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Current until December 2019
Emergency Protocols is a non-profit organisation dedicated to integrating and improving emergency medical guidelines.

These protocols are current at the time of publication, based on guidelines from peak medical organisations and published expert opinion. They do not replace clinical judgement, and should not be seen as inflexible authoritative statements but rather as cognitive aids to assist practitioners managing each individual situation. These protocols are not a substitute for seeking appropriate expert advice.

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Although every effort has been made to ensure that these protocols are accurate and current, Emergency Protocols shall not be responsible for any errors or omissions or for any consequences arising from the use of these protocols.

This edition is current as of June 2018, and should not be used after December 2019.

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Printed copies of this manual can be purchased from www.emergencyprotocols.org.au
We welcome any comments via e-mail: info@emergencyprotocols.org.au

Sources
Australia and New Zealand Emergency Department Airway Registry (www.airwayregistry.org.au)
Australian Resuscitation Council (www.resus.org.au)
Australian Society of Clinical Immunology (www.allergy.org.au)
Difficult Airway Society (www.das.uk.com)
NSW Health (www.health.nsw.gov.au)
Stanford Anesthesia Emergency Manual (www.emergencymanual.stanford.edu)
Open and clear the airway:
- head tilt and chin lift (unless cervical spine injury)
- jaw thrust
- suction

Assess for difficult bag-mask ventilation:
- Mask seal: beard, facial trauma, blood, vomit
- Obesity
- Age > 55 years
- No teeth
- Stiff ventilation: COPD, asthma, ARDS, term pregnancy

Insert oropharyngeal airway and/or nasopharyngeal airway (nasopharyngeal route relatively contra-indicated with facial or basal skull fractures)

Bag-mask ventilate with 100% oxygen

continued next page
Pre-oxygenate using **bag-mask ventilation** with 100% oxygen for **3 minutes**

Additional **high flow oxygen** via **nasal prongs** at 15 L/min

**ASSESS FOR DIFFICULT AIRWAY**

**Assess** for **difficult intubation**:

- **Look externally**: obesity, short neck, facial or neck trauma
- **Evaluate**:
  - 3 fingers between incisors
  - 3 fingers under mandible
  - 2 fingers between mandible and larynx
- **Mallampatti**:

  ![Mallampatti Grades](image)

<table>
<thead>
<tr>
<th>I</th>
<th>II</th>
<th>III</th>
<th>IV</th>
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<tbody>
<tr>
<td><img src="image" alt="Mallampatti I" /></td>
<td><img src="image" alt="Mallampatti II" /></td>
<td><img src="image" alt="Mallampatti III" /></td>
<td><img src="image" alt="Mallampatti IV" /></td>
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</tbody>
</table>

- **Obstruction**: soft tissue swelling, tumour, recent neck surgery, epiglottitis
- **Neck mobility**: cervical collar, elderly, rheumatoid arthritis

**IF PREDICTED DIFFICULT AIRWAY GO TO PAGE 9 (AIRWAY - DIFFICULT)**

If not predicted difficult airway then **continue on next page**

continued next page
INTUBATION DRUGS

Draw up induction drug:

- **IV ketamine 1.5 mg/kg** (preferred in sepsis, hypotension, asthma)
  
  OR

- **IV thiopentone 3 mg/kg** (adult) or **1 to 2 mg/kg** (elderly)
  
  OR

- **IV propofol 1.5 mg/kg**
  
  Consider **lower dose** if shocked or elderly

Draw up paralysis drug:

- **IV suxamethonium 1.5 mg/kg** of total body weight
  
  (increases serum potassium. Avoid in hyperkalaemia, recent burns, muscular dystrophy or other skeletal myopathy, or history of malignant hyperthermia)
  
  OR

- **IV rocuronium 1.2 mg/kg** of ideal body weight
  
  (if suxamethonium contra-indicated, but paralysis lasts 10 to 40 minutes)

  Check if the rocuronium reversal agent **sugammadex** (Bridion®) is available
  
  (IV sugammadex dose 16 mg/kg, ie. 1200 mg for 75 kg patient)

PRE-INTUBATION CHECKLIST (NEXT TWO PAGES)

continued next page
Team leader identified
Everyone introduced, by name and role, and each briefed in turn by team leader
If cervical spine injury is suspected then person doing in-line cervical spine immobilisation briefed?
Do you have enough help?
Predicted to be difficult?

Verbalise the airway strategy:
A. Initial tracheal intubation
B. Secondary tracheal intubation
C. Maintenance of oxygenation (LMA)
D. Surgical airway (cricothyroidotomy)

Anticipated problems?
Questions or concerns?

Position:
- sniffing ramp if obese

Haemodynamics:
- consider fluid bolus (IV normal saline)
- consider pressors (IV metaraminol 0.5 to 1 mg)

Pre-oxygenation:
- 3 minutes
- > 15 L/min O₂ via mask
- and 15 L/min via nasal prongs

Non-invasive ventilation if:
- obese
- obstructive sleep apnoea
- sats < 95% despite O₂

Monitoring equipment:
- end-tidal CO₂
- oxygen saturations
- ECG monitoring
- non-invasive BP:
  - non-IV-fluid arm
  - 2 minute intervals
**CHECKLIST**

## DRUGS

- **First IV cannula** or intraosseous line: fluid running
- **Second IV cannula** or intraosseous line
- **Induction** drug:
  - ketamine 1.5 mg/kg
  - or thiopentone 1 to 3 mg/kg
  - or propofol 1.5 mg/kg
- **Paralysis** drug:
  - suxamethonium 1.5 mg/kg
  - or rocuronium 1.2 mg/kg
- **Vasopressor** drug:
  - metaraminol 0.5 to 1 mg
- **Post-intubation** drug infusion:
  - propofol
  - or morphine & midazolam
  - or other
- **Draw up** drugs
- **Draw up** normal saline flushes
- **Label** drugs and flushes
- Check drug **contra-indications**
- Check **allergies**

## EQUIPMENT

- **Suction** working
- **Oxygen**:
  - bag-valve mask
  - end-tidal CO₂ **connected**
- Oropharyngeal airway
- Nasopharyngeal airway
- **Laryngoscopes x 2**: check **light**
  - check **blade size**
- **Endotracheal tubes x 2**: choose sizes
  - **test cuffs** with **syringe**
  - lubricate
- **Bougie** or **stylet**:
  - lubricate
- Ventilator **settings** (see page 80)
- Ventilator **circuit**
- Tube **tie** or **tape**
- **Magill's** forceps
- **Laryngeal mask airway**: check size
- **Surgical airway** equipment:
  - scalpel
  - size 6.0 endotracheal tube
Make first attempt your best attempt

Verbalise the airway strategy:

**Plan A**: initial tracheal intubation: direct laryngoscopy or video laryngoscopy, bougie or stylet, three attempts in 2 minutes, sats ≥ 90%

**Plan B**: secondary tracheal intubation: different blade or video laryngoscopy, bougie or stylet, three attempts in 2 minutes, sats ≥ 90%

**Plan C**: maintenance of oxygenation: laryngeal mask airway, three attempts in 2 minutes, sats ≥ 75%

**Plan D**: surgical airway: scalpel-bougie-tube cricothyroidotomy

Plan A: Initial Tracheal Intubation

Give induction drug and flush

Give paralysis drug and flush

If cervical spine injury is suspected then use manual in-line immobilisation

Direct laryngoscopy or video laryngoscopy

Bougie or stylet

If poor view apply external laryngeal manipulation

Maximum of three attempts in 2 minutes

If sats < 90% then re-insert oropharyngeal airway and/or nasopharyngeal airway and bag-mask ventilate using two pairs of hands

If cannot oxygenate then go to page 10 (Airway - Failed)

Continued next page
If successful intubation then go to Ventilation (page 80)

CONSIDER WHAT OTHER HELP IS AVAILABLE

Optimise patient position (consider pillows or ramp)
Maximum head extension and jaw thrust
Consider bed tilt
Aim for face horizontal and ear canal level with sternal notch

PLAN B: SECONDARY TRACHEAL INTUBATION

Consider different laryngoscope
Consider different laryngoscope blade

Direct laryngoscopy or video laryngoscopy
Bougie or stylet
Avoid cricoid pressure
External laryngeal manipulation

Maximum of three attempts in 2 minutes
If sats < 90% then re-insert oropharyngeal airway and/or nasopharyngeal airway and bag-mask ventilate using two pairs of hands

IF UNSUCCESSFUL THEN GO TO PAGE 10 (AIRWAY - FAILED)

If successful intubation then go to Ventilation (page 80)
PATIENT UNRESPONSIVE AND NEAR DEATH

CALL FOR HELP  INFORM TEAM  CRASH CART

Maintain oxygenation and optimise patient position

Attempt intubation. If successful then go to Ventilation (page 80)

Bag-mask ventilate with 100% oxygen

IF UNABLE TO VENTILATE THEN GO TO PAGE 10 (AIRWAY - FAILED)

IV suxamethonium 2 mg/kg

Attempt intubation. If successful then go to Ventilation (page 80)

Bag-mask ventilate with 100% oxygen

IF UNABLE TO VENTILATE THEN GO TO PAGE 10 (AIRWAY - FAILED)

Attempt intubation. If successful then go to Ventilation (page 80)

Bag-mask ventilate with 100% oxygen

GO TO PAGE 10 (AIRWAY - FAILED)
If forced to act:

- give induction and paralysis drugs (see page 3)
- one best attempt
- if successful then go to Ventilation (page 80)
- if failed then go to Airway - Failed (page 10)

If any one of:

- bag-mask ventilation
- or laryngeal mask airway
- or intubation

are predicted to be unsuccessful then consider awake technique with:

- direct laryngoscopy
- or video laryngoscopy
- or intubating LMA
- or fibreoptic scope
- or blind intubation

if anaesthetist and equipment available

- or transtracheal airway

otherwise use RSI with double setup (second airway doctor ready for surgical airway)

If successful intubation see Ventilation (page 80)
AIRWAY - FAILED

“CAN’T INTUBATE”

Cease external laryngeal manipulation
Insert laryngeal mask airway (LMA)

Maximum of three attempts with laryngeal mask airway
Consider changing device or size

If successful oxygenation then go to Ventilation (page 80)

IF SATS < 90% THEN “FAILED LARYNGEAL MASK AIRWAY”

Bag-mask ventilate using two pairs of hands
Optimise patient position (consider pillows or ramp)
Maximum head extension and jaw thrust
Oropharyngeal and/or nasopharyngeal airway

If successful oxygenation then calm down and consider other options

IF SATS < 75% THEN “CAN’T INTUBATE, CAN’T OXYGENATE”

GO TO NEXT PAGE (AIRWAY - SURGICAL)
Remove pillow and **extend neck**

Use non-dominant hand to **stabilise** the larynx

Locate **cricothyroid membrane**.
If cricothyroid membrane **not palpable** then make **vertical skin incision** of **8 to 10 cm** and **blunt dissect** with fingers of both hands

**Horizontal incision** through cricothyroid membrane

**Rotate blade** 90 degrees

Slide **bougie** along blade into trachea

Remove blade

Railroad **size 6.0 cuffed endotracheal tube** over bougie, directed down towards the lungs until the cuff disappears

Hold endotracheal tube securely while bougie is removed

See **Ventilation Guidelines** (page 80)
ANAPHYLAXIS

**REMOVE ALLERGEN**

**CALL FOR HELP** ➤ **INFORM TEAM** ➤ **CRASH CART**

- **Lie patient flat** unless upright position needed to maintain airway

- **IM adrenaline 0.5 mg** into mid-lateral thigh (0.5 mL of 1:1000 ampoule)

- **High-flow oxygen**

- **Monitor respirations, oxygen saturations, heart rate, blood pressure** and **ECG**

- **Repeat adrenaline dose** every 5 minutes as needed

- **Intravenous** or **intraosseous** access

- **If hypotensive give IV normal saline 20 mL/kg bolus**

If multiple doses of adrenaline required, inadequate response or deterioration, then start an **IV adrenaline infusion**: 6 mL of 1:1000 adrenaline in normal saline 100 mL, start infusion at 7 mL/hour (= 0.1 micrograms/kg/minute for 70 kg patient). Titrate rate according to response. Use large vein if possible.

*continued next page*
If adrenaline infusion ineffective or unavailable, consider:

for persistent hypotension/shock:
- give IV normal saline (maximum 50 mL/kg in the first 30 minutes)
- in patients with cardiogenic shock (especially if taking beta-blockers) consider an IV glucagon bolus of 1 to 2 mg; this may be repeated or followed by an infusion of 1 to 2 mg/hour
- IV metaraminol (1 to 10 mg) or IV vasopressin (10 to 40 units) only after expert advice

for upper airway obstruction:
- nebulised adrenaline (5 mL, ie. 5 ampoules of 1:1,000)
- consider intubation (see Airway - Difficult page 9)

for persistent wheeze:
- bronchodilators: salbutamol 12 puffs of 100 micrograms via spacer or nebulised salbutamol 5 mg
- PO prednisone 50 mg or IV hydrocortisone 200 mg

Observe for at least 4 hours after last dose of adrenaline

Educate patient
- Consider script for adrenaline auto-injector (EpiPen)

Do not discharge at night or if no responsible adult can care for patient at home
This protocol is only for LIFE-THREATENING ASTHMA in adults

CALL FOR HELP INFORM TEAM CRASH CART

If peri-arrest give IM adrenaline 0.5 mg (0.5 mL of adrenaline 1:1000)

Nebuliser mask with salbutamol 10 mg (two nebules given together)
Oxygen 10 L/min aiming for saturations ≥ 92%

Continuous salbutamol 10 mg (two nebules given together)

NON-INVASIVE VENTILATION

If not improving but cooperative then trial non-invasive ventilation:

BIPAP settings: \( \text{FiO}_2 \) 1.0 (100% oxygen)
IPAP 10 cmH\(_2\)O
EPAP 0 to 5 cmH\(_2\)O

titrate support according to blood gases and expert advice
use salbutamol 12 puffs via a metered dose inhaler through the circuit

continued next page
IF NOT IMPROVING THEN GO TO PAGE 16

Continuous salbutamol 10 mg (two nebulisers given together)

Add ipratropium bromide:
- if using nebuliser mask then add ipratropium bromide 500 microgram nebuliser every 20 minutes (can be added to the nebuliser with the salbutamol)
- if using non-invasive ventilation then add ipratropium bromide 8 puffs via metered dose inhaler every 20 minutes through the circuit

IV access and take blood for FBC, EUC, CaMgPh and venous blood gas

IV hydrocortisone 100 mg

IV magnesium sulphate 10 mmol in 100 mL normal saline 0.9% over 20 minutes

IV maintenance fluids

Seek expert advice

Consider IV salbutamol infusion. Dilute 5 mL of salbutamol 1 mg/mL ampoules up to 50 mL with normal saline (5 mg/50 mL = 100 mcg/mL). Give IV salbutamol 250 mcg bolus ( = 2.5 mL) over five minutes, then start infusion at 5 mcg/min ( = 3 mL/h). Can increase to 10 mcg/min ( = 6 mL/h). Watch for hypokalaemia and lactic acidosis. Monitor serum potassium, glucose and blood gas every 1 to 2 hours.

IF NOT IMPROVING THEN GO TO NEXT PAGE
INTUBATION IN ASTHMA

Prepare for intubation if:

- not improving
- failing non-invasive ventilation
- rising PCO₂

Perform intubation only if staff are adequately trained, otherwise prepare equipment and drugs while awaiting arrival of expert help.

Consider using IV ketamine 2 mg/kg as induction drug and bronchodilator.

Consider using IV rocuronium 1.2 mg/kg.

See Airway (page 1) and Pre-Intubation Checklist (page 4).

Inflate cuff to 20 to 30 cmH₂O.

Check tube placement using end-tidal CO₂ monitor:

If using colourimeter then “go for gold” within six breaths.

continued next page
**Check tube placement:**
- **look** for symmetric chest expansion
- **auscultation** (check both axillae and over stomach)

**Secure tube**
**Record position** at incisor teeth (approximately 21 cm in females, 23 cm in males)

**Insert** **nasogastric** or orogastric tube

**Avoid vigorous bagging** when intubated
Allow **prolonged time** for **expiration**

**Check portable CXR** for endotracheal tube position

Start **ketamine infusion** if no contra-indications. Dilute ketamine 200 mg ampoule with normal saline 0.9% to give a total volume of 50 mL ( = 4 mg/mL). For a 70 kg patient start infusion at 5 mL/h ( = 21 mg/h and 5 micrograms/kg/minute).

---

SEE VENTILATOR SETTINGS ON NEXT PAGE

---

continued next page
VENTILATOR SETTINGS IN ASTHMA

Seek expert help as patients with very severe asthma can be difficult to ventilate. Safe initial settings are shown here.

Mode VC-SIMV

VT 6 mL/kg of ideal body weight

<table>
<thead>
<tr>
<th>Height</th>
<th>5'153 cm</th>
<th>5'2&quot;156 cm</th>
<th>5'4&quot;163 cm</th>
<th>5'6&quot;168 cm</th>
<th>5'8&quot;173 cm</th>
<th>5'10&quot;178 cm</th>
<th>6'183 cm</th>
<th>6'2&quot;188 cm</th>
<th>6'4&quot;193 cm</th>
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<tbody>
<tr>
<td>VT male</td>
<td>305</td>
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<td>415</td>
<td>440</td>
<td>470</td>
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<tr>
<td>VT female</td>
<td>275</td>
<td>295</td>
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<td>385</td>
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<td>440</td>
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<td>VT pregnant</td>
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<td>510</td>
<td>550</td>
<td>585</td>
<td>625</td>
<td>650</td>
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RR 10 /min

continued next page
**ASTHMA**

- **Pmax** 35 cmH₂O

- **FiO₂** 100%

- **PEEP** 5 cmH₂O

- **I:E** 1:4

Observe closely for signs of pneumothorax

Check blood gas and discuss with expert

Insert urinary IDC

**Raise** head of bed to 45° (or higher if obese)

*continued next page*
If hypotensive and difficult to ventilate then **disconnect** tube and allow patient to expire stacked breaths

If **complications** on the ventilator then **call for help** and check:

- **Dislodgement:** check end-tidal CO\(_2\) waveform, repeat laryngoscopy
- **Obstruction:** check for high peak inspiratory pressure, **suction** secretions
- **Pneumothorax:** check breath sounds, equal chest rise, pleural sliding on ultrasound, repeat CXR
- **Equipment failure:** **disconnect** from ventilator, **bag** patient, check all connections in circuit, check gas supply, replace filter in circuit
- **Stacking breaths:** **bag** slowly, push on chest to assist expiration

Never ignore a ventilator alarm

**continued next page**
If Pmax alarms:

the Oxylog 3000 displays !!! Paw high
check for patient agitation and tube obstruction
if not agitation or obstruction then press and hold Insp Hold

If Pplat > 30 then decrease VT in 1 mL/kg steps to a minimum of 4 mL/kg

Seek expert advice
ASYSTOLE

CPR: 30 COMPRESSIONS : 2 BREATHS
100 TO 120 PER MINUTE
5 CM DEEP
ROTATE COMPRESSORS
MINIMISE INTERRUPTIONS

CALL FOR HELP  INFORM TEAM  CRASH CART

START CPR

Attach defibrillator or monitor

Pads or paddles in left midaxillary line over sixth intercostal space (under breast) and right parasternal area over second intercostal space. In patients with a PPM or ICD put pads at least 8 cm from the PPM or ICD.

Consider airway adjuncts (oro- or naso-pharyngeal airway, and if skilled LMA or ETT)
High-flow oxygen
Intravenous or intraosseous access

IV adrenaline 1 mg followed by normal saline 20 mL flush
CPR 2 minutes
Look at the clock
Waveform capnography (end-tidal CO₂ monitoring)

If the rhythm is shockable (VF or pulseless VT) then shock using 200 J

continued on page 25
### Find and Treat Cause

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<tr>
<th>Condition</th>
<th>Treatment</th>
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<tbody>
<tr>
<td>Hypocalcaemia</td>
<td>- Give IV calcium gluconate 10% 20 mL or IV calcium chloride 10% 10 mL</td>
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<tr>
<td></td>
<td>- Consider profound acidosis and give IV sodium bicarbonate 8.4% 1 mL/kg bolus on expert advice</td>
</tr>
<tr>
<td>Hypovolaemia</td>
<td>- Give IV normal saline 20 mL/kg and check haemoglobin</td>
</tr>
<tr>
<td>Hypocalcaemia</td>
<td>- Give IV calcium gluconate 10% 20 mL or IV calcium chloride 10% 10 mL</td>
</tr>
<tr>
<td>Hypoxia</td>
<td>- Give high-flow oxygen, check connections, check bilateral breath sounds, suction endotracheal tube and reconfirm placement, consider CXR</td>
</tr>
<tr>
<td>Hyperkalaemia</td>
<td>- Give IV calcium chloride 10% 10 mL bolus or IV calcium gluconate 10% 30 mL bolus</td>
</tr>
<tr>
<td></td>
<td>- Give IV short-acting insulin 10 units with IV dextrose 50% 50 mL</td>
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<tr>
<td></td>
<td>- Give nebulised salbutamol 10 to 20 mg</td>
</tr>
<tr>
<td>Hyperkalaemia</td>
<td>- Give IV potassium chloride 1 mmol/mL 5 mL bolus and IV magnesium sulphate 50% 2.5 mL bolus</td>
</tr>
<tr>
<td>Hypothermia</td>
<td>- Use forced air blanket, warm IV fluids, raise room temperature</td>
</tr>
<tr>
<td>Hyperthermia</td>
<td>- Consider sepsis, neuroleptic malignant syndrome, serotonin toxicity, malignant hyperthermia, heat stroke</td>
</tr>
<tr>
<td>Hypothermia</td>
<td>- Consider toxins including medications, infusions, ingestions, and medication error</td>
</tr>
<tr>
<td>Tension pneumothorax</td>
<td>- Check for signs and perform emergency needle decompression or finger thoracostomy. Call for CXR but do not delay treatment</td>
</tr>
<tr>
<td>Cardiac tamponade</td>
<td>- Consider especially if penetrating trauma or recent cardiac surgery</td>
</tr>
</tbody>
</table>

Consider myocardial infarct and pulmonary embolus (may require PCI or thrombolysis).
Simultaneously Find and Treat Cause (facing page)

Plan actions before interrupting compressions

CPR 2 minutes

Shockable? then shock using 200 J

IV adrenaline 1 mg
CPR 2 minutes

Shockable? then shock
After third shock give IV amiodarone 300 mg in dextrose 5% 20 mL

CPR 2 minutes

Shockable? then shock

IV adrenaline 1 mg
CPR 2 minutes

Shockable? then shock
After fifth shock consider IV amiodarone 150 mg in dextrose 5% 20 mL

CPR 2 minutes

Shockable? then shock

continued next page
IV adrenaline 1 mg  
CPR 2 minutes

Shockable? then shock

If refractory pulseless VT or VF then consider IV magnesium 50% 2.5 mL bolus

CPR 2 minutes

Shockable? then shock

IV adrenaline 1 mg  
CPR 2 minutes

Shockable? then shock

CPR 2 minutes

CPR now exceeds 20 minutes

IF RETURN OF SPONTANEOUS CIRCULATION GO TO PAGE 53 (ROSC)
CALL FOR HELP

Call for help:
consider obstetrician, paediatrician, midwife or experienced GP
are any of the nurses trained as midwives?
at least one health professional for mother
at least one health professional for baby

PREPARE

Prepare:
emergency delivery kit
warm towels
sterile scissors
cord ties
gown
sterile gloves
eye protection

continued next page
HISTORY

History:
- antenatal notes
- current gestation
- gravidity, parity
- previous deliveries (vaginal, caesarean, complications)
- any problems during this pregnancy
- medical conditions including bleeding disorders

EXAMINATION

Observations including blood pressure

Palpate fundus:
- work out presenting part
- if skilled use ultrasound

Assess foetal heart rate using handheld Doppler (normal range in labour is 110 to 160 beats/min)

Take bloods:
- haemoglobin
- group & hold

continued next page
LABOUR

**First stage:** regular uterine contractions with dilation of the cervix

**Second stage:** descent of the presenting part and delivery

**Third stage:** delivery of the placenta

**Signs of imminent delivery:**
- **bloody show** (expulsion of mucus plug from cervix)
- **breakage of amniotic sac** (determine the appearance of the expelled fluid)
- **urge to push** or sensation of impending defaecation

If:

- the **baby is not crowning** (ie. the baby’s head is not bulging at the perineum)

  **AND**

- **no urge to push**

  **AND**

- **no complications**

then consider **moving the mother** to a delivery suite

*continued next page*
### DELIVERY

Allow mother to get into **comfortable position** (ideally on her back with knees up)

Wash hands and put on gloves

When the **head is visible** tell mother to **stop pushing** to prevent tearing of the perineum

If **cord** is **wrapped around the neck** then gently slip it over the head

If **sac** is **covering the head** then tear it open with your fingers to let the baby breathe

About one minute after the head is out the mother should have another contraction and urge to push, which should expel the rest of the baby

During delivery **support the baby**, but let them be born by themselves

**Do not pull** the baby

Be **careful** with the **slippery baby**

*continued next page*
If the baby is not in good health then start Neonatal Resuscitation

If the baby is healthy, pink, active and crying then put the baby on the mother's chest

Dry the baby and keep the baby warm

APGAR score at 1, 5 and 10 minutes (see chart below)

<table>
<thead>
<tr>
<th>APGAR</th>
<th>2</th>
<th>1</th>
<th>0</th>
</tr>
</thead>
<tbody>
<tr>
<td>Appearance</td>
<td>Pink all over</td>
<td>Body is pink</td>
<td>Blue or pale</td>
</tr>
<tr>
<td>Pulse</td>
<td>&gt; 100 /min</td>
<td>&lt; 100 /min</td>
<td>No pulse</td>
</tr>
<tr>
<td>Grimace</td>
<td>Cries on stimulation</td>
<td>Grimace when suctioned</td>
<td>No response</td>
</tr>
<tr>
<td>Activity</td>
<td>Active</td>
<td>Weak movement</td>
<td>No movement</td>
</tr>
<tr>
<td>Respiration</td>
<td>Strong cry</td>
<td>Gasping</td>
<td>No cry</td>
</tr>
</tbody>
</table>

APGAR score is the sum of the five components

Give mother oxytocin (after excluding undiagnosed twin pregnancy):

IV oxytocin 5 units in 20 mL normal saline 0.9% as slow push over five minutes

OR

IM oxytocin 5 units if no IV access

Clamp the umbilical cord with two clamps/ties and cut in between (about 4 cm from the baby)

continued next page
**DELIVERY OF THE PLACENTA**

**Do not hurry** the delivery of the placenta

A few minutes after birth there may be a gush of blood and lengthening of the cord

Place **one hand** on the **lower abdomen** to **protect the uterus**

**Guide the placenta out** by **holding the cord** so it does not sag, but **do not pull it**

Gently **massage the funds of the uterus** to encourage contraction and delivery of the placenta, and to reduce blood loss

Repeatedly massage the uterus for the next hour to assist with uterine contraction
### BRADYCARDIA

**COMPROMISED AND HEART RATE < 60**

**IF NO PULSE THEN GO TO PAGE 49 (PEA)**

- **CALL FOR HELP**
- **INFORM TEAM**
- **CRASH CART**

**Maintain airway**

**Assist breathing** as needed

**High-flow oxygen**

**Monitor** respiratory, oxygen saturations, heart rate, blood pressure and ECG

**Intravenous** or intraosseous access

**Prepare for transcutaneous pacing** (see next page)

**IV atropine 0.5 or 0.6 mg**

**Repeat** every 3 to 5 minutes to a total of 3 mg

**Check electrolytes**

**Look for and treat** possible causes (e.g., IHD, hypokalaemia, drugs especially beta-blockers, calcium-channel blockers, digoxin and amiodarone)

*continued next page*
If **atropine ineffective** then seek **expert advice** and consider:

- **transcutaneous pacing** (see below)

**OR**

- **IV adrenaline infusion**: 6 mL of 1:1000 adrenaline in normal saline 100 mL, start at 2 to 10 mL/h ( = 2 to 10 micrograms/minute). Titrate to clinical response. Use large vein if possible.

**OR**

- **IV isoprenaline**: dilute 1 mg of isoprenaline in 50 mL normal saline, give **bolus** of 1 mL ( = 20 micrograms), repeat according to response, then start **infusion** at 3 to 12 mL/h ( = 1 to 4 micrograms/min) and titrate up to maximum of 60 mL/h ( = 20 micrograms/min)

**Transcutaneous pacing**

- Clip hair and dry the skin
- Put **negative pad** on **anterior chest** to the left of the lower third of the sternum (under the female breast)
- Put **positive pad** on the **patient’s back** to the left of the spine beneath the scapula
- Consider **sedation** (eg. IV fentanyl 50 to 100 micrograms and IV midazolam 1 to 5 mg)
- **Demand** pacing mode
- Current **70 mA**
- **Start pacing**
- **Increase mA** until pacing captured on monitor (ie. pacer spike is immediately followed by a wide QRS complex and a broad T wave, with suppression of native QRS complexes). If pacing not captured at 130 mA then resite electrodes and repeat.
- When pacing is captured, set current at **10 mA above threshold**
- Ongoing **sedation** and **analgesia**
DIABETIC KETOACIDOSIS

Symptoms: THIRST, VOMITING, ABDOMINAL PAIN, WEAKNESS, CONFUSION, POLYURIA, WEIGHT LOSS

Signs: DEHYDRATION, DEEP SIGHING RESPIRATIONS, SMELL OF KETONES ON BREATH, LETHARGY, DROWSINESS

Diagnosis: KETONES: ketones in urine or blood (> 0.6 mmol/L), ACIDOSIS: pH < 7.3

This protocol is for unwell patients. Patients with pH > 7.3 who are not dehydrated or vomiting may tolerate oral fluids and SC insulin.

CALL FOR HELP INFORM TEAM RESUS BAY

RESUSCITATION

Airway: protect airway as required (page 1). Naso-gastric tube if coma or vomiting

Breathing: oxygen if hypoxic

Circulation: give IV fluid 1000 to 2000 mL in first hour (PlasmaLyte, Hartmann’s or normal saline 0.9%)

continued next page
**DISABILITY** assessed by **Glasgow Coma Scale (GCS)**

<table>
<thead>
<tr>
<th>Eye Opening</th>
<th>Spontaneous</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>To voice</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>To pain</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>None</td>
<td>1</td>
</tr>
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</table>

<table>
<thead>
<tr>
<th>Verbal Response</th>
<th>Oriented</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Confused</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>Inappropriate words</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Incomprehensible sounds</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>None</td>
<td>1</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Motor Response</th>
<th>Obeys commands</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Localises pain</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>Withdraws from pain</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>Abnormal flexion</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Abnormal extension</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>None</td>
<td>1</td>
</tr>
</tbody>
</table>

**Glasgow Coma Scale (GCS) is the sum of the best responses**

**Weigh** patient or estimate weight

*continued next page*
INVESTIGATIONS

IV access:
- FBC EUC CaMgPh lipase BGL serum osmolality
- blood ketones (fingerprick)
- **venous gas**
- investigations for precipitating cause (consider septic workup)

Urine:
- ketones
- culture (if clinical evidence of infection)
- consider β-HCG

ECG

SEVERITY

<table>
<thead>
<tr>
<th>pH</th>
<th>Severity</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 7.3 to 7.2</td>
<td>Mild</td>
</tr>
<tr>
<td>&lt; 7.2 to 7.1</td>
<td>Moderate</td>
</tr>
<tr>
<td>&lt; 7.1</td>
<td>Severe</td>
</tr>
</tbody>
</table>

continued next page
EXCLUDE HYPEROSMOLAR HYPERGLYCAEMIC STATE (HHS)

Is this Hyperosmolar Hyperglycaemic State (HHS)?

- osmolality > 320 mosmol/kg (calculated osmolality = sodium x 2 + urea + BGL)
- BGL > 30 mmol/L
- pH > 7.3 and HCO₃ > 15 mmol/L
- low or no ketones on fingerprick test (< 0.6 mmol/L)

then different management is required. Seek expert advice.

REHYDRATION

IV fluid 1000 to 2000 mL in first hour (PlasmaLyte, Hartmann’s or normal saline 0.9%)  

IV fluid 500 mL/h over next 2 to 4 hours (PlasmaLyte or Hartmann’s)

Adjust IV fluid rate to achieve:

- normal perfusion
- normal blood pressure
- urine output > 0.5 mL/kg/h

continued next page
INSULIN INFUSION

If $K \geq 3.3$ then:
- add short-acting insulin (Actrapid or Humulin R) 100 units to 99 mL of normal saline 0.9% to make 100 mL of 1 unit/mL
- flush tubing
- start IV infusion at 5 mL/h ( = 5 units/h)

If $K < 3.3$ then delay insulin infusion until potassium replaced

If patient has a Continuous Subcutaneous Insulin Infusion (CSII) pump then turn the CSII pump off

continued next page
POTASSIUM REPLACEMENT

If $K > 5.0$ then do not replace potassium

If urine output $< 30 \text{ mL/h}$ then do not replace potassium

If $K \text{ 3.5 to 5.0}$ then give IV normal saline 0.9% $100 \text{ mL}$ with KCl 10 mmol over one hour (can be via sidleline)

If $K < 3.5$ then give IV normal saline 0.9% $100 \text{ mL}$ with KCl 10 mmol over one hour (can be via sidleline), then repeat IV normal saline 0.9% 100 mL with KCl 10 mmol over next hour

MAGNESIUM REPLACEMENT

If $Mg < 0.6 \text{ mmol/L}$ then given IV normal saline 0.9% 100 mL with magnesium sulphate 10 mmol (5 mL of 50% solution) over 4 hours

PHOSPHATE REPLACEMENT

If $PO_4 < 0.32 \text{ mmol/L}$ then give IV normal saline 0.9% 500 mL with potassium dihydrogen phosphate 10 mmol over 6 hours

continued next page
## MONITOR

**Hourly:**
- respiratory rate, saturations, heart rate, blood pressure, temperature
- **neuro observations** using GCS
- BGL
- fluid balance

**2 to 4 hourly:**
- **EUC**
  - venous gas
  - ketones

Consider **urinary IDC** and **naso-gastric tube**

At 2 and 4 hours, if **BGL is not decreasing** or **venous pH is not increasing** then **increase the insulin infusion rate**

**Continue insulin infusion until ketosis cleared**, so patient will require additional dextrose once BGL < 15 mmol/L or if BGL falls by > 5 mmol/L/hour

When **BGL < 15 mmol/L** add **IV dextrose 10% at 100 mL/h**, and continue the rehydration fluid (PlasmaLyte or Hartmann’s)

Aim for **BGL 10 to 15 mmol/L** while on insulin infusion

Consider **DVT prophylaxis**
HYPERKALAEMIA

K ≥ 6.5 mmol/L

CALL FOR HELP  INFORM TEAM  CRASH CART

Stop IV potassium and PO potassium and NGT feeding
Stop any medication causing hyperkalaemia (eg. ACE-inhibitors, spirinolactone, beta-blockers, digoxin)

Continuous cardiac monitoring and ECG:

K > 6.5
- tall “tented” T waves
- prolonged PR interval, flat P waves

K > 7.5
- wide QRS (increased risk of arrhythmia)
  - progresses to disappearance of P wave
  - fusion of QRS and T wave into a sine wave
  - ventricular fibrillation may be the first ECG manifestation

IV access:
- confirm hyperkalaemia with second sample (but assume correct reading if renal failure)
- check EUC and BGL
- venous blood gas
- consider CK, cortisol, aldosterone, and digoxin level

continued next page
HYPERKALAEMIA

TREATMENT

If ECG changes of hyperkalaemia then give IV calcium gluconate 10% 30 mL

Nebulised salbutamol 10 mg

IV dextrose 50% 50 mL

IV insulin bolus:
  - if advanced CKD in non-diabetic patient then give IV short-acting insulin (Actrapid or Humulin R) 0.1 units/kg as bolus (maximum 10 units)
  - in all other patients give IV short-acting insulin (Actrapid or Humulin R) 10 units as bolus

If pH < 7.2 then consider IV sodium bicarbonate 8.4% 1 mL/kg (maximum 100 mL, do not give simultaneously with calcium)

Give PO or PR polystyrene sulfonate (Resonium) 30 g (avoid in ileus, abdominal surgery, perforation, hypernatraemia)

Check BGL after 15 and 30 minutes and then hourly for four hours

Consider acute adrenal insufficiency due to abrupt cessation of steroids (treat with IV hydrocortisone and volume replacement)

Seek expert advice
## HYPOGLYCAEMIA

### BGL < 4 mmol/L

<table>
<thead>
<tr>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>If patient is <strong>conscious</strong> and able to <strong>swallow safely:</strong></td>
</tr>
<tr>
<td>oral glucose <strong>15 g</strong> or soft drink/juice <strong>150 mL</strong></td>
</tr>
<tr>
<td>then <strong>two biscuits</strong></td>
</tr>
<tr>
<td>If patient is on insulin infusion then <strong>stop insulin infusion</strong></td>
</tr>
<tr>
<td>If no IV access (and cannot swallow) give <strong>IM glucagon 1.0 unit</strong></td>
</tr>
<tr>
<td>(full vial)</td>
</tr>
<tr>
<td>Identify and treat the <strong>cause</strong> of hypoglycaemia, considering:</td>
</tr>
<tr>
<td><strong>intercurrent illness</strong> (eg. IDDM with vomiting)</td>
</tr>
<tr>
<td>drug error</td>
</tr>
<tr>
<td>toxic ingestion</td>
</tr>
<tr>
<td>endocrine and metabolic disorders</td>
</tr>
<tr>
<td>deliberate self-harm</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>Check <strong>ECG</strong></td>
</tr>
<tr>
<td><strong>Recheck</strong> BGL in 15 minutes</td>
</tr>
<tr>
<td><strong>Repeat</strong> IV dextrose 50% 30 mL as required</td>
</tr>
<tr>
<td>Delay regular insulin until hypoglycaemia has resolved, and consider lower dose</td>
</tr>
</tbody>
</table>
CALL FOR HELP

INFORM TEAM

CRASH CART

START CPR

**Attach defibrillator or monitor**

**Pads** or **paddles** in left midaxillary line over sixth intercostal space (under breast) and right parasternal area over second intercostal space. In patients with a PPM or ICD put pads at least 8 cm from the PPM or ICD.

Consider **airway** adjuncts (oro- or naso-pharyngeal airway, and if skilled LMA or ETT) followed by **high-flow oxygen**

**Intravenous** or **intraosseous access**

**IV adrenaline 1 mg** followed by normal saline 20 mL flush

**CPR 2 minutes**

Look at the **clock**

Waveform **capnography** (end-tidal CO₂ monitoring)

If the rhythm is shockable (**VF** or **pulseless VT**) then **shock** using **200 J**

continued on page 51
### FIND AND TREAT CAUSE

#### OBTAIN BEDSIDE BLOODS AND CONSIDER CARDIAC ULTRASOUND

- **Hypocalcaemia**: give IV calcium gluconate 10% 20 mL or IV calcium chloride 10% 10 mL bolus on expert advice.
- **Hypovolaemia**: give IV normal saline 20 mL/kg and check haemoglobin.
- **Hypocalcaemia**: give IV calcium gluconate 10% 20 mL or IV calcium chloride 10% 10 mL bolus.
- **Hyperthermia**: consider sepsis, neuroleptic malignant syndrome, serotonin toxicity, malignant hyperthermia, heat stroke.
- **Hypothermia**: use forced air blanket, warm IV fluids, raise room temperature.
- **Toxins**: including medications, infusions, ingestions, and medication error.
- **Tension Pneumothorax**: Check for signs and perform emergency needle decompression or finger thoracostomy. Call for CXR but do not delay treatment.
- **Cardiac Tamponade**: especially if penetrating trauma or recent cardiac surgery.

---

Consider **myocardial infarct** and **pulmonary embolus** (may require PCI or thrombolysis).

If **hypoxia** give high-flow **oxygen**, **check connections**, check for bilateral breath sounds, suction endotracheal tube and reconfirm placement, consider **CXR**.

If **hyperkalaemia**: give IV calcium chloride 10% 10 mL bolus or IV calcium gluconate 10% 30 mL bolus. Give IV short-acting insulin 10 units with IV dextrose 50% 50 mL. Give nebulised salbutamol 10 to 20 mg.

If **hypokalaemia** give IV potassium chloride 1 mmol/mL 5 mL bolus and IV magnesium sulphate 50% 2.5 mL bolus.

If profound **acidosis** consider IV sodium bicarbonate 8.4% 1 mL/kg bolus on expert advice.

If **hypovolaemia** give IV normal saline 20 mL/kg and check haemoglobin.

If **hypocalcaemia** give IV calcium gluconate 10% 20 mL or IV calcium chloride 10% 10 mL.

If **hypothermia** use forced air blanket, warm IV fluids, raise room temperature.

Consider **toxins** including medications, infusions, ingestions, and medication error.

Consider **tension pneumothorax**. Check for signs and perform emergency needle decompression or finger thoracostomy. Call for CXR but do not delay treatment.

Consider **cardiac tamponade** especially if penetrating trauma or recent cardiac surgery.
Simultaneously **Find and Treat Cause** (facing page)

**Plan actions** before interrupting compressions

CPR 2 minutes

**Shockable? then shock** using **200 J**

**IV adrenaline 1 mg**

CPR 2 minutes

**Shockable? then shock**

After third shock give **IV amiodarone 300 mg** in dextrose 5% 20 mL

CPR 2 minutes

**Shockable? then shock**

CPR 2 minutes

**Shockable? then shock**

**IV adrenaline 1 mg**

CPR 2 minutes

**Shockable? then shock**

After fifth shock consider **IV amiodarone 150 mg** in dextrose 5% 20 mL

CPR 2 minutes

**Shockable? then shock**

**continued next page**
### PULSELESS ELECTRICAL ACTIVITY

<table>
<thead>
<tr>
<th>Step</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td><strong>IV adrenaline 1 mg</strong>&lt;br&gt;<strong>CPR 2 minutes</strong></td>
</tr>
<tr>
<td>2</td>
<td><strong>Shockable? then shock</strong></td>
</tr>
<tr>
<td>3</td>
<td>If refractory pulseless VT or VF then consider <strong>IV magnesium 50% 2.5 mL bolus</strong></td>
</tr>
<tr>
<td>4</td>
<td><strong>CPR 2 minutes</strong></td>
</tr>
<tr>
<td>5</td>
<td><strong>Shockable? then shock</strong></td>
</tr>
<tr>
<td>6</td>
<td><strong>IV adrenaline 1 mg</strong>&lt;br&gt;<strong>CPR 2 minutes</strong></td>
</tr>
<tr>
<td>7</td>
<td><strong>Shockable? then shock</strong></td>
</tr>
<tr>
<td>8</td>
<td><strong>CPR 2 minutes</strong></td>
</tr>
</tbody>
</table>

**CPR now exceeds 20 minutes**

**IF RETURN OF SPONTANEOUS CIRCULATION GO TO PAGE 53 (ROSC)**

---

IF RETURN OF SPONTANEOUS CIRCULATION GO TO PAGE 53 (ROSC)
Re-evaluate **ABCDE** and re-assess **all tubes and lines**

- **Cervical collar** if required

- **12-lead ECG, CXR, IDC, and nasogastric tube**

- **Temperature probe** in nasopharynx, oesophagus or bladder

- Assess for **injuries** from resuscitation

**Treat precipitating causes**

- Aim for **sats 94 to 98%** (or if at risk of hypercapnic respiratory failure aim 88 to 92%)

- Maintain **normal PaCO₂**

- Consider an **anti-arrhythmic drug infusion** (eg. amiodarone 0.6 mg/kg/h in dextrose 5%, for 12 to 24 h, maximum 1200 mg/24 hours)

- Prevent and manage **fever** but do not cool below 36 °C

- Consider **emergency cardiac catheterisation** (especially if STEMI or new LBBB)
Open and clear the airway:
- head tilt and chin lift
- jaw thrust
- suction
- consider oropharyngeal or nasopharyngeal airway

High-flow oxygen
Consider recovery position to avoid aspiration

Check blood glucose
Take blood for venous gas, EUC, CaMgPh and anticonvulsant levels

If alcohol withdrawal cannot be excluded give IV/IM thiamine 100 mg

If this is eclampsia give IV magnesium sulphate 50% 8 mL (equal to 4 g) in 50 mL normal saline over 10 minutes, then IV magnesium sulphate 50% 4 mL/hour and seek expert advice. Can use IV diazepam 10 mg over 5 minutes while the magnesium is being prepared.

For status epilepticus give:

- IV/IM midazolam 5 to 10 mg

OR
- IV diazepam 10 to 20 mg

OR
- IV clonazepam 1 mg

continued next page
The benzodiazepines have a short duration of anticonvulsant effect, so should be followed immediately by:

**IV phenytoin 15 to 20 mg/kg** at a rate not exceeding 50 mg/minute with ECG and BP monitoring. Do not use phenytoin if overdose with cardiotoxic drugs such as tricyclics is suspected.

**OR**

**IV levetiracetam 20 mg/kg** over 15 minutes

**OR**

**IV sodium valproate 10 mg/kg** (maximum 800 mg) over 3 to 5 minutes then **IV sodium valproate 1 to 2 mg/kg/hour** (maximum 2500 mg in 24 hours)

**OR**

**IV phenobarbitone 10 to 20 mg/kg** at a rate not exceeding 100 mg/minute

### If seizures continue then seek expert advice

If **seizures continue** then 15 minutes after the first dose of benzodiazepines give a second dose:

**IV/IM midazolam 5 to 10 mg**

**OR**

**IV diazepam 10 to 20 mg**

**OR**

**IV clonazepam 1 mg**

If **seizures continue** then:

- consider **intubation** and **general anaesthesia**
- consider **infusion** of clonazepam, midazolam, propofol or thiopentone
- consider **overdose** (e.g. tricyclics, tramadol)
- consider **pseudoseizures** (especially if venous gas remains normal)
- arrange **ICU transfer**
SUPRAVENTRICAL TACHYCARDIA

CALL FOR HELP  INFORM TEAM  CRASH CART

IF NO PULSE THEN GO TO PAGE 49 (PEA)

IF HYPOTENSION, SEVERE CHEST PAIN OR DECREASED LEVEL OF CONSCIOUSNESS THEN GO TO PAGE 57 (TACHYCARDIA)

SINUS TACHYCARDIA IS NOT SVT

Monitor respirations, oxygen saturations, heart rate, blood pressure and ECG

Have defibrillator at bedside

Attempt vagal manoeuvres:

- Valsalva manoeuvre with head-down tilt
- Carotid sinus massage unless elderly

If unsuccessful then while recording ECG rhythm strip, give:

- IV adenosine 6 mg bolus (using cubital fossa cannula with three-way tap, flush immediately with normal saline 20 mL)

- If unsuccessful give IV adenosine 12 mg bolus

- If unsuccessful give IV adenosine 18 mg bolus

OR

- IV verapamil 1 mg/minute up to 15 mg with blood pressure monitoring. Avoid in heart failure, hypotension, and beta-blocker usage.
SYMPTOMATIC TACHYCARDIA WITH PULSE
THAT IS NOT SINUS TACHYCARDIA

IF NO PULSE THEN GO TO PAGE 97 (PULSELESS VT)

CALL FOR HELP  INFORM TEAM  CRASH CART

Assess and support airway and breathing
High-flow oxygen
Monitor respiration, oxygen saturations, heart rate, blood pressure and ECG
Intravenous or intraosseous access
Look for and treat possible causes

If patient UNSTABLE: (altered conscious state, chest pain or hypotension)
Give IV sedation as required. Be prepared to support airway.
Ensure the defibrillator is synchronised
Perform synchronised DC cardioversion 100 to 200 J (if obese start at 200 J)
If shock fails to deliver:
    try a different lead
    check cables and power supply
    consider unsynchronised DC shock if disorganised rhythm
Repeat shock up to three attempts (may need to press synchronise each time)
IV amiodarone 300 mg in dextrose 5% 100 mL over 10 to 20 minutes
Repeat shock if required
IV amiodarone 900 mg over 24 hours

continued next page
If patient **STABLE:**

- **QRS < 0.12 s** then go to next page (**Stable Narrow Complex Tachycardia**)  
- **QRS ≥ 0.12 s** then go to page 60 (**Stable Wide Complex Tachycardia**)  

0.12 seconds is three small squares on ECG.
**STABLE NARROW COMPLEX TACHYCARDIA**

<table>
<thead>
<tr>
<th><strong>QRS &lt; 0.12 s</strong></th>
</tr>
</thead>
</table>

**REGULAR:**
- Sinus tachycardia
- Paroxysmal supraventricular tachycardia
- Atrial flutter with 2:1 block (150/minute)
- Atrial flutter with 1:1 block (300/minute)
- Atrial tachycardia
- Atrioventricular nodal re-entry tachycardia
- Atrioventricular re-entry tachycardia
- Junctional tachycardia

**IRREGULAR:**
- Atrial fibrillation
- Atrial flutter with variable block
- Multifocal atrial tachycardia
- Atrial tachycardia with variable block
- Drug toxicity (eg. digoxin)

**If the diagnosis is clear** then treat according to the diagnosis.

**If the diagnosis is not clear** then to differentiate and potentially revert:
- attempt **vagal manoeuvres** (eg. Valsalva with head-down tilt)
- If the rhythm reverts then it is probably re-entry SVT. Observe for recurrence.
- If the rhythm does not revert then consider **adenosine** and seek expert advice.
STABLE WIDE COMPLEX TACHYCARDIA

REGULAR:
Most likely to be VT (monomorphic)
Other possibilities include atrial flutter or aberrant conduction in SVT
If VT then go to page 95 (Ventricular Tachycardia)
If the diagnosis is not clear then presume VT until proven or advised otherwise. Seek expert advice. Consider:
- semi-elective cardioversion
- IV amiodarone 150 to 300 mg over 20 to 30 minutes
Check electrolytes and troponin

IRREGULAR:
VT can be irregular (polymorphic)
Other possibilities include:
- Wolff-Parkinson-White with atrial fibrillation
- aberrant conduction with atrial fibrillation
- aberrant conduction with atrial flutter and variable block
- aberrant conduction with multifocal atrial tachycardia
If the diagnosis is not clear then seek expert advice

TORSADES:
Go to next page (Torsades de Pointes)

IF PATIENT BECOMES UNSTABLE THEN GO TO PAGE 57 (TACHYCARDIA)

PRESUME VT UNTIL PROVEN OTHERWISE

Seek expert advice as soon as possible
Cease any drugs that may be causing torsades (eg. neuroleptics, macrolides, sotalol)
Check serum potassium

If underlying bradycardia give IV atropine 0.5 or 0.6 mg and repeat as necessary

Consider:

- Temporary overdrive pacing at 90 to 100/minute (see page 20)
- IV magnesium sulphate 50% 4 mL (equal to 2 g) over 10 to 15 minutes
  then IV magnesium sulphate 50% 1 to 1.5 mL per hour for 12 to 24 hours
- IV isoprenaline: dilute 1 mg of isoprenaline in 50 mL normal saline, give bolus of
  1 mL ( = 20 mcg), repeat according to response, then start infusion at 3 to 12 mL/h
  ( = 1 to 4 mcg/min) and titrate up to maximum of 60 mL/h ( = 20 mcg/min)
- IV lignocaine 1 to 1.5 mg/kg (usually 75 to 100 mg) over 1 to 2 minutes
  then IV lignocaine 4 mg/minute for 1 hour
  then IV lignocaine 1 to 3 mg/minute

Avoid amiodarone, disopyramide, flecainide and sotalol
TREAT THE PERSON, NOT THE POISON

See also:  
- Beta blockers page 66  
- Calcium channel blockers page 68  
- Tricyclics page 70  
- Paracetamol page 72

RESUSCITATION

Airway

Breathing

Circulation

DETECT AND CORRECT

If blood glucose < 4 mmol/L then give IV dextrose 50% 50 mL. Check blood glucose again in five minutes.

If seizures give:

- IV/IM midazolam 5 to 10 mg
- IV diazepam 5 to 10 mg

Do not use phenytoin. If seizures from tricyclic overdose then go to page 70

continued next page
If hyperthermia > 38.5 °C then cool (eg. ice packs, cold IV fluids)
If hyperthermia > 39.5 °C then paralyse, intubate and ventilate (see page 1)

**EMERGENCY ANTIDOTE ADMINISTRATION**

If alcohol withdrawal cannot be excluded give IV/IM thiamine 100 mg

If opiate overdose (pin-point pupils, respiratory depression) then give:
- IV naloxone 100 micrograms and repeat every 30 to 60 seconds
- OR
- IM or SC naloxone 400 micrograms (in arrest give IV or IM naloxone 800 micrograms)

Seek expert toxicology advice if other antidotes required

If sodium channel blocker overdose (eg. tricyclic antidepressants such as dothiepin or amitriptyline, local anaesthetics, cocaine, propranolol, flecainide, carbamazepine, quinine) then see page 70

If beta blocker overdose (eg. atenolol, metoprolol, sotalol) then see page 66

If calcium channel blocker overdose (eg. verapamil, diltiazem) then see page 68

If digoxin overdose then consider digoxin-specific antibodies (eg. Digibind, DigiFab)

If organophosphate poisoning then give IV atropine 2 mg and repeat every 15 minutes until respiratory secretions dry and oxygenation restored

continued next page
RISK ASSESSMENT

Stop and think about:

- **agent(s):** ask ambulance officers or family to search
- ask family about agents potentially available
- count missing tablets
- check records for previous prescriptions

- **dose(s)**
- **time** since ingestion
- **clinical features** and expected clinical course
- **patient** factors (including weight and co-morbidities)

SUPPORTIVE CARE

- **Supportive care** (eg, fluids, sedation or seizure control using IV benzodiazepines)

- **Monitoring** (respirations, O₂ sats, heart rate, BP, temperature, end tidal CO₂)

- **Document** the **criteria** for changing management

INVESTIGATIONS

- **Blood glucose**

- **Paracetamol** level

- **12-lead ECG**

*continued next page*
In the 12-lead ECG look for:

- rate
- rhythm
- PR interval
- QRS duration in lead II
- QT interval
- dominant R’ wave in aVR

If dominant R’ wave in aVR then see Tricyclic Overdose (page 70)

If paracetamol overdose then see page 72

Call Poisons: Australia 131 126, NZ 0800 764 766, or local toxicologist

DECONTAMINATION

Seek expert advice from Poisons Information Centre before starting decontamination as risks frequently outweigh benefits. For severe toxicity experts may advise:

- if conscious and cooperative: PO activated charcoal 1 g/kg to maximum of 50 g
- if intubated: NG activated charcoal 1 g/kg to maximum of 50 g
- if extended release tablets: PO or NG whole bowel irrigation with polyethylene glycol electrolyte solution at 2 L/hour

DISPOSITION

Disposition is based on risk assessment and psychosocial assessment
**BETA BLOCKER OVERDOSE**

**Poisons Information Centre: Australia 131 126, NZ 0800 764 766**

**IF PROPRANOLOL OVERDOSE THEN GO TO PAGE 70 (TRICYCLICS)**

**IF SOTALOL OVERDOSE HAS CAUSED TORSADES THEN GO TO PAGE 61**

---

**Signs:**
- **BRADYCARDIA**
- **HYPOTENSION**
- **PR interval > 0.20 s** (five small squares on ECG)
- **ANY BRADYARRHYTHMIA**

---

**CALL FOR HELP**

**INFORM TEAM**

**CRASH CART**

*If hypotension* give **IV normal saline** 500 to 1000 mL boluses to a maximum of 20 mL/kg.

*If bradycardia:*
- give **IV atropine 1 mg**
- repeat twice if needed
- if **bradycardia continues** then consider **isoprenaline infusion** (see page 35)

*If hypotension* persists then start **IV adrenaline infusion** using adrenaline 6 mg in dextrose 5% 100 mL, start at 2 mL/h and titrate up rapidly to systolic 100 mmHg.

---

*continued next page*
If refractory hypotension then seek expert advice, which may include high-dose insulin therapy for inotropic support:

- **IV dextrose 50%** 50 mL bolus (unless BGL > 22 mmol/L)
  followed by **IV short-acting insulin** 1 unit/kg bolus
  then, if advised by expert:

  - **IV short-acting insulin** infusion using short-acting insulin 50 units in normal saline 50 mL, start at 0.5 units/kg/hour, titrated every 30 minutes to maximum of 5 units/kg/hour
  - **IV dextrose 50%** 50 mL/hour infusion, preferably through central line, titrated to maintain normal blood glucose

Monitor **blood glucose** every 20 minutes for first hour, then every hour
Monitor **serum potassium** but only replace if < 2.5 mmol/L and there is a source of potassium loss

If severe toxicity and intubated then give **NG activated charcoal 1 g/kg** to a maximum of 50 g

**COMPLETE ALL STEPS IN TOXICOLOGY (PAGE 62)**

Call Poisons: Australia 131 126, NZ 0800 764 766, or local toxicologist
CALCIUM CHANNEL BLOCKER OVERDOSE

Signs: BRADYCARDIA or FIRST DEGREE HEART BLOCK
HYPOTENSION
RAPID DETERIORATION
ISCHAEMIA (MYOCARDIAL, CEREBRAL, MESENTERIC)

PR interval > 0.20 s (five small squares on ECG)
ANY BRADYARRHYTHMIA

If hypotension give IV normal saline 500 to 1000 mL boluses to a maximum of 20 mL/kg

If hypotension or bradycardia give:

**IV calcium gluconate 10%** 60 mL bolus

**OR**

**IV calcium chloride 10%** 20 mL bolus (through central line)

Repeat intravenous calcium up to three times
Consider **calcium infusion** to keep serum calcium > 2.0 mmol/L

If bradycardia give IV atropine 0.5 or 0.6 mg every two minutes to a maximum of 1.8 mg

continued next page
If refractory hypotension then seek expert advice, which may include high-dose insulin therapy for inotrop support:

**IV dextrose 50%** 50 mL bolus (unless BGL > 22 mmol/L)
followed by **IV short-acting insulin** 1 unit/kg bolus
then, if advised by expert:

**IV short-acting insulin** infusion using short-acting insulin 50 units in normal saline 50 mL, start at 0.5 units/kg/hour, titrated every 30 minutes to maximum of 5 units/kg/hour

**IV dextrose 50%** 50 mL/hour infusion, preferably through central line, titrated to maintain normal blood glucose

Monitor **blood glucose** every 20 minutes for first hour, then every hour
Monitor **serum potassium** but only replace if < 2.5 mmol/L and there is a source of loss
Catecholamines are rarely effective in calcium channel blocker poisoning

**If severe toxicity** then:
if intubated give **NG activated charcoal 1 g/kg** to maximum of 50 g
if **extended release** tablets consider **whole bowel irrigation** with PO or NG polyethylene glycol electrolyte solution at 2 L/hour

**If hypotension** or **bradycardia** continues then seek expert advice and consider:
transvenous **pacing**
intra-aortic balloon pump
cardiopulmonary bypass
extracorporeal membrane oxygenation

**COMPLETE ALL STEPS IN TOXICOLOGY (PAGE 62)**

Call Poisons: Australia 131 126, NZ 0800 764 766, or local toxicologist
TRICYCLIC OVERDOSE

Signs: RAPID DETERIORATION within 1 to 2 hours of ingestion
Initial AGITATION then CONFUSION and COMA
DILATED PUPILS and WARM DRY SKIN
Initial SINUS TACHYCARDIA and MILD HYPERTENSION
Subsequent HYPOTENSION and ARRHYTHMIAS
SEIZURES or CARDIAC ARREST

R' WAVE > 3 mm in aVR
QRS > 0.10 predicts SEIZURES
QRS > 0.16 predicts VENTRICULAR ARRHYTHMIAS
normal QRS is 0.08 to 0.10 s (two to two-and-a-half small squares on ECG)

If ventricular tachycardia or ventricular fibrillation then:
IV sodium bicarbonate 8.4% 1 to 2 mL/kg bolus
repeat every 1 to 2 minutes until return of perfusing rhythm
DC shocks for cardioversion or defibrillation are unlikely to be successful
avoid procainamide, amiodarone and beta-blockers

If CNS depression (GCS < 12) then:
give IV sodium bicarbonate 8.4% 1 to 2 mL/kg to prevent metabolic acidosis
intubate (see page 1)
insert nasogastric tube and give NG activated charcoal 1 g/kg to maximum 50 g

continued next page
**TRICYCLIC OVERDOSE**

If seizure then:

- **intubate** (see page 1)
- **benzodiazepines** if prolonged (eg. IV diazepam 5 to 10 mg)
- **IV sodium bicarbonate 8.4% 1 to 2 mL/kg** bolus
- avoid phenytoin

If QRS > 0.10 s then:

- **IV sodium bicarbonate 8.4% 1 to 2 mL/kg** bolus
- **repeat** every 3 to 5 minutes
- **titrate** until QRS < 0.10 s

AND

- **hyperventilate** if intubated (aim for pH 7.50 to 7.55)

If hypotension then:

- give **IV normal saline 10 to 20 mL/kg** as initial bolus
- if remains hypotensive give **IV sodium bicarbonate 8.4% 1 to 2 mL/kg** bolus
- if remains hypotensive consider **IV noradrenaline infusion** using noradrenaline 6 mg in dextrose 5% 100 mL, start at 1 mL/h, titrate to maximum 20 mL/h

If severe toxicity and **intubated** then give **NG activated charcoal 1 g/kg** to a maximum of 50 g

**COMPLETE ALL STEPS IN TOXICOLOGY (PAGE 62)**

Call Poisons: Australia 131 126, NZ 0800 764 766, or local toxicologist
PARACETAMOL OVERDOSE

Call Poisons Information Centre or local toxicologist if:

> \(50\) g or > \(1\ g/kg\) ingestion
paracetamol level is double the nomogram line (page 73)
intravenous paracetamol error or overdose
hepatotoxicity (eg. ALT > 1000)
any concerns

TIME OF INGESTION

Single ingestion:
If < 8 hours ago then go to page 74
If > 8 hours ago then go to page 75

Multiple ingestions within 8 hour period:
If < 8 hours since first dose then go to page 74
If > 8 hours since first dose then go to page 75

Unknown time of ingestion:
Assume > 8 hours since first dose and go to page 75

Poisons Information Centre: Australia 131 126, NZ 0800 764 766
### NAC Infusion

<table>
<thead>
<tr>
<th>Weight</th>
<th>First Bag</th>
<th>Second Bag</th>
<th>Third Bag</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>dextrose 5% 200 mL over 60 minutes (acetylcysteine)</td>
<td>dextrose 5% 500 mL over 4 hours (acetylcysteine)</td>
<td>dextrose 5% 1000 mL over 16 hours (acetylcysteine)</td>
</tr>
<tr>
<td>41 - 50 kg</td>
<td>7.5 g = 37.5 mL</td>
<td>2.5 g = 12.5 mL</td>
<td>5 g = 25 mL</td>
</tr>
<tr>
<td>51 - 60 kg</td>
<td>9 g = 45 mL</td>
<td>3 g = 15 mL</td>
<td>6 g = 30 mL</td>
</tr>
<tr>
<td>61 - 70 kg</td>
<td>10.5 g = 52.5 mL</td>
<td>3.5 g = 17.5 mL</td>
<td>7 g = 35 mL</td>
</tr>
<tr>
<td>71 - 80 kg</td>
<td>12 g = 60 mL</td>
<td>4 g = 20 mL</td>
<td>8 g = 40 mL</td>
</tr>
<tr>
<td>81 - 90 kg</td>
<td>13.5 g = 67.5 mL</td>
<td>4.5 g = 22.5 mL</td>
<td>9 g = 45 mL</td>
</tr>
<tr>
<td>91 - 100 kg</td>
<td>15 g = 75 mL</td>
<td>5 g = 25 mL</td>
<td>10 g = 50 mL</td>
</tr>
<tr>
<td>≥ 101 kg</td>
<td>16.5 g = 82.5 mL</td>
<td>5.5 g = 27.5 mL</td>
<td>11 g = 55 mL</td>
</tr>
</tbody>
</table>

First bag: acetylcysteine 150 mg/kg in dextrose 5% 200 mL over 60 minutes  
Second bag: acetylcysteine 50 mg/kg in dextrose 5% 500 mL over 4 hours  
Third bag: acetylcysteine 100 mg/kg in dextrose 5% 1000 mL over 16 hours  
Concentration of acetylcysteine is 200 mg/mL
## INGESTION < 8 HOURS AGO

**RISK OF HEPATOTOXICITY IF > 10 g OR > 200 mg/kg**

- If **massive ingestion** ( > 30 g or > 500 mg/kg) then go to page 78

- If **modified release** (eg. Panadol Osteo) ingestion then go to page 77

- If < 2 hours since ingestion then give **PO activated charcoal 50 g**

- Measure **paracetamol level** 4 to 8 hours after ingestion

- If paracetamol level is **double nomogram line** (page 73) then go to page 78

- If paracetamol level is above **nomogram line** then **start NAC infusion** (page 73)

- If paracetamol level unavailable within 8 hours then **start NAC infusion** (page 73)

- If NAC infusion is started within 8 hours and the three bag NAC infusion protocol is completed, then no further blood tests are required
## INGESTION > 8 HOURS AGO

**RISK OF HEPATOTOXICITY IF > 10 g OR > 200 mg/kg**

<table>
<thead>
<tr>
<th>Scenario</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>If <strong>massive ingestion</strong> (&gt; 30 g or &gt; 500 mg/kg) then go to page 78</td>
<td></td>
</tr>
<tr>
<td>If <strong>modified release</strong> (eg. Panadol Osteo) ingestion then go to page 77</td>
<td></td>
</tr>
<tr>
<td><strong>Start NAC infusion</strong> (page 73)</td>
<td></td>
</tr>
<tr>
<td>Measure <strong>paracetamol level</strong> and <strong>ALT</strong></td>
<td></td>
</tr>
<tr>
<td>If paracetamol level is <strong>double nomogram line</strong> (page 73) then go to page 78</td>
<td></td>
</tr>
</tbody>
</table>

If paracetamol level is under nomogram line (page 73) and ALT < 50 then **cease NAC infusion.** No further treatment is required unless abdominal pain, nausea or vomiting.

After the third bag of the NAC infusion measure **ALT**

If ALT > 50 then **continue NAC infusion** with another bag of acetylcysteine 100 mg/kg in dextrose 5% 1000 mL over 16 h (same as the third bag, see page 73)
MULTIPLE INGESTIONS OVER > 8 HOURS

RISK OF HEPATOTOXICITY IF:
- > 10 g or 200 mg/kg in a single 24 hour period
- OR
- > 6 g or > 150 mg/kg per 24 hour period for the preceding 48 hours
- OR
- > 4 g/day or > 100 mg/kg/day for > 48 hours in patient with abdominal pain, nausea or vomiting

Measure paracetamol level and ALT

If paracetamol level < 20 mg/L ( < 132 µmol/L) and ALT < 50 then no further treatment is required

If paracetamol level ≥ 20 mg/L ( ≥ 132 µmol/L) and/or ALT ≥ 50 then start NAC infusion (see page 73).

Take blood in 8 hours:
- If paracetamol level < 10 mg/L ( < 66 µmol/L) and ALT < 50 or unchanged then cease NAC infusion and no further treatment is required
- otherwise continue NAC infusion and check ALT every 12 hours
PARACETAMOL OVERDOSE

MODIFIED RELEASE INGESTION

Modified release brand names: PANADOL OSTEO
PANADOL EXTEND
DUATROL SR
OSTEOMOL 665 mg
OSTEO PARACETAMOL 665 mg

If severe toxicity:

if conscious and cooperative give PO activated charcoal 1 g/kg to maximum of 50 g
if intubated give NG activated charcoal 1 g/kg to maximum of 50 g

If ingestion > 10 g or 200 mg/kg then start NAC infusion (page 73)

Measure paracetamol level at 4 to 8 hours and repeat 4 hours later
If either level is above nomogram line (page 73) then continue NAC infusion
If both levels are below nomogram line and decreasing then cease NAC infusion

If paracetamol level is double nomogram line (page 73) then go to page 78

After the third bag of the NAC infusion measure paracetamol level and ALT
If paracetamol level > 10 mg/L ( > 66 µmol/L) or ALT > 50 and increasing then continue NAC infusion with acetylcysteine 100 mg/kg in dextrose 5% 1000 mL over 16 hours (ie. same as the third bag, page 73)
PARACETAMOL OVERDOSE

MASSIVE INGESTION ( > 30 g OR > 500 mg/kg)

If < 4 hours since ingestion:
- if conscious and cooperative give PO activated charcoal 1 g/kg to maximum of 50 g
- if intubated give NG activated charcoal 1 g/kg to maximum of 50 g

If modified release (eg. Panadol Osteo) ingestion then give PO/NG activated charcoal even if beyond 4 hours, and measure paracetamol level in 4 hours

Start NAC infusion with double dose in third bag (ie. 200 mg/kg in 16 h bag)

<table>
<thead>
<tr>
<th>Weight</th>
<th>First Bag</th>
<th>Second Bag</th>
<th>Third Bag (DOUBLE DOSE FOR MASSIVE INGESTION ONLY)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>dextrose 5% 200 mL over 60 minutes (acetylcysteine)</td>
<td>dextrose 5% 500 mL over 4 hours (acetylcysteine)</td>
<td>dextrose 5% 1000 mL over 16 hours (acetylcysteine)</td>
</tr>
<tr>
<td></td>
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<td></td>
<td></td>
</tr>
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<td>3 g = 15 mL</td>
<td>12 g = 60 mL</td>
</tr>
<tr>
<td>61 - 70 kg</td>
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<td>3.5 g = 17.5 mL</td>
<td>14 g = 70 mL</td>
</tr>
<tr>
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<td>16 g = 80 mL</td>
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<td>81 - 90 kg</td>
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<td>4.5 g = 22.5 mL</td>
<td>18 g = 90 mL</td>
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<td>5 g = 25 mL</td>
<td>20 g = 100 mL</td>
</tr>
<tr>
<td>≥ 101 kg</td>
<td>16.5 g = 82.5 mL</td>
<td>5.5 g = 27.5 mL</td>
<td>22 g = 110 mL</td>
</tr>
</tbody>
</table>

Call Poisons: Australia 131 126, NZ 0800 764 766, or local toxicologist

After the third bag of the NAC infusion measure paracetamol level and ALT
- If paracetamol level > 10 mg/L (> 66 µmol/L) or ALT increasing then continue NAC infusion
VENTILATION

Inflate cuff to 20 to 30 cmH₂O

Check tube placement:

**end-tidal CO₂** (if using colourimeter then “go for gold” within six breaths)

![Graph](image)

**look** for symmetric chest expansion

**auscultation** (check both axillae and over stomach)

Secure tube

Record position at incisor teeth (approximately 21 cm in females, 23 cm in males)

**IF ASTHMA OR COPD THEN GO TO PAGE 84 (OBSTRUCTIVE STRATEGY)**

INITIAL VENTILATOR SETTINGS FOR LUNG-PROTECTIVE STRATEGY

**Mode** VC-SIMV

continued next page
VENTILATION

VT 6 mL/kg of ideal body weight

<table>
<thead>
<tr>
<th>Height</th>
<th>5' 153 cm</th>
<th>5'2&quot; 156 cm</th>
<th>5'4&quot; 163 cm</th>
<th>5'6&quot; 168 cm</th>
<th>5'8&quot; 173 cm</th>
<th>5'10&quot; 178 cm</th>
<th>6' 183 cm</th>
<th>6'2&quot; 188 cm</th>
<th>6'4&quot; 193 cm</th>
</tr>
</thead>
<tbody>
<tr>
<td>VT male</td>
<td>305</td>
<td>320</td>
<td>360</td>
<td>385</td>
<td>415</td>
<td>440</td>
<td>470</td>
<td>490</td>
<td>520</td>
</tr>
<tr>
<td>VT female</td>
<td>275</td>
<td>295</td>
<td>330</td>
<td>360</td>
<td>385</td>
<td>415</td>
<td>440</td>
<td>470</td>
<td>490</td>
</tr>
<tr>
<td>VT pregnant</td>
<td>370</td>
<td>390</td>
<td>440</td>
<td>480</td>
<td>510</td>
<td>550</td>
<td>585</td>
<td>625</td>
<td>650</td>
</tr>
</tbody>
</table>

RR 16/min

Pmax 35 cmH₂O

FiO₂ start at FiO₂ 100% and PEEP 5, then titrate to saturations 88 to 95%

<table>
<thead>
<tr>
<th>FiO₂ (%)</th>
<th>40</th>
<th>40</th>
<th>50</th>
<th>50</th>
<th>60</th>
<th>70</th>
<th>70</th>
<th>70</th>
<th>80</th>
<th>90</th>
</tr>
</thead>
<tbody>
<tr>
<td>PEEP (cmH₂O)</td>
<td>5</td>
<td>8</td>
<td>8</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>12</td>
<td>14</td>
<td>14</td>
<td>14</td>
</tr>
</tbody>
</table>
If hypertensive **acute pulmonary oedema** then start PEEP at 10 cmH$_2$O and titrate up while titrating IV GTN, aiming for systolic ≤ 140 mmHg

If **cardiogenic shock** then avoid high PEEP

If **head injury** then use PEEP 5 cmH$_2$O and aim for ETCO$_2$ in low end of normal range

In patients with “sick lungs” ETCO$_2$ may differ from P$_v$CO$_2$ or P$_a$CO$_2$

Insert **nasogastric** or orogastric tube

**Maintain sedation:**

Mix **morphine 50 mg** and **midazolam 50 mg** and make up to **50 mL** with **normal saline**. Each 1 mL contains morphine 1 mg and midazolam 1 mg. Give **loading dose** of **2 to 10 mL**, and **start infusion at 2.5 to 5 mL/hour**.

**OR**

**IV propofol 10 mg/mL** (neat solution) at **3 to 5 mL/hour** and

**IV fentanyl 50 micrograms/mL** (neat solution) **loading dose** of **2 to 4 mL** (**= 100 to 200 micrograms**) then **0.4 to 4 mL/hour** (**= 20 to 200 micrograms/hour**)
If Pmax alarms:
the Oxylog 3000 displays !!! Paw high
check for patient agitation and tube obstruction
if not agitation or obstruction then press and hold Insp Hold

If Pplat > 30 then decrease VT in 1 mL/kg steps to a minimum of 4 mL/kg
INITIAL VENTILATOR SETTINGS FOR OBSTRUCTIVE STRATEGY

**Mode**: VC-SIMV

**VT**: 6 mL/kg of ideal body weight

<table>
<thead>
<tr>
<th>Height</th>
<th>5' 153 cm</th>
<th>5'2&quot; 156 cm</th>
<th>5'4&quot; 163 cm</th>
<th>5'6&quot; 168 cm</th>
<th>5'8&quot; 173 cm</th>
<th>5'10&quot; 178 cm</th>
<th>6' 183 cm</th>
<th>6'2&quot; 188 cm</th>
<th>6'4&quot; 193 cm</th>
</tr>
</thead>
<tbody>
<tr>
<td>VT male</td>
<td>305</td>
<td>320</td>
<td>360</td>
<td>385</td>
<td>415</td>
<td>440</td>
<td>470</td>
<td>490</td>
<td>520</td>
</tr>
<tr>
<td>VT female</td>
<td>275</td>
<td>295</td>
<td>330</td>
<td>360</td>
<td>385</td>
<td>415</td>
<td>440</td>
<td>470</td>
<td>490</td>
</tr>
<tr>
<td>VT pregnant</td>
<td>370</td>
<td>390</td>
<td>440</td>
<td>480</td>
<td>510</td>
<td>550</td>
<td>585</td>
<td>625</td>
<td>650</td>
</tr>
</tbody>
</table>

**RR**: 8 /min

continued next page
**VENTILATION**

**Pmax** 35 cmH₂O

![Diagram showing Pmax 35 cmH₂O]

**FiO₂** minimum for saturations 88 to 95%

![Diagram showing FiO₂ 60%]

**PEEP** 0 cmH₂O

**I:E** ≥ 1:4

**Autoflow On** with slope

Insert **nasogastric** or orogastric tube

*continued next page*
Maintain **sedation:**

Mix **morphine 50 mg** and **midazolam 50 mg** and make up to **50 mL** with **normal saline**. Each 1 mL contains morphine 1 mg and midazolam 1 mg. Give **loading dose** of **2 to 10 mL**, and **start infusion at 2.5 to 5 mL/hour**.

**OR**

**IV propofol 10 mg/mL** (neat solution) at **3 to 5 mL/hour**

and

**IV fentanyl 50 micrograms/mL** (neat solution) **loading dose** of **2 to 4 mL** ( = 100 to 200 micrograms) then **0.4 to 4 mL/hour** ( = 20 to 200 micrograms/hour)

Check portable **CXR**

Insert urinary **IDC**

**Raise** head of bed to 45° (or higher if obese)

Consider **permissive hypercapnia** keeping pH > 7.1

Examine expiratory flow curves

If breath stacking then decrease RR to minimum of 4/min

If hypotensive and difficult to ventilate then **disconnect** tube and allow patient to expire stacked breaths

**continued next page**
VENTILATION

TROUBLESHOOTING THE VENTILATOR

If complications on the ventilator then call for help and check:

- **Dislodgement**: check end-tidal CO₂ waveform, repeat laryngoscopy
- **Obstruction**: check for high peak inspiratory pressure, **suction** secretions
- **Pneumothorax**: check breath sounds, pleural sliding on **ultrasound**, repeat CXR
- **Equipment failure**: disconnect from ventilator, **bag** patient, check all connections in circuit, check gas supply
- **Stacking breaths**: **bag** slowly, push on chest to assist

Never ignore a ventilator alarm

If **Pmax** alarms:

- the Oxylog 3000 displays **!!! Paw high**
- check for **patient agitation** and **tube obstruction**
- if not agitation or obstruction then press and hold **Insp Hold**

![](image)

If Pplat > 30 then **decrease VT** in 1 mL/kg steps to a minimum of 4 mL/kg

Seek expert advice
VENTRICULAR FIBRILLATION

CALL FOR HELP  INFORM TEAM  CRASH CART

START CPR

Attach defibrillator or monitor
Pads or paddles in left midaxillary line over sixth intercostal space (under breast) and right parasternal area over second intercostal space. In patients with a PPM or ICD put pads at least 8 cm from the PPM or ICD.

If the rhythm is shockable (VF or pulseless VT) then shock
For all shocks use 200 J then immediately continue chest compressions

Consider airway adjuncts (oro- or naso-pharyngeal airway, and if skilled LMA or ETT)
High-flow oxygen
Intravenous or intraosseous access
Waveform capnography (end-tidal CO₂ monitoring)

CPR 2 minutes
Look at the clock

continued on page 91
FIND AND TREAT CAUSE

**OBTAIN BEDSIDE BLOODS AND CONSIDER CARDIAC ULTRASOUND**

Consider myocardial infarct and pulmonary embolus (may require PCI or thrombolysis)

If hypoxia give high-flow oxygen, check connections, check for bilateral breath sounds, suction endotracheal tube and reconfirm placement, consider CXR

If hyperkalaemia:
- give IV calcium chloride 10% 10 mL bolus or IV calcium gluconate 10% 30 mL bolus
- give IV short-acting insulin 10 units with IV dextrose 50% 50 mL
- give nebulised salbutamol 10 to 20 mg

If hypokalaemia give IV potassium chloride 1 mmol/mL 5 mL bolus and IV magnesium sulphate 50% 2.5 mL bolus

If profound acidosis consider IV sodium bicarbonate 8.4% 1 mL/kg bolus on expert advice

If hypovolaemia give IV normal saline 20 mL/kg and check haemoglobin

If hypocalcaemia give IV calcium gluconate 10% 20 mL or IV calcium chloride 10% 10 mL

If hyperthermia consider sepsis, neuroleptic malignant syndrome, serotonin toxicity, malignant hyperthermia, heat stroke

If hypothermia use forced air blanket, warm IV fluids, raise room temperature

Consider toxins including medications, infusions, ingestions, and medication error

Consider tension pneumothorax. Check for signs and perform emergency needle decompression or finger thoracostomy. Call for CXR but do not delay treatment.

Consider cardiac tamponade especially if penetrating trauma or recent cardiac surgery
Simultaneously Find and Treat Cause (facing page)

Plan actions before interrupting compressions

Shockable? then shock using 200 J

IV adrenaline 1 mg followed by normal saline 20 mL flush
CPR 2 minutes

Shockable? then shock

After third shock give IV amiodarone 300 mg in dextrose 5% 20 mL
CPR 2 minutes

Shockable? then shock

IV adrenaline 1 mg
CPR 2 minutes

Shockable? then shock

After fifth shock consider IV amiodarone 150 mg in dextrose 5% 20 mL
CPR 2 minutes

Shockable? then shock

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<table>
<thead>
<tr>
<th>Action</th>
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<tbody>
<tr>
<td>IV adrenaline 1 mg</td>
</tr>
<tr>
<td>CPR 2 minutes</td>
</tr>
</tbody>
</table>

Shockable? then shock

If refractory pulseless VT or VF then consider **IV magnesium 50% 2.5 mL bolus**

CPR 2 minutes

Shockable? then shock

IV adrenaline 1 mg

CPR 2 minutes

Shockable? then shock

CPR 2 minutes

**CPR now exceeds 20 minutes**

**IF RETURN OF SPONTANEOUS CIRCULATION GO TO PAGE 53 (ROSC)**
**VENTRICULAR TACHYCARDIA**

**IF NO PULSE THEN GO TO PAGE 97 (PULSELESS VT)**

---

**CALL FOR HELP**  
**INFORM TEAM**  
**CRASH CART**

---

If **PULSE but COMPROMISED** (hypotension, chest pain or altered conscious state):

- Give **IV sedation** as required. Be prepared to support airway.
- Ensure the defibrillator is **synchronised**
- Perform **synchronised DC cardioversion** 100 to 200 J (if obese start at 200 J)
- If shock fails to deliver:
  - try a different lead
  - check cables and power supply
  - consider unsynchronised DC shock if disorganised rhythm
- If no response **repeat shock** at 200 J (may need to press **synchronise** each time)

---

If **HAEMODYNAMICALLY STABLE** then consider:

- **IV amiodarone 300 mg** in dextrose 5% over 20 to 30 minutes  
  then **IV amiodarone 900 mg** over 24 hours

  **OR**

  - **IV sotalol 1.5 mg/kg** in dextrose 5% over 15 to 30 minutes  
    then **IV sotalol 80 to 160 mg** over 12 hours

  **OR**

  - **IV lignocaine 1 to 1.5 mg/kg** (usually 75 to 100 mg) over 1 to 2 minutes  
    then **IV lignocaine 4 mg/minute** for 1 hour then **1 to 3 mg/minute**

---

Look for causes (eg. **electrolytes**, myocardial infarct or ischaemia, medications)

---

**Seek expert advice as soon as possible**

---
START CPR

Attach defibrillator or monitor

Pads or paddles in left midaxillary line over sixth intercostal space (under breast) and right parasternal area over second intercostal space. In patients with a PPM or ICD put pads at least 8 cm from the PPM or ICD.

If the rhythm is shockable (VF or pulseless VT) then shock
For all shocks use 200 J then immediately continue chest compressions

Consider airway adjuncts (oro- or naso-pharyngeal airway, and if skilled LMA or ETT)
High-flow oxygen
Intravenous or intraosseous access
Waveform capnography (end-tidal CO₂ monitoring)

CPR 2 minutes
Look at the clock

continued on page 99
FIND AND TREAT CAUSE

**OBTAIN BEDSIDE BLOODS AND CONSIDER CARDIAC ULTRASOUND**

Consider **myocardial infarct** and **pulmonary embolus** (may require PCI or thrombolysis)

If **hypoxia** give high-flow **oxygen**, **check connections**, check for bilateral breath sounds, suction endotracheal tube and reconfirm placement, consider **CXR**

If **hyperkalaemia**:
  - give **IV calcium chloride 10%** 10 mL bolus or **IV calcium gluconate 10%** 30 mL bolus
  - give **IV short-acting insulin** 10 units with **IV dextrose 50%** 50 mL
  - give **nebulised salbutamol 10 to 20 mg**

If **hypokalaemia** give **IV potassium chloride 1 mmol/mL** 5 mL bolus and **IV magnesium sulphate 50%** 2.5 mL bolus

If profound **acidosis** consider **IV sodium bicarbonate 8.4%** 1 mL/kg bolus on expert advice

If **hypovolaemia** give **IV normal saline** 20 mL/kg and check haemoglobin

If **hypocalcaemia** give **IV calcium gluconate 10%** 20 mL or **IV calcium chloride 10%** 10 mL

If **hyperthermia** consider sepsis, neuroleptic malignant syndrome, serotonin toxicity, malignant hyperthermia, heat stroke

If **hypothermia** use forced air blanket, **warm IV fluids**, raise room temperature

Consider **toxins** including medications, infusions, ingestions, and medication error

Consider **tension pneumothorax**. Check for signs and perform emergency needle decompression or finger thoracostomy. Call for CXR but do not delay treatment.

Consider **cardiac tamponade** especially if penetrating trauma or recent cardiac surgery
Simultaneously **Find and Treat Cause** (facing page)

**Plan actions** before interrupting compressions

**Shockable? then shock using 200 J**

**IV adrenaline 1 mg** followed by normal saline 20 mL flush

**CPR 2 minutes**

**Shockable? then shock**

After third shock give **IV amiodarone 300 mg** in dextrose 5% 20 mL

**CPR 2 minutes**

**Shockable? then shock**

**IV adrenaline 1 mg**

**CPR 2 minutes**

**Shockable? then shock**

After fifth shock consider **IV amiodarone 150 mg** in dextrose 5% 20 mL

**CPR 2 minutes**

**Shockable? then shock**

**continued next page**
### PULSELESS VENTRICULAR TACHYCARDIA

<table>
<thead>
<tr>
<th>Step</th>
<th>Description</th>
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</table>
| 1    | **IV adrenaline 1 mg**  
**CPR 2 minutes**  |
| 2    | **Shockable? then shock** |
| 3    | **If refractory pulseless VT or VF then consider IV magnesium 50% 2.5 mL bolus**  
**CPR 2 minutes**  |
| 4    | **Shockable? then shock** |
| 5    | **IV adrenaline 1 mg**  
**CPR 2 minutes**  |
| 6    | **Shockable? then shock** |
| 7    | **CPR 2 minutes**  |

**CPR now exceeds 20 minutes**

**IF RETURN OF SPONTANEOUS CIRCULATION GO TO PAGE 53 (ROSC)**
Emergency Protocols are a flight manual for the crashing patient.

In medicine competence is often measured by the ability to remember. Doctors have been taught to manage emergencies independently, by calmly reciting steps that may be stumbled over in a crisis managed by a team.

Cognitive aids, such as checklists and emergency manuals, have been frowned upon as “cookbook” medicine that somehow simplifies treatment – as if that is a bad thing in an emergency. Of course cognitive aids are no substitute for clinical acumen, good training, hard-won experience, and rehearsal with simulators. But perhaps the real opposition is to changing the image of the doctor in an emergency, away from the swashbuckling hero and towards a more human, more fallible, more integrated team member.

Pilots, military commanders and nuclear power plant operators use cognitive aids because:

- in a crisis memory fails, cognition is overloaded, “tunnel vision” develops, performance degrades, and distractions interrupt planned actions\(^1\,^2\)
- relevant literature can be difficult to find, poorly structured, and excessively detailed
- aviators have long demonstrated the safety benefits of a culture of teamwork engrained with cognitive aids and crew resource management techniques\(^3\,^4\)
- expertise requires repeated practice, and no-one is an expert in every emergency.

Using cognitive aids the doctor, like the pilot, still “flies the plane” and makes the big decisions. But cognitive aids improve performance, safety and satisfaction, which is why they have been widely adopted across industries managing time-critical emergencies. Good evidence supports cognitive aids in simulated medical emergencies.\(^5\,^6\,^7\) A trial from Harvard using intra-operative crisis checklists demonstrated a 73% reduction in critical errors, with 97% of participants wanting the checklists used if they were undergoing an operation.\(^8\) The adoption of cognitive aids in medicine is a cultural change whose time has come.

Emergency Protocols are integrated and improved guidelines from peak medical organisations. These protocols are linear and stepwise, rather than branching and looping, because sequential algorithms are simpler and safer in medical emergencies.\(^9\) Printed protocols are more accessible, user-friendly, familiar, robust and reliable than screen-based applications.

Emergency Protocols are standardised with common-sense definitions. A “difficult airway” is something that you predict. A “failed airway” is something that happens to you. The diagrams in the Ventilation protocol feature the ubiquitous Oxylog transport ventilator, the little orange workhorse of Australian retrieval medicine.

Emergency Protocols work best when doctors and nurses are familiar with the protocols and have trained with them in simulated emergencies.\(^10\) Assigning a reader is recommended\(^11\) as the reader can prompt the team and help avoid the task fixation common in medical emergencies.

Emergency Protocols are developed and tested by a team of doctors, nurses, graphic designers, a senior commercial pilot and ex-military test pilot, and human factors practitioners. These protocols are constantly updated as expert opinion evolves. New guidelines are parsed, refined, integrated and iteratively tested. Drug doses are presented as the amount and concentration of the commonly available formulation, minimising calculation and confusion in emergency drug administration. Protocol steps are practical, such as checking oxygen connections for the hypoxic patient. There is no extraneous information to wade through. In an emergency you don’t need to know the level of evidence . . . just what to do next.
The Trial of Emergency Medicine Protocols in Simulation Training (TEMPIST) is a large prospective randomised block-controlled simulator-based trial studying doctors and nurses managing simulated medical emergencies with and without Emergency Protocols. TEMPIST is underway at the University Centre for Rural Health in Lismore, NSW. Outcome measures are critical life-saving steps specific to each scenario, recorded on video and by high-fidelity manikin. Data collection has been completed. Preliminary analysis demonstrates a 54% decrease in critical errors when using Emergency Protocols, across a wide range of clinical scenarios and clinician seniority. Results will be published in a peer-reviewed journal and available at [www.emergencyprotocols.org.au](http://www.emergencyprotocols.org.au).

Emergency Protocols are used in Advanced Emergency Performance Training (ADEPT). The ADEPT course teaches high-level non-technical skills to doctors, nurses and allied health professionals. ADEPT features ex-military pilots and human factors professionals. Two innovative days optimise the participants skills in leadership, teamwork, communication, assertion, conflict management, self-awareness, situation awareness and decision-making. ADEPT is accredited for Continuing Professional Development points by the Australasian College of Emergency Medicine and the Australian College of Rural and Remote Medicine.

Emergency Protocols are endorsed by the Emergency Care Institute of the Agency for Clinical Innovation and by the Australian College of Rural and Remote Medicine.

References
EMERGENCY PHONE NUMBERS: