthetic Technician – 67162. The Anaesthetist will transfer the patient from ED to OT.
3. Timely communication with Consultant Anaesthetist on-call if not already present.
4. Procedures as required by ED Team Leader (e.g. vascular access)
Practical Points:

1. **Unable to attend** If you are unable to attend ED immediately contact the ICU access Registrar - **66979** to inform them you are indisposed. A line of communication should be then maintained between ICU & Anaesthetics and Anaesthetics should make every effort to attend ED as soon as possible. **DO NOT Call the ED Consultant.**

2. **Attending ED** Make sure you introduce yourself to the ED Team Leader on arrival. Await their instructions before entering the Trauma Bay. Remain behind the Red Line until asked to cross.

Roles of other Team Members:

1. **ICU Registrar**
   a. Provide procedural assistance to the ED Team Leader
   b. If skills appropriate may provide airway assistance as per Anaesthetist especially if Anaesthesia unable to attend
   c. Assist with advanced transfusion management (Massive Transfusion Protocol)
   d. Clear line of communications
      i. ICU Consultant
      ii. ICU TL regarding bed management
      iii. Anaesthesia as overleaf

2. **Surgical Registrar**
   a. Provide procedural assistance to the ED Team Leader
   b. May be required to undertake primary survey if ED skill mix reduced
   c. Clear line of communication with Surgical Consultant to make time critical decisions about movement to theatre
MASSIVE TRANSFUSION PROTOCOL (MTP)

Introduction
Massive transfusion is defined by the Australian Red Cross as
“in adults, Replacement of >1 blood volume in 24 hours or >50% of blood volume in 4 hours (adult blood volume is approximately 70ml/kg)…In children it is defined as transfusion of >40ml/kg”

A Massive transfusion protocol should be initiated if there is an anticipated requirement for a massive transfusion and involves multiple team members. Where possible ROTEM analysis should be used to guide the delivery of blood component therapy.

ROTEM
Criteria for the use of ROTEM analysis are:
- Any patient with a massive transfusion protocol activated
  - ROTEM results will guide product use according the ROTEM-guided MTP
- Trauma patient
  - If a request to perform ROTEM comes from OT or ED and it is stated that the patient has critical bleeding
- Obstetrics
  - If a request to perform a ROTEM comes from OT and it is stated that the patient is bleeding excessively
- Actively bleeding patients
  - Anticipated to need >3 units of blood in the next hour
  - Haemodynamically unstable due to active bleeding requiring blood transfusion eg PPH / upper GI bleed

Use of ROTEM should be discussed with the on-call Intensivist and in general the patient will need to be critically bleeding.

Once ROTEM approved
- Contact ICU Registrar (66979) to coordinate ROTEM use
- Notify Pathology that ROTEM is being used to guide the MTP
- Collect 5ml blood in a Citrate blood tube (Blue top)
- Hand deliver sample to ICU Nursing Team Leader with 2 patient identification stickers. DO NOT SEND in the Lamson tube system
- Results can be monitored real-time on the ROTEM Secure View accessed via most PC desktops in the OT

ROTEM should not be used to monitor antiplatelet agents and anticoagulants routinely.

See below for ROTEM analysis guidance. The ICU Registrar will be available to liaise with the treating time on appropriate blood product use. It is the anaesthetist’s responsibility to communicate with Blood Bank about requirements.
If treatment is given ROTEM should be repeated after 10 minutes to assess response.

If ROTEM confirms hypofibrinoginaemia Fibrinogen concentrate (RiaSTAP) is available in ICU. 2 specialists are required to approve the use of RiaSTAP; the on-call intensivist and usually the lead clinician involved in the resuscitation.
ROTEM ALGORITHM FOR INTERPRETATION

CAIRNS HOSPITAL ROTEM ALGORITHM
CONTINUE TRANSFUSING PACKED CELLS BASED ON CLINICAL NEED

INDICATIONS:
- MHP activation
- Actively bleeding & anticipated to need >3 units of blood in next hour or haemodynamically unstable

HOW TO ORDER:
- CALL ICU Reg 66979 & NOTIFY Blood Bank 66314
- Runner takes citrate tube to ICU
- Open desktop icon to see real-time results

Do not perform ROTEM unless clinically significant bleeding

Physiological targets:
- temp ≥ 36
- pH ≥ 7.2
- iCa ≥ 1mmol
- Hb > 70g/L

STEP 1: FIBRINOLYSIS – FIBTEM/EXTEM
- FIBTEM CT >600s (flat line) AND EXTEM A5 ≤35mm
  (early diagnosis)
- EXTEM or FIBTEM ML>5%
  (late diagnosis)

- TXA 1g + Fib Conc 4g
  (2 consultant approval, including 1 ICU consultant)

- TXA 1g

STEP 2: FIBRINOGEN - FIBTEM
- FIBTEM A5 ≤10mm
  (obstetrics ≤12mm)
- Low fibrinogen

- Cryoprecipitate 20 U
  (paeds: 5ml/kg)

- FIBTEM A5 <8mm
  (Obstetrics < 10mm)
- Critically low fibrinogen

- Cryoprecipitate 20 U
  OR fibrinogen concentrate 1g/25kg
  (Fib conc only if critical – 2 consultant approval required including 1 ICU consultant)

STEP 3: PLATELETS – FIBTEM/EXTEM
- FIBTEM A5 > 10mm
  AND EXTEM A5 ≤35mm
- Poor platelet contribution

- Platelets 1 pooled bag
  (paeds: 10ml/kg)

STEP 4: FACTORS – FIBTEM/EXTEM
- FIBTEM A5 > 10mm
  AND EXTEM CT ≥ 90 sec
- Low coagulation factors

- FFP 4U
  (paeds: 15ml/kg)
  OR Prothrombinex 12.5U/kg
  (Contains only factors II, IX, X, VII)

Repeat ROTEM test 10 minutes after therapy OR after every 4 units packed cells OR if ongoing bleeding

Special situations:
- Warfarin – prothrombinex 25-50U/kg, Vitamin K 5-10mg iv
- Heparin – protamine

ROTEM is not used to detect or monitor direct thrombin inhibitors, warfarin, LMWH, von Willebrands disease, GpIIb/IIIa or other platelet inhibitors (e.g. aspirin) due to low sensitivity to these agents – discuss with haematologist

NB: cryoprecipitate 20U is equivalent to apheresis cryoprecipitate 10 U
CAIRNS HOSPITAL CRITICAL BLEEDING ALGORITHM

MASSIVE HAEMORRHAGE PROTOCOL
CRITICAL BLEEDING ALGORITHM FOR PATIENTS WITH HAEMORRHAGE AND HAEOMODYNAMIC INSTABILITY
CAIRNS HOSPITAL

STOP THE BLEEDING
Identify source
Control external bleeding
Pelvic binder/splint fractures
Specialty involvement ASAP
Consider Red Blanket Protocol

RING BLOOD BANK 66314
Inform of patients condition
Request 2-4 units O NEG RBC
Collect & Send XMATCH specimen URGENTLY to Pathology Blood Bank
Inform if using ROTEM
RING ICU REG 66979
Request ROTEM
Send runner to ICU with labelled citrate tube (blue top) for ROTEM

FLUID RESUSCITATE
Actively warm patient and fluid
Avoid excessive crystalloid
Tolerate SBP 80-100mmHg (unless traumatic brain injury)

Transfuse 2-4 units O NEG RBC
(10ml/kg if paediatric)

SEND BASELINE BLOODS
VBG
ICU: ROTEM (blue top – citrate)
PATHOLOGY/BLOOD BANK: GPH, FBC, coags, EUC/LFTS, lipase

TRANEXAMIC ACID if within 3 hours of injury
1g over 10 min, 1g over 8 hours
(15mg/kg if paediatric)

MONITOR:
ROTEM – 10 mins post blood components
FBC, coagulation, blood gas – every 30-60 minutes

if continuing uncontrolled bleeding or haemodynamic instability
ACTIVATE MASSIVE HAEMORRHAGE PROTOCOL
Call Blood Bank 66314. Inform if using ROTEM
Ring ICU Reg 66979 for ongoing ROTEM

CHECK SPECIAL SITUATIONS:
Warfarin
Vitamin K 5-10mg IV
Prothrombinex 25-50 IU/kg
Dabigatran/rixaroxaban
Discuss with haematologist
Obstetrics Haemorrhage
Target fibrinogen >2.5g/L
Head Injury:
Target platelets >100
Target SBP >100mmHg

MHP ROTEM
4 RBC
Blood components as per ROTEM algorithm

MHP Non-ROTEM
(Only If No ROTEM Available)
4 RBC (20ml/kg paed)
20 U (10U apheresis) cryoprecipitate
(5ml/kg paed)
4 FFP (20ml/kg paed)
1 dose platelets in every 2nd pack
(from pack 2)
(10ml/kg paed)

PHONE NUMBERS:
ED Consultant 66100
Surgical Registrar 67670
ICU Registrar 66970
ICU Team Leader 66976
Duty Anaesthetist 66910
Blood Bank 66314
Coagulation Lab 66631
Wardsman 66411 or 66412

COMMUNICATE
Lab staff MUST be notified which products per ROTEM required or if additional products required
Cryoprecipitate takes 29 mins to thaw
When bleeding controlled notify Blood Bank 66314
STOP MASSIVE HAEMORRHAGE PROTOCOL
Return unused products

TARGETS:
Temp > 36 C, pH > 7.2, iCa >1mmol/L, Hb >70g/L, platelets >75, fibrinogen >1.5g/L (>2.5g/L obstetrics)
RED BLANKET PROTOCOL

Introduction

Patients who remain haemodynamically unstable despite resuscitation, with uncontrollable or non-compressible bleeding, may need to be expediently transferred to the operating theatre for life saving surgery.

- A Trauma Call must already be activated
- Staff will attend the trauma call as required by their role – Trauma Call
- Massive transfusion protocol should be activated
- Case may be discussed with the general surgical consultant prior to patient arrival in ED if there is sufficient pre-hospital concern
- Upon receipt of a trauma call the duty anaesthetist should, in liaison with the theatre team leader, identify potential staff and theatre space for a potential red blanket patient requiring emergency surgery

Decision for ‘Red Blanket’ activation

- The Surgical Consultant may make the decision to approve activation of a ‘Red Blanket’
- The Emergency Department Consultant or surgical registrar may recommend a red blanket to the Surgical Consultant
- The decision should occur in agreement between the Emergency and Surgical consultant

Process for ‘Red Blanket’ activation

- Call Duty Anaesthetist on 66910 and state ‘Red Blanket Activation’
- The duty anaesthetist will liaise with the theatre team leader who will organise additional staff and theatre space

Emergency Consultant responsibilities

- The most senior emergency department doctor will accept full resuscitation responsibility until a formal handover to an anaesthetic team occurs
- After hours, this may necessitate the emergency doctor continuing to assist in theatre until the anaesthetist has the resources to assume full responsibility
- Ensure that massive transfusion protocol has been activated
- Inform ICU registrar of need for post-operative bed
- May be required to transfer the patient to theatre once notified theatre is ready
Surgical Consultant/team responsibilities
- Inform the operating theatre of specific surgical requirements
- Inform the anaesthetist of any specific surgical requirements/surgical plan
- Proceed to the theatre immediately
- Ensure patient or next of kin has informed consent, or emergency consent process has occurred
- Inform the theatre team leader of patient details, operation plan

Anaesthetist responsibilities
- Liaise with theatre team leader to organise theatre staff and space
- Notify the emergency consultant (66100) of the operating theatre readiness, and number
- Liaise with anaesthetic technician/assistant regarding specific anaesthetic requirements
- Organise extra anaesthetic staff if required
- Assume responsibility of the patient’s resuscitation when clinically safe to do so
- Delegate tasks to other staff as appropriate (i.e. organise ‘blood team leader’)
RED BLANKET ACTIVATION FLOWSHEET

SURGICAL & EMERGENCY CONSULTANTS to activate RED BLANKET if indicated

Activate Massive Transfusion Protocol
BLOOD BANK – 66314

CALL DUTY ANAESTHETIST – 66910
Declare: “RED BLANKET ACTIVATION”

ANAESTHETIST DUTIES
➢ Arrange operating theatre & staffing
➢ Liaise with Emergency consultant (66100) about theatre availability
➢ Organize additional anaesthesia staff
➢ Discuss plan with anaesthesia assistant
➢ Take over resuscitation lead from Emergency consultant when possible
➢ Delegate resuscitation roles as appropriate: Circulation, procedures

ED CONSULTANT DUTIES
➢ Take charge of resuscitation duties
➢ Continue resuscitation until handover to anaesthesia team is complete
➢ This may include transfer to operating theatre and ongoing care if anaesthetist is initially unavailable
➢ Inform ICU registrar (66979) to arrange post-op ICU bed

ACTIVATION TRIGGERS
➢ UNCONTROLLABLE BLEEDING
➢ HAEMODYNAMIC INSTABILITY DESPITE RESUSCITATION

SURGICAL DUTIES
➢ Inform operating theatre of specific surgical & equipment requirements
➢ Discuss surgical plan with anaesthesia and OT teams
➢ Ensure consent via next of kin, or emergency consent is completed

CALL DUTY ANAESTHETIST – 66910
Declare: “RED BLANKET ACTIVATION”
EMERGENCY BOOKING PROCEDURES

1. At the beginning of the shift divert 66910 to emergency list anaesthetist’s DECT phone (at Anaesthetic Secretary’s desk) – usually Consultant’s phone during daytime and Reg’s phone after hours.

2. Receive call on 66910 from surgeon – write down in the Emergency List Red Book all relevant clinical and patient details (including patient name, URN, location, fasting status, urgency code, expected duration of surgery, surgeon details), and add your name.

3. Advise surgeon of expected start time and remind them to call the nursing staff booking phone 66940, or transfer the call from your DECT phone:

   Transferring from DECT Handsets:
   - Press 66940 then the green dial button – wait for ringing tone
   - Press centre OK button to complete transfer
   - Press red phone button to end your call

4. Tell anaesthetic tech and nursing staff in your theatre about the case.

5. At the end of your shift, hand over folder and information to next anaesthetic Consultant (or night Registrar), who then MUST divert 66910 to their phone.

6. During working hours no Orthopaedic Trauma should be booked on the Emergency List without approval by the Anaesthetic Consultant responsible for the Emergency List (see below)

7. Out of hours (including weekends) Orthopaedic Trauma are booked as per other Emergency Cases with list order determined with negotiation between all relevant surgical teams & Emergency List Anaesthetist.

8. Orthopaedic Trauma – Lists are currently Sunday to Friday. The Orthopaedic Department determines list order & priority though some negotiation with the Trauma List Anaesthetist may be necessary.

9. If either the Emergency Theatre or Orthopaedic Trauma theatre is un-utilised, other brief (eg <30 min) operating time cases may be placed into the empty theatre. This must be approved by the Emergency List Anaesthetic consultant prior to arranging.
<table>
<thead>
<tr>
<th>Category</th>
<th>Description</th>
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</thead>
</table>
| A        | Immediate – First Available Operating Theatre (Time frame < 1 hour)  
Patient at immediate risk of loss of life or limb |
| B        | Critical – Next reasonably available theatre (Time frame < 4 hours)  
Patient stable currently but imminent risk of deterioration or organ survival |
| C        | Priority – Same day (Time frame < 24 hours; may need to be done after hours)  
Surgical problem at substantial risk of deterioration if untreated |
| D        | Desirable Non-Critical – Time frame < 10 days  
Inpatient. Do if time within reasonable hours, plan to finish by 10 pm. |
| E        | Elective Non-Critical – Time frame < 10 days - Outpatient. Plan to finish 10 pm. |

*If the choice of Code is unclear or disputed, both Consultant Surgeon/Obstetrician and Consultant Anaesthetist must be contacted*
Notification of the Consultant

As a registrar you are never expected to administer and anaesthetic without consultation, supervision and assistance from your consultant in a timely manner whenever you require it. The decision as to when to call will vary according to the experience of the registrar and / or the level of complexity of the case. If you are unsure it is always better to call than not. As a rule of thumb – if you think “Should I call the consultant?” call your consultant.

The following protocol details which cases, as a minimum, should be discussed with the supervising consultant.

1. Trainees with less than one year’s anaesthetic experience at Registrar level, not including ICU, **must** notify consultant about all cases

2. Trainees with less than two year’s anaesthetic experience at Registrar level, must notify the consultant about all:
   a. Children under 10-years-old
   b. All seriously ill patients (e.g. ASA 3-5, multi-trauma)
   c. All unfamiliar situations
   d. All GA LSCSs

3. ALL trainees must notify the consultant about:
   a. Children less than 5-years-old
   b. Any medico-legal or political concerns
   c. Any compromised airway
   d. Any complications of the anaesthetic
   e. Any patients requiring ICU admission
   f. Patients requiring the presence of 2 anaesthetists
   g. Potential or actual death of the patient

4. For all post-fellowship registrars, consultation and supervision is available at all time
OBSTETRIC EMERGENCY LIST MANAGEMENT

Caesarean Sections
The following categories are to be used when booking an emergency caesarean section. The obstetric team must inform both the anaesthetist and the theatre staff - this will allow them to organise theatre appropriately. The category may change if the maternal or fetal condition deteriorates; ongoing discussion is essential and should involve consultant staff if there are any problems or delays.

<table>
<thead>
<tr>
<th>Category</th>
<th>Description</th>
<th>Examples</th>
</tr>
</thead>
</table>
| Crash    | Critical obstetric emergency requiring immediate access to the first available operating theatre and delivery as fast as possible. | – Uncontrolled haemorrhage  
– Severe fetal distress  
– Cord prolapse |
| 1        | Requires access to theatre within **15 minutes** and delivery within **30 minutes**. | – Haemorrhage  
– Fetal distress |
| 2        | Requires access to theatre within **30 minutes** and delivery within **60 minutes** | – Maternal or fetal compromise that is urgent but not immediately life threatening |
| 3        | Requires access to theatre within **60 minutes** and delivery within **90 minutes** | – Failure to progress with no fetal compromise |
| 4        | Requires delivery that day but no maternal or fetal compromise | – Previous LSCS with ruptured membranes but not in labour |
| 5        | Desirable to do that day but can be deferred | – Elective LSCS but no space on list |

If the choice of Code is unclear or disputed, both Consultant Obstetrician and Consultant Anaesthetist
Please Direct any queries to:
Dr Andy Potter or Dr James Sartain

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Cairns Hospital
PO Box 902, Cairns QLD 4870
Ph: 07 4226 6960 / Fax: 07 4226 6854
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The information in this document was up to date at the time of publication.

For further updates, please visit

The Cairns Anaesthetists’ Association website:

www.cairnsanaesthesia.org