Clinical Practice Guidelines

Air Ambulance Victoria

Ambulance Victoria

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Rapid Sequence Intubation

General Notes

- This CPG is to be used in conjunction with and as an adjunct to CPG A0302 Endotracheal Intubation
- An exception to the mandatory use of functional electronic capnography may be made if winching is required to access the patient and it is not possible to carry electronic capnography in which case a disposable capnograph must be used to check ETT position
- In patients who are frail with coma due to respiratory failure (i.e. COPD, pulmonary oedema) then intubation facilitated by sedation (IFS) may be used. A single dose of sedation only should be given as per CPG A0302. If intubation is not possible due to the presence of airway reflexes, then RSI should be undertaken
- Preparation of Noradrenaline infusion
  - Noradrenaline 3mg (3mls) added to make 50 mls with Glucose 5% or Normal Saline 0.9%
  - 1ml/hr = 1 mcg/min

Further Information

- In patients who are initially hypoxic and in whom pre-oxygenation with bag/mask is difficult (i.e. obese patients), then pre-oxygenate with high flow oxygen (12l/min) via nasal prongs in addition to spontaneous breathing via bag/mask
- Pre-oxygenate with 100% oxygen using bag/valve/mask and PEEP 5mmHg
**Indications**
- Patients with Glasgow Coma Score ≤ 12
- Patients with actual or potential airway compromise (e.g., laryngeal burns)
- Patients with significant hypoxia (e.g., SPO₂ ≤ 92% on supplemental oxygen or significant chest trauma, massive pulmonary embolism, severe pneumonia)
- Patients with suspected spinal cord injury and respiratory compromise
- Combative and/or suicidal patients
- Patients with severe pain unable to be managed using analgesic agents

**Precautions**
- Potential difficult intubation (upper airway injury, limited mouth opening, spinal column injury or abnormality)
- Right time < 10 minutes in time critical patient who has adequate oxygenation and ventilation without intubation
- Uncontrolled bleeding

**Contraindications**
- Any contraindications for Succinylcholine AND Rocuronium
- Inability to continuously monitor vital signs, SPO₂, and ETCO₂
- Coma due to ruptured abdominal aortic aneurysm

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**Flowchart**

**RSI – Trauma (any GCS), asthma GCS ≤ 12 or hypoxia (non-trauma)**
- **Stop**
  - Ketamine 1.5 mg/kg IV
- **Action**
  - **Paralyzing agent**
    - Succinylcholine 1.5mg/kg IV round up to the nearest 25mg (max 150mg)
  - Fentanyl 100 mcg IV
  - Midazolam 0.1 mg/kg IV (max 10 mg)

**RSI – Non – traumatic coma (GCS ≤ 12)**
- **Stop**
  - Adjusted sedation doses may be required
- **Action**
  - Full dose sedation required
  - SBP > 120 mmHg
  - Ketamine 1.5 mg/kg IV
  - Succinylcholine 1.5mg/kg IV round up to the nearest 25mg (max 150mg)

**RSI – Post cardiac arrest (GCS ≤ 12)**
- **Stop**
  - Adjusted fentanyl doses may be required. Commence Mx inadequate perfusion prior to RSI
- **Action**
  - **Paralyzing agent**
    - Succinylcholine 1.5mg/kg IV round up to the nearest 25mg (max 150mg)
  - Fentanyl 100 mcg IV

**RSI – Airway burns GCS > 12, non-traumatic, suicidal behaviour**
- **Action**
  - Propofol 1.5 mg/kg IV
  - Fentanyl 100 mcg IV

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**Delayed Sequence Intubation**
- If patient is combative AND hypoxic (O₂ saturations < 92%) and adequate pre-oxygenation using nasal oxygenation and bag/mask is difficult to achieve
- **Action**
  - Ketamine 1.5 mg/kg IV (max 200mg)
  - Once patient settles, allow 3 minutes for pre-oxygenation
- **Paralyzing agent**
  - Succinylcholine 1.5mg/kg IV round up to the nearest 25mg (max 150mg)

- If Succinylcholine is contraindicated administer Rocuronium 1.2mg/kg IV (max 100mg)
- If a second dose of Succinylcholine is required, pre-treat with Atropine 0.6mg IV
Care of Intubated Patient

- Target tidal volume is 6 ml/kg
- Start with PEEP 5cm H$_2$O. In the setting of acute lung injury, if the SpO$_2$ remains low (<92%) increase PEEP to 10mmHg then to a maximum of 15cm H$_2$O to achieve an oxygenation saturation target of 94%
- Target ETCO$_2$ is 30mmHg (adjust ventilation rate accordingly) except in severe asthma or severe lung injury (without brain injury) when a higher ETCO$_2$ may be used
- If possible, check arterial or venous pCO$_2$ using iStat
- A HME filter should be used to prevent airway damage from prolonged ventilation with dry oxygen
- Temperature should be measured using an oesophageal temperature probe

Post Intubation Sedation and Paralysis

- Sedate using Morphine/Midazolam and paralysis using Pancuronium as per CPG A0302 Rapid Sequence Intubation
- If Propofol is given for induction then consider post intubation sedation using:
  - Propofol Infusion at rate 100mg – 300 mg/hr (10 – 30 mls/hr). Add Morphine infusion for patients intubated with Propofol and in possible pain
- If Pancuronium causes tachycardia (>120/minute), maintain paralysis with
  - Rocuronium 50 mg IV bolus at 15 minute intervals or Rocuronium infusion 0.6mg/kg/hr IV bolus
- If patient has had continuous seizure activity:
  - Midazolam Infusion @ 0.2 – 0.4mg/kg/hr IV
  - Supplement with Midazolam 0.2mg/kg/hr IV as required. There is no upper dose limit for the administration of this drug.
  - Patients intubated for status epilepticus should not receive routine post intubation paralysis. However if sedation using Midazolam is insufficient to safely maintain intubation and ventilation, then Pancuronium should be administered
Post Intubation Blood Pressure Control

Action

- If patient has trauma, treat blood pressure as per CPG AAV 08 Inadequate Perfusion associated with Hypovolaemia
- If patient has coma due to non-traumatic brain injury due to suspected intracranial bleeding or subarachnoid haemorrhage
  - Maintain SBP > 120mmHg and < 140mmHg
  - If hypotension is present (SBP < 120mmHg)
    - Maintain Morphin and Midazolam at 2mg/hr IV
    - Administer Normal Saline 0.9% 20ml/kg IV
    - If SBP remains < 120mmHg despite fluid challenge then consider Noradrenaline infusion. Titrate to a SBP 120mmHg using a dose between 5 -25mcg/min IV (5ml/hr – 25ml/hr)
  - If hypertension is present (SBP > 140mmHg) despite Morphin and Midazolam at 10mg/hr
    - Administer Propofol 0.5mg/kg IV bolus and repeat if required
    - Commence Propofol infusion at 100 mg/hr (10ml/hr) and increase if required to 200mg/hr (20ml/hr)
Flowchart

**Failed Intubation**
- Unable to see vocal cords during initial laryngoscopy

**Action**
- Place bougie “blindly” into trachea, railroad ETT over bougie

**Consider**
- Objective confirmation of tracheal placement with ETCO₂

**Action**
- Paralysis and sedation as appropriate

**Consider**
- Able to oxygenate and ventilate using ILMA

**Action**
- Advance endotracheal tube component via ILMA into trachea

**Action**
- Immediately remove ETT and replace with intubating LMA

**Action**
- Attempt intubation via ILMA once only

**Consider**
- Able to intubate

**Action**
- Remove ILMA and attempt oxygenation and ventilation using BVM and oral airway

**Consider**
- Able to oxygenate and ventilate using BVM and oral airway

**Action**
- Oxygenate and ventilate until reflexes return and oral airway not tolerated, then remove.
- Do not sedate and paralyse

**Action**
- Oxygenate and ventilate via LMA or BVM until reflexes return
- If unable to confirm LMA placement or LMA not tolerated then remove and continue ventilation via BVM

**Action**
- Paralysis and sedation as appropriate
Flowchart

**Status**
- Evidence of persistent bradycardia

**Initial Assessment**
- Atropine has been administered
- Isoprenaline or Adrenaline infusion running
- Transvenous pacing is not available

**Action: Commencement of Transthoracic Pacing**
- Attach pads to left anterior chest wall and right posterior chest wall
- Switch Zoll Series X monitor/defibrillator to "Pacing"
- Provide appropriate sedation
  - Administer Midazolam 1-2mg IV and Fentanyl 50mcg IV and repeat as required
- Set pacing output to 30mA and a heart rate of 70/minute
- Increase by 10mA until capture of QRS on ECG
- Set at 10mA above capture voltage
Pacing Wire Care

- In general the OUTPUT setting on the pacemaker should be set at 2 times the THRESHOLD level plus 1mA (i.e. 2 x THRESHOLD(mA) + 1mA)
- Pacing THRESHOLD would usually be determined on consultation with the sending hospital
- In general the SENSITIVITY setting should be set towards the maximum sensitivity (i.e. 0.5mV is the most sensitive)
- If Transthoracic Pacing instituted prior to or during flight consider implications on mission safety and appropriate communication with relevant aircrew/pilot.
Flowchart

**Status**
- Evidence of persistent bradycardia

**Initial Management & Assessment**
- Referring hospital handover
- Need for aeromedical transport with temporary transvenous pacing (TVP) wire for symptomatic bradycardia
- Confirm clinical evidence of appropriate transvenous pacemaker settings and pacemaker pacing or not pacing

**Pacemaker not Pacing**
- **Action**
  - IF pacemaker NOT currently pacing (i.e. demand rate < intrinsic rate)
    - Check that pacor 100% sensing intrinsic cardiac activity
  - IF pacemaker NOT currently sensing
    - Set sensitivity until 100% sensed intrinsic activity noted
    - Increase demand rate to > intrinsic rate to check:
      - Pacemaker capture
      - Appropriate output settings
    - Confirm evidence of 100% capture on ECG and presence of peripheral pulses
    - Return demand rate to appropriate settings
    - Do not increase rate above 100 bpm

**Pacemaker Pacing**
- **Action**
  - IF pacemaker currently pacing (i.e. demand rate> intrinsic rate)
    - Confirm evidence of 100% capture on ECG and presence of peripheral pulses
  - IF 100% capture not present
    - Increase OUTPUT until capture and pulses achieved
  - Set OUTPUT to appropriate levels with safety margin

**Pacing wire care**
- **Action**
  - Confirm, secure and note position and insertion length of temporary transvenous pacing wire
  - Confirm and secure all connections

**Pacemaker Failure to Capture or Pace**
- **Action**
  - Transvenous Pacing failure to capture and/or pacemaker fail to pace AND/OR
  - Less than adequate perfusion i.e. clinical evidence of bradycardia
  - Check all leads, connections and pacemaker function
  - Place patient in left lateral position and/or encourage patient to cough
  - Reassess physiological status
  - IF less than adequate perfusion:
    - Increase OUTPUT until capture and return to adequate perfusion
  - Consider need for institution of Transsthoracic pacing (TPP) or pharmacological support
  - IF Transvenous Pacing ineffective or not possible AND less than adequate perfusion
    - Manage as per CPG A0402 Bradycardia and/or AAV-03 Transsthoracic Pacing
Special Notes

- ALS Flight Paramedics must consult with either the clinician or a MFP via the FCC prior to exceeding the 20mg IV maximum dose of Morphine or 200mcg IV maximum dose of Fentanyl

- Morphine Infusion
  - Morphine 30mg added to make 30ml with Dextrose 5% or Normal Saline
  - 1ml/hr = 1mg/hr

- Ketamine Infusion
  - Ketamine 50mg added to make 50ml with Dextrose 5% or Normal Saline
  - 1ml/hr = 1mg/hr
  - Ketamine 50mg may be obtained by adding 50mg (5ml) of the pre-diluted 10mg/ml Ketamine solution to 45ml Dextrose or Normal Saline to make a 1mg/ml dilution

- The preferred choice for non IV therapy pain relief is IN Fentanyl.

- Dosage for IN Fentanyl for adults
  - Fentanyl 200mcg IN
  - Repeat up to 50mcg IN @ 5/60 titrated to pain or side effects (max dose 400mcg)

- If elderly, frail or weight ≤ 60kg
  - Fentanyl 100mcg IN
  - Repeat up to 50mcg IN @ 5/60 titrated to pain or side effects (max dose 200mcg)
Flowchart

**Status**
- Complaint of pain

**Initial Management**
- Pain score > 2
- Refer to CPG A0501 Pain Relief for initial treatment

**Inadequate Analgesia Obtained**
- Pt in severe pain despite Morphine 10-20mg IV or Fentanyl 100-200mcg IV. Consider several pharmacological agents as appropriate

**Action**
- Consider Ketamine 10-20mg IV every 5-10 minutes titrated to pain relief or side effects
- Consider Parecoxib Sodium 40mg IV
- Consider infusions of Morphine @ 2-10mg/hr and/or Ketamine @ 4-16mg/hr if transport time is prolonged
- For patients with severe traumatic pain who do not respond adequately to the above, then consider RSI

**Patient Trapped Requiring Limb Amputation**
- General anaesthesia (without paralysis and intubation) may be required for trapped patients requiring limb amputation. In this situation administer:
  - Ketamine 1.5mg/kg IV bolus
Inadequate Perfusion Associated with Sepsis

Special Notes

- Noradrenaline infusion preparation
  - Noradrenaline 3mg added to 47ml of Dextrose 5% or Normal Saline
  - 1ml/hr = 1 mcg/min
- Steroid therapy is not routinely administered in severe sepsis
- Appropriate antibiotics should be administered. Consult with receiving hospital for administration of Ceftriaxone 1gm IV
- For inter-hospital transfers, consult with ARV for recommended antibiotic therapy

Flowchart

- **Status**
  - Suspected or diagnosed severe sepsis

- **Assess**
  - Manage and treat as CPG A0705 Inadequate Perfusion Non-Cardiogenic/Non-Hypovolaemic

- **Airway and Breathing**
  - If in respiratory distress, SpO₂ < 92% on supplemental O₂ or in altered conscious state
  - Intubate prior to transport as per CPG AAV 01 Rapid Sequence Intubation

- **Perfusion**
  - If systolic blood pressure < 90mmHg after Normal Saline 40mL/kg
  - Consider invasive blood pressure monitoring as per CPG AAV REF01 Arterial Line Insertion
  - Noradrenaline infusion
    - Noradrenaline infusion must be administered through a separate dedicated IV line. If a CV line is not inserted, short term administration via a separate peripheral line may be undertaken with care to avoid extravasation.
    - Commence @ 5mcg/min (5mL/hr) and titrate to SBP > 90 to a maximum 25mcg/min (25mL/hr)
    - Consult with receiving hospital if treatment not effective
Special Notes

Additional Modifying Factors

- Penetrating trunk trauma – accept a palpable carotid pulse and transport immediately. The treatment of major haemorrhage following penetrating truncal trauma is surgical.
- In cases where there is uncontrolled bleeding and the flight time is short, there must be no additional scene time spent undertaking RSI, even in the comatose patient
- If the patient is aged 15 – 17 years, parental consent is required for administration of PRCC

Flowchart

- **Status**
  - Evidence of hypovolaemia

- **Assess**
  - Manage as per CPG A0801 Hypovolaemia
  - Apply arterial tourniquet if appropriate (i.e. uncontrolled limb bleeding despite adequate external pressure)
  - Apply haemostatic dressing if appropriate (i.e. uncontrolled head/trunk wound bleeding despite adequate pressure)

- **If SBP < 70 mmHg**

- **Action**
  - Administer Packed Red Cell Concentrate.
  - Assess after each transfusion and repeat as required
  - If the patient has severe traumatic brain injury (GCS ≤ 9), commence Adrenaline infusion and titrate to SBP ≥ 120mmHg
In the case of an inter-hospital transfer, if an ICC has been inserted at sending hospital and major haemothorax is present and > 1L of blood flows out of the ICC

- Consult with ARV Coordinator
- Clamp off ICC and assess if able to adequately oxygenate and ventilate patient
- Release clamp if oxygenation and/or ventilation become unsatisfactory

**Flowchart**

**Related Resources**

Flowchart

**Status**
- Potential or suspected spinal injury

**Assess**
- Manage initially as per CPG A0904 Spinal Injury

**Airway**
- Intubate as required as per CPG AAV 001 Rapid Sequence Intubation in the presence of quadriplegia and paradoxical ventilation

**If SBP remains < 90mmHg and prolonged**
- If isolated neurogenic shock is suspected
  - Administer Normal Saline 10mL/kg IV aiming to maintain systolic blood pressure > 90mmHg
- Invasive blood pressure monitoring should be established as per CPG AAV 11 Arterial Line Insertion
- If SBP remains < 90mmHg, commence Noradrenaline Infusion
  - 5mcg/min (5mL/hr) – 25mcg/min (25mL/hr) IV to titrate to SBP > 90mmHg to maintain spinal cord perfusion and limit secondary injury.

Preparation of Noradrenaline Infusion:
- Noradrenaline 3mg added to make 50mL with Glucose 5% or Normal Saline
- 1mL/hr = 1 mcg/min
This CPG is to be used in conjunction with and as an adjunct to AV CPG A0201 Cardiac Arrest.

**Traumatic Cardiac Arrest**

The intent is to prioritise haemorrhage control and managing correctable causes prior to other therapies. Priorities include oxygenation and ventilation; exclusion of tension pneumothorax by insertion of bilateral pleural decompression and administration of Red Cell Concentrate x 4 IV/IO in order of clinical need. This should be followed by routine cardiac arrest management including cardiac rhythm check. Once correctable causes have been addressed, a cardiac rhythm check and other standard cardiac arrest therapies such as compressions and adrenaline should be administered.

- In cases where the Hx, MOI or injuries are inconsistent with traumatic cardiac arrest, or patient is in VF/VT, consider medical cause. If any doubt exists as to the cause of arrest, treat as per Medical Cardiac Arrest.
- Control of major haemorrhage is a priority and can be achieved with tourniquets, haemostatic dressings and/or direct pressure.
- A pelvic splint should be applied after other interventions in undifferentiated blunt trauma. Where pelvic fracture is clearly contributing to cardiac arrest, a pelvic splint may be applied earlier.
- A supraglottic airway is an appropriate option to manage the airway initially and to facilitate continuous compressions. When ETT is attempted, it should not interrupt compressions.
- ETCO$_2$ can be used as a surrogate marker of cardiac output during cardiac arrest. Where capnography is available, measure ETCO$_2$. An ETCO$_2$ reading greater than 10mmHg is desirable.
- Where clear signs of prolonged cardiac arrest are present, or continued resuscitation may be futile, consider [AAV CPG G 01](#) and/or [AV CPG A0203](#) Withholding or Ceasing Resuscitation.
- IV access may be difficult in this cohort of patient and consideration should be given to rapidly establishing peripheral access via IO.

**Ratios of compression to ventilation:**

**No ETT/SGA**
- 30 compressions to 2 ventilations
- Aim for 100 – 120 compressions per minute
- Pause for ventilations

**ETT/SGA**
- 15 compressions to 1 ventilation
- Aim for 100 – 120 compressions per minute
- 6 - 8 ventilations per minute
- No pause for ventilations
- The required depth of compression is > 5cm and full recoil of the chest should be allowed.
• Evidence suggests compressions rates often differ from recommendations. Consider using metronome if available.

• CPR operators should rotate every 2 minutes to reduce fatigue and maintain performance. A gradual fall in ETCO₂ may suggest fatigue during CPR.

Flowchart

- Traumatic cardiac arrest
  • Hx, MOI or injuries do not suggest medical causes of cardiac arrest

- Initial management
  - Prioritise control of major haemorrhage over all other interventions
    • Control external blood loss
    • Apply arterial tourniquet if appropriate (i.e. uncontrolled limb bleeding despite adequate external pressure)
    • Apply haemostatic dressing if appropriate (i.e. uncontrolled head/trunk wound bleeding despite adequate pressure)
    • Apply pelvic splint if a fracture of the pelvis is suspected

- Subsequent management
  - Action
    • Open airway (insert airway or SGA) and administer oxygen using gentle ventilation
    • Check cardiac rhythm (if asystole consider cessation of resuscitation)
    • Insert large bore IV cannula and administer Red Cell Concentrate x 4
    • Perform bilateral finger thorocostomy
    • Commence chest compressions

- Perform the following
  - Action
    • Endotracheal intubation and measure ETCO₂
    • Cardiac ultrasound to diagnose pericardial tamponade and/or pseudo-PEA (Pulseless Electrical Activity)
General Care

- An exception to the mandatory use of functional electronic capnography may be made if winching is required to access the patient and it is not possible to carry electronic capnography in which case a disposable capnograph must be used to check ETT position.
- If RSI is in the setting of head injury, spinal column or spinal cord injury, then an assistant must stabilise the head and neck.

Infusion Preparation

- **Morphine + Midazolam Infusion (Paediatric)**
  - Morphine 15mg + Midazolam 15mg in 15ml D5W or Normal Saline
    - 1ml = 1mg each drug
    - 0.1ml = 0.1mg each drug
    - 1ml/hr = 1 mg/hr

- **Fentanyl + Midazolam Infusion (Paediatric)**
  - Fentanyl 300mcg + Midazolam 15mg in 15ml D5W or Normal Saline
    - 1ml = 20mcg Fentanyl + 1mg Midazolam
    - 0.1ml = 2mcg Fentanyl + 0.1mg Midazolam
  - Infusion rate 0.1 – 0.2ml/kg/hr IV
Rapid Sequence Intubation (Paediatric)

**Indications**
- Patients with Glasgow Coma Score ≤ 12
- Patients with actual or potential airway compromise (e.g. airway burns)
- Patients with significant hypoxia (i.e. SpO₂ ≤ 92% on supplemental oxygen e.g. chest trauma, severe pneumonia)
- Patients with suspected spinal cord injury and respiratory compromise
- Patients with severe pain unable to be managed using analgesic agents

**Precautions**
- Potential difficult intubation (upper airway injury, limited mouth opening, spinal column injury or abnormality)
- Flight time < 10 minutes in time-critical patient who has adequate oxygenation and ventilation without intubation
- Coma due to uncontrolled bleeding (e.g. penetrating trauma)

**Contraindications**
- Any contraindications for Suxamethonium AND Rocuronium
- Inability to continuously monitor vital signs, SpO₂ and ETCO₂

- In cases where HR < 80/min, pre-treat with Atropine 0.02mg/kg IV to a maximum of 0.6mg

**Flowchart**

- **RSI - Trauma, asthma GCS ≤ 12 or hypoxia (SpO₂ < 92%)**
  - Action
  - Ketamine 1.5 mg/kg IV

- **RSI - Non - traumatic coma (GCS ≤ 12)**
  - Action
  - Midazolam 0.1 mg/kg IV
  - Fentanyl 2.0 mcg/kg IV

- **RSI - Post cardiac arrest (GCS ≤ 12)**
  - Action
  - Fentanyl 2.0 mcg/kg IV

- **RSI - Airway burns GCS > 12, consult with RCH to authorise**
  - Action
  - Propofol 1.0 mg/kg IV
  - Fentanyl 2.0 mcg/kg IV

**Paralyzing agent**

- **Paralyzing agent**
  - Action
  - Suxamethonium 1.5 mg/kg IV

- Followed immediately after confirmation of ETT placement with ETCO₂ by Pancuronium 0.1 mg/kg
- If Suxamethonium is contraindicated administer Rocuronium 1.2mg/kg IV

This is an uncontrolled document, it is the reader's responsibility to ensure currency.
Care of Intubated Patient

- Target tidal volume is 6 ml/kg
- Start with PEEP 5cm H₂O. In the setting of acute lung injury, if the SpO₂ remains low (<92%) increase PEEP to 10mmHg then to a maximum of 15cm H₂O to achieve an oxygenation saturation target of >94%
- Target ETCO₂ is 30mmHg (adjust ventilation rate accordingly) except in severe asthma or severe lung injury (without brain injury) when a higher ETCO₂ may be used
- If possible, check arterial or venous pCO₂ using iStat
- A HME filter should be used to prevent airway damage from prolonged ventilation with dry oxygen
- Temperature should be measured using an oesophageal temperature probe

Post Intubation Sedation and Paralysis

Action

- Sedate using Morphine/Midazolam 0.2 mg/kg/hr - 0.4 mg/kg/hr IV
- If Propofol is given for induction then consider post intubation sedation using:
  - Propofol Infusion at rate 2 mg/kg/hr – 4 mg/kg/hr IV
- If Pancuronium causes tachycardia (>140/minute), maintain paralysis with
  - Rocuronium 0.6 mg/kg IV bolus at 15 minute intervals
- If patient has had continuous seizure activity:
  - Midazolam Infusion @ 0.2 – 0.4mg/kg/hr IV
  - Supplement with Midazolam 0.2mg/kg IV PRN as required. There is no upper dose limit for the administration of this drug.
  - Patients intubated for status epilepticus should not receive routine post intubation paralysis. However if sedation using Midazolam is insufficient to safely maintain intubation and ventilation, then Pancuronium should be administered
Failed Intubation Drill (Paediatric)

Flowchart

1. **Failed Intubation**
   - Unable to see vocal cords during initial laryngoscopy

2. **Action**
   - Insert OP Airway and ventilate with 100% Oxygen

3. **Action**
   - Reattempt intubation using bougie with blind placement of ETT over bougie

4. **Action**
   - Objective confirmation of tracheal placement (ETCO₂)

   - Yes
     - **Action**
       - Continue management in accordance with relevant CPG

   - No
     - **Action**
       - Immediately remove ETT, insert OP or NP airway and ventilate with 100% Oxygen

5. **Action**
   - If sedation/paralysis drugs administered allow these to wear off and patient to resume normal respiration

6. **Action**
   - If unable to oxygenate and ventilate with OP or NP airway, insert appropriately sized LMA

7. **Action**
   - If unable to oxygenate and ventilate with LMA, perform cricothyroidotomy using approved kit

Related Resources

https://av-digital-cpg.web.app/assets/pdf/CWI/CWI OPS 181 Paediatric needle cricothyroidotomy and jet oxygenation [CPG AAV P02].pdf
**Flowchart**

**Inadequate Analgesia Obtained**
- Patient is in severe pain despite Morphine 0.2mg/kg IV. Consider several different pharmacological agents as appropriate.

**Action**
- Ketamine 0.25mg/kg IV every 5 – 10 minutes titrated to pain relief or side effects
- Infusion of Morphine @ 0.1 mg/kg/hr AND/OR Ketamine @ 0.1 – 0.2 mg/kg/hr if transport time will be prolonged
- Paracoxib Sodium 0.5 mg/kg IV
- For patients with severe traumatic pain who do not respond adequately to the above, then consider RSI

**Patient trapped requiring limb amputation**
- General anaesthesia (without paralysis and intubation) may be required for trapped patients requiring limb amputation

**Action**
- Ketamine 1.5 mg/kg IV bolus
### Inadequate Perfusion Associated with Hypovolemia

**Flowchart**

**Initial management**
- Manage as per CPG P0801 Hypovolaemia (Paediatric)
- Apply arterial tourniquet if appropriate (i.e. uncontrolled limb bleeding despite adequate external pressure)

**If systolic BP remains < 100mmHg**
- After **20mL/kg Normal Saline**, seek consent for a blood transfusion from a parent and if approved
- Administer **Packed Red Cell Concentrate 10mL/kg**
- Assess after each transfusion and repeat, as required
- If consent from a parent is not possible, administer further **Normal Saline 20mL/kg**
- If the patient has severe traumatic brain injury (GCS < 9) and remains hypotensive despite commencement of blood transfusion, consult the RCH Emergency Physician to commence **adrenaline/noradrenaline infusion** and titrate to systolic BP that is normal for age

**Additional Modifying Factors**
- Penetrating trunk injury – Accept a palpable carotid pulse and transport immediately. The treatment of major haemorrhage following penetrating truncal trauma is surgical
- In cases where the flight time is short, there must be no additional scene time undertaking RSI, even in a comatose patient
General Care

- This CPG is to be used in conjunction with and as an adjunct to AV CPG P0201 Cardiac Arrest (Paediatric)

Traumatic Cardiac Arrest

- The intent is to prioritise haemorrhage control and managing correctable causes prior to other therapies. Priorities include oxygenation and ventilation; exclusion of tension pneumothorax by insertion of bilateral intercostal catheters; and administration of Red Cell Concentrate 10ml/kg IV/IO in order of clinical need. This should be followed by routine cardiac arrest management including cardiac rhythm check. Once correctable causes have been addressed, a cardiac rhythm check and other standard cardiac arrest therapies such as compressions and adrenaline should be administered.

- In cases where the Hx, MOI or injuries are inconsistent with traumatic cardiac arrest, or patient is in VF/VT, consider medical cause. If any doubt exists as to the cause of arrest, treat as per Medical Cardiac Arrest.

- Control of major haemorrhage is a priority and can be achieved with tourniquets, haemostatic dressings and/or direct pressure.

- A pelvic splint should be applied after other interventions in undifferentiated blunt trauma. Where pelvic fracture is clearly contributing to cardiac arrest, a pelvic splint may be applied earlier.

- A supraglottic airway is an appropriate option to manage the airway initially and to facilitate continuous compressions. When ETT is attempted, it should not interrupt compressions.

- ETCO\textsubscript{2} can be used as a surrogate marker of cardiac output during cardiac arrest. Where capnography is available, measure ETCO\textsubscript{2}. An ETCO\textsubscript{2} reading greater than 10mmHg is desirable.

- Where clear signs of prolonged cardiac arrest are present, or continued resuscitation may be futile, consider AAV CPG G01 and/or AV CPG A0203 Withholding or Ceasing Resuscitation.

Administration of Red Cell Concentrate (RCC)

- It is a legal requirement to obtain parental consent prior to administration of Red Cell Concentrate for any patient aged under 18 years (except if married). Therefore RCC must only be administered to a child < 18 years if a parent/legal guardian can be contacted and the parent/legal guardian does not object to the administration of a “blood transfusion”

Ratios of compression to ventilation

No ETT/SGA

- 15 compressions to 2 ventilations
- Aim for 100 - 120 compressions per minute
- <14 ventilations per minute
- Pause for ventilations

ETT/SGA

- 15 compressions to 2 ventilations
- Aim for 100 - 120 compressions per minute
- <14 ventilations per minute
- No pause for ventilations

Flowchart

**Traumatic cardiac arrest**
- Hx, MOI or injuries do not suggest medical causes of cardiac arrest

**Initial management**
- Control external blood loss
- Apply arterial tourniquet if appropriate (i.e. uncontrolled limb bleeding despite adequate external pressure)
- Apply haemostatic dressing if appropriate (i.e. uncontrolled head/trunk wound bleeding despite adequate pressure)
- Apply pelvic splint if the fracture of the pelvis is suspected

**Subsequent management**

**Action**
- Open airway (insert airway or SGA) and administer oxygen using gentle ventilation
- Check cardiac rhythm (if asystole consider cessation of resuscitation)
- Insert large bore IV cannula and administer **Red Cell Concentrate 10mL/kg IV** and repeat as needed if consent of a parent is possible
- Perform bilateral finger thoracostomy
- Commence chest compressions

**Perform the following**

**Action**
- Endotracheal intubation and measure ETCO₂
- Cardiac ultrasound to diagnose pericardial tamponade and/or pseudo- PEA (Pulseless Electrical Activity)
• 10 mg in 2.5 mL (ampoule)
• 10 mg in 5 mL (ampoule)

**Primary Emergency Indication**

1. Muscle relaxant for maintaining endotracheal intubation

**Adult doses:**

• 0.5 mg/kg

**Contraindications**

1. Allergy to atracurium or cisatracurium
2. Asthma
3. Significant cardiovascular disease

**Precautions**

1. Myasthenia gravis (prolongs paralysis)
2. Neuromuscular diseases e.g. dystrophia myotonica, history of polio (unpredictable effect)
3. Severe obesity (unpredictable effect)
4. Burns (may require increase dose and shortened duration of action)
5. Acidosis, dehydration, debilitation, electrolyte imbalance (enhance effects)
6. Hypothermia (increases intensity and/or duration of action)

**Side Effects**

• Anaphylaxis

**Infusions**

• 10 – 20 mg/hr (adult) following bolus
Notes

- Trade name: Tracrium
- Metabolism: Hydrolysis
- Route: IV
- Onset: 1 minute
- Duration: 20 minutes
- During air transport, the use of muscle relaxants is considered the safest approach to maintaining endotracheal intubation. In most cases the initial bolus will maintain relaxation for the duration of the flight. However, particular care should be taken to ensure adequate muscle relaxant during the unloading procedure. At the first sign of any return of movement a repeat bolus must be administered.
<table>
<thead>
<tr>
<th>Presentation</th>
<th>10 mg or 20 mg tablet</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pharmacology</td>
<td>A calcium channel blocker</td>
</tr>
<tr>
<td></td>
<td>Actions:</td>
</tr>
<tr>
<td></td>
<td>• Relaxes uterine smooth muscle</td>
</tr>
<tr>
<td>Metabolism</td>
<td>Metabolised by the liver</td>
</tr>
<tr>
<td>Primary emergency Indications</td>
<td>Premature labour</td>
</tr>
<tr>
<td>Contraindications</td>
<td>Hypotension (systolic BP &lt; 100 mmHg)</td>
</tr>
<tr>
<td>Precautions</td>
<td>Since Nifedipine causes hypotension, care must be taken to avoid hypovolaemia</td>
</tr>
<tr>
<td>Route of administration</td>
<td>Oral</td>
</tr>
<tr>
<td>Usual Dose</td>
<td>20 mg tablet</td>
</tr>
<tr>
<td>Side effects</td>
<td>• Hypotension</td>
</tr>
<tr>
<td></td>
<td>• Tachycardia</td>
</tr>
<tr>
<td>Special notes</td>
<td>Onset time: 10 minutes</td>
</tr>
<tr>
<td></td>
<td>Peak: 12 minutes</td>
</tr>
<tr>
<td></td>
<td>Duration: 240 minutes</td>
</tr>
<tr>
<td></td>
<td><strong>Administer only on advice of a physician for premature labour</strong></td>
</tr>
</tbody>
</table>
**Presentation** | 4mg in 4ml ampoule
---|---
**Pharmacology** | A synthetic adrenergic stimulant with primarily alpha effects
| Actions:
| • Causes peripheral vasoconstriction ($\alpha$ receptors)
**Metabolism** | By monoamine oxidase and other enzymes in blood, liver and around nerve endings and excreted by the kidneys
**Primary emergency indications** | • Severe sepsis with inadequate perfusion and mean arterial BP < 70 mmHg
| • Neurogenic shock
| • Hypotensive intracranial haemorrhage
**Contraindications** | • Hypovolaemic shock
| • Patients with mesenteric or peripheral vascular ischaemia, unless administration is deemed life threatening
**Precautions** | Since Noradrenaline may cause tissue necrosis, care must be taken to avoid leakage of the drug into tissues
**Route of administration** | Intravenous infusion using syringe pump only
**Usual Dose** | Noradrenaline 3 mg diluted to 50 ml with 47 ml Normal Saline or Dextrose 5%
| 1ml resultant solution = 0.06 mg Noradrenaline
| 1ml/hr = 1.0 mcg/min
**Side effects** | • Peripheral ischaemia
| • Ventricular arrhythmias
| • Hypertension
**Special notes** | Noradrenaline must be administered via a dedicated IV line. If a CV line is not inserted, short term administration via a separate peripheral line may be undertaken with care to avoid extravasation
| Intravenous effects (bolus):
| Onset: 1 minute
| Peak: 2 minutes
| Duration: 5 minutes
<table>
<thead>
<tr>
<th>Presentation</th>
<th>300ml pack (Blood group O Rhesus negative)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pharmacology</td>
<td>Human blood product</td>
</tr>
<tr>
<td></td>
<td>Actions</td>
</tr>
<tr>
<td></td>
<td>• Increases oxygen transport</td>
</tr>
<tr>
<td>Metabolism</td>
<td></td>
</tr>
<tr>
<td>Primary emergency indications</td>
<td>• Hypovolaemic shock and 20ml/kg crystalloid resuscitation already administered</td>
</tr>
<tr>
<td></td>
<td>• Hypovolaemic shock and measured anaemia (Hct &lt; 30)</td>
</tr>
<tr>
<td></td>
<td>• Measured anaemia (Hct &lt; 27) in patients with cardiac or neurological injury/disease</td>
</tr>
<tr>
<td></td>
<td>• Severe measured anaemia (Hct &lt; 21)</td>
</tr>
<tr>
<td>Contraindications</td>
<td>• Known religious objection to blood products</td>
</tr>
<tr>
<td></td>
<td>• Children &lt; 18 years old without parental consent who are not married</td>
</tr>
<tr>
<td>Route of administration</td>
<td>Intravenous</td>
</tr>
<tr>
<td>Usual Dose</td>
<td>1-5 units (300- 1500 ml)</td>
</tr>
<tr>
<td>Side effects</td>
<td>• Anaphylaxis</td>
</tr>
<tr>
<td></td>
<td>• Infection</td>
</tr>
<tr>
<td></td>
<td>• Hypothermia</td>
</tr>
<tr>
<td>Special notes</td>
<td>If available, a fluid warming device should be used to administer this product</td>
</tr>
<tr>
<td>Presentation</td>
<td>40mg powder in glass vial</td>
</tr>
<tr>
<td>--------------</td>
<td>--------------------------</td>
</tr>
<tr>
<td>Pharmacology</td>
<td>A non-steroidal anti-inflammatory drug (selective Cox-2 receptor inhibitor) Actions: • Analgesic</td>
</tr>
<tr>
<td>Metabolism</td>
<td>By the liver</td>
</tr>
<tr>
<td>Primary emergency Indications</td>
<td>Severe traumatic or post-surgical pain, unrelieved by Morphine or Fentanyl</td>
</tr>
<tr>
<td>Contraindications</td>
<td>• Known hypersensitivity to non-steroidal anti-inflammatory drugs, Aspirin or Sulphonamides • Age &gt; 60 years • Known renal impairment • Increased risk of acute renal failure i.e. Crush Syndrome (limb compressed &gt; 1 hour), prolonged hypotension (&gt;1 hour) • Penetrating chest injury • Major bleeding suspected</td>
</tr>
<tr>
<td>Precautions</td>
<td>Nil of significance</td>
</tr>
<tr>
<td>Route of administration</td>
<td>Intravenous bolus</td>
</tr>
<tr>
<td>Side effects</td>
<td>• Renal failure • Gastro-intestinal bleeding/ulceration (long term use) • Hypertension • Hypotension</td>
</tr>
<tr>
<td>Special notes</td>
<td>Intravenous effects (bolus): Onset: 5 minutes Peak: 30 minutes Duration: 18 hours In some patients the onset time may be prolonged due to delayed conversion of the drug to the active metabolite</td>
</tr>
</tbody>
</table>
**Propofol**

<table>
<thead>
<tr>
<th>Presentation</th>
<th>200mg in 20ml ampoule</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pharmacology</td>
<td>A sedative/anaesthetic agent</td>
</tr>
<tr>
<td>Metabolism</td>
<td>By the liver</td>
</tr>
</tbody>
</table>
| Primary emergency Indications | • Induction of anaesthesia with GCS ≥ 13  
  — Airway burns  
  — Non trauma  
  • Sedation during mechanical ventilation  
  • Intracranial haemorrhage with hypertension |
| Contraindications | • Allergy to Propofol or component parts (egg, soybean or glycerol)  
  • Sedation or anaesthesia in children < 3 years  
  • Hypotension BP < 100mmHg |
| Precautions | Since Propofol may cause hypotension, care must be taken to avoid hypovolaemia |
| Route of administration | Intravenous |
| Side effects | • Hypotension  
  • Respiratory depression  
  • Bradycardia |
| Special notes | Since Propofol has no analgesic properties, a Morphine or Fentanyl infusion may be required in addition to Propofol infusion for post operative and trauma patients  
Intravenous effects (bolus):  
Onset: 1 minutes  
Peak: 2 minutes  
Duration: 5 minutes |
### Rocuronium (AAV)

| **Presentation** | 50mg in 5 ml ampoule  
100mg in 10 ml ampoule |
|------------------|------------------------|
| **Pharmacology** | Non-depolarising neuromuscular blocking agent  
Actions  
• Fast onset medium acting muscle relaxant |
| **Metabolism**   | Primarily by the liver |
| **Primary emergency Indications** |  
• As part of rapid sequence intubation when the use of Suxamethonium is contraindicated e.g. hyperkalaemia, malignant hyperthermia  
• Maintenance of paralysis as an alternative to Pancuronium in patients where the increase in heart rate associated with Pancuronium may be undesirable |
| **Contraindications** |  
• Known hypersensitivity |
| **Precautions**  |  
• Potential difficult airway |
| **Route of administration** | Intravenous bolus  
Infusion via syringe pump |
| **Usual Dose**   |  
• **Intubation:** 1.2 mg/kg will provide good intubating conditions in most patients in less than 2 minutes  
• **Maintenance of paralysis:** Repeat boluses of 50mg IV every 15 minutes or 0.6mg/kg/hr IV infusion. |
| **Preparation**  | Dilute 200 mg into 20 ml Normal Saline |
| **Side effects** | Allergic reactions including anaphylaxis |
| **Special notes** | Onset: 1 minute  
Duration of effect: 20 minutes  
Upon removal from refrigeration at room temperature storage conditions (25 deg) use Rocuronium within 90 days |
Vecuronium

- 4 mg powder
- 10 mg powder

Primary Emergency Indication

1. Muscle relaxant for maintaining endotracheal intubation

Adult doses:

- 0.1 mg/kg

Contraindications

1. Allergy to atracurium or cisatracurium
2. Asthma
3. Significant cardiovascular disease

Precautions

1. Renal impairment (prolongs paralysis)
2. Hepatic (prolongs paralysis)
3. Myasthenia gravis (prolongs paralysis)
4. Neuromuscular diseases e.g. dystrophia myotonica, history of polio (unpredictable effect)
5. Severe obesity (unpredictable effect)
6. Burns (may require increase dose and shortened duration of action)
7. Acidosis, dehydration, debilitation, electrolyte imbalance (enhance effects)
8. Hypothermia (increases intensity and/or duration of action)

Side Effects

- Anaphylaxis

Infusions

- 5 – 15 mg/hr following bolus
Notes

- Trade name: Norcuron
- Metabolism: Renal / Liver
- Route: IV
- Onset: 2 minutes
- Duration: 30 minutes
- During air transport, the use of muscle relaxants is considered the safest approach to maintaining endotracheal intubation. In most cases the initial bolus will maintain relaxation for the duration of the flight. However, particular care should be taken to ensure adequate muscle relaxant during the unloading procedure. At the first sign of any return of movement a repeat bolus must be administered.
Withholding and/or Ceasing Resuscitation

CPG AAV G01

Special Notes

• A Refusal of Treatment Certificate may be completed by:
  — A person aged 18 years or older
  — An agent where a person aged 18 years or older has completed an Enduring Power of Attorney (Medical Treatment); or by
  — A guardian appointed by the Civil and Administrative Tribunal (VCAT)

• A Refusal of Treatment Certificate may be sighted by the attending ambulance crew, or they may accept in good faith the advice of those present at the scene. If there is any doubt about the application of a certificate the default position of resuscitation should be adopted

• A Refusal of Treatment Certificate may only be completed in relation to a current condition. When ceasing or withholding resuscitative efforts in these circumstances the attending Ambulance or MICA Paramedic needs to be satisfied that the patient’s cardiac arrest is most likely due to this current condition

• Ambulance crews must clearly record full details of the information given to them and the basis for their decision regarding resuscitation on the Patient Care Record (PCR). This is particularly important in circumstances where a copy of the Refusal of Treatment Certificate has not been sighted as it will serve if necessary as evidence of their good faith

• Under the Medical Treatment Act 1988 a person acting under the direction of a registered Medical Practitioner who, in good faith and in reliance on a Refusal of Treatment Certificate, refuses to perform or continue medical treatment is not guilty of professional misconduct or guilty of an offence or liable in any civil proceedings because of the failure to perform or continue that treatment.

Circumstances Where Resuscitation Efforts May Be Withheld

• Likely risk to Paramedic health and safety
• Clear evidence of prolonged cardiac arrest (e.g. rigor mortis, decomposition, post mortem lividity)
• Injuries incompatible with life (e.g. decapitation)
• Inadequate resources to deal with all patients (e.g. multi casualty incidents)
• Death declared by a Medical Officer who is, or has been, at the scene
• An adult (18 years or older), where a Refusal of Treatment Certificate has been completed for a current condition which most likely caused the cardiac arrest
• A child (< 18 years old), where a Court Order is provided to the attending Ambulance crews indicating that Cardiopulmonary Resuscitation (CPR) is not to be commenced
• An adult patient (18 years or older) whose initial cardiac rhythm is asystole (over a minimum 30 second period), provided the time interval between the onset of cardiac arrest i.e. collapse, and arrival of the crew at the patient has exceeded 10 minutes and there are no compelling reasons to continue, such as suspected hypothermia, suspected drug overdose, a child (< 18 years) or family/bystander requests continued efforts

Circumstances Where Resuscitation Efforts May Be Ceased

• An adult patient (18 years or older) who, after 30 minutes of Advanced Life Support resuscitation (including advanced airway management), defibrillation and/or Adrenaline) has no return of spontaneous circulation, is not in VF or VT, has no other signs of life present such as gasps or pupil
reaction and hypothermia or drug overdose are not suspected

- During Air Ambulance transport when cardiac arrest occurs in the setting of severe injury and a quickly reversible cause for the cardiac arrest has been excluded (i.e. pneumothorax, cardiac arrhythmia) and it is not practical to continue chest compressions to hospital
Flowchart

**Status**
- Patient with potential haemodynamic instability

**Assess**
- The blood pressure of a patient with potential haemodynamic instability is most reliably monitored during air transport with an electronic transducer connected to an intra-arterial cannula.
- Provided there is a palpable radial pulse and time permits, an arterial line maybe inserted by a MICA Flight Paramedic in any of the following conditions:
  - Secondary transfer of haemodynamically unstable patients
  - Primary attendance at haemodynamically unstable patients where the transport time is likely protracted or where NIBP is unreliable

**Action**
- Up to two attempts at insertion are allowed at one radial artery site only.
- A 20G or 22G IV cannula or a proprietary kit with guide-wire may be used.
- An injection of 1-2mL of Lignocaine 1% S/C may be required at the cannulation site in an awake patient.