CRISIS CHECKLISTS
OPERATING ROOM

1. Air Embolism – Venous
2. Anaphylaxis
3. Bradycardia – Unstable
4. Cardiac Arrest – Asystole
5. Cardiac Arrest – VF/VT
6. Failed Airway
7. Fire
8. Haemorrhage
9. Hypotension
10. Hypoxia
11. Malignant Hyperthermia
12. Tachycardia – Unstable
13. Local Anaesthetic Toxicity
14. High Airway Pressure
15. Debriefing After Event

SUSPECTED EVENT

 version 1.0 August 2013
Auckland City Hospital
Level 8
Adult and Emergency Anaesthesia

Critical Event Checklist

Version 1.1
1. Air Embolism

*Decreased end-tidal CO₂, decreased oxygen saturation, hypotension, tachycardia, ECG changes*

1. Call for help and the resuscitation trolley
2. Who is the “hands-off” leader?
3. Inform the surgeon
4. FiO₂ increased to 100%
5. Nitrous oxide stopped?
6. Stop source of air entry
   - Wound filled with irrigation or cover in saline soaked swabs
   - Surgical site lowered below the level of the heart if possible
   - Entry point search (including open venous lines)
7. Has CPR been considered to disperse air lock? Consider cardiac arrest checklist

**Consider:**
- Left side down once source controlled
- Additional monitoring
- Fluid bolus
- Inotropes - adrenaline +/- infusion
- Transoesophageal echo (TOE) if diagnosis unclear

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**Critical CHANGES**

If PEA develops:  *Go to ⇒ CHECKLIST 4*
If VT/VF develops:  *Go to ⇒ CHECKLIST 5*
Additional Considerations

- Aspiration air from CVP line
- Discontinuation operation
- Arrange supportive care in ICU
2. Anaphylaxis

Hypotension, bronchospasm, high peak-airway pressures, decreased or lack of breath sounds, tachycardia, urticaria

1. Call for help and the resuscitation trolley
2. Who is the “hands-off” leader?
3. FiO₂ increased to 100% and consider turning off volatile agent
4. Adrenaline bolus - 50-100mcg and repeated as required
5. Potential causative agents removed?
6. Airway established/secured?
7. IV access adequate?
8. IV Fluids bolus

Consider:
- Adrenaline +/- Noradrenaline infusion
- Vasopressin
- Salbutamol - if resistant bronchospasm
- Glucagon – for beta blocker reversal
- TOE/TTE to assess filling and cardiac bypass where available

### Critical CHANGES

If **ASYSTOLE/PEA** develops: Go to ☐ CHECKLIST 4
If **VT/VF** develops: Go to ☐ CHECKLIST 5

### Common CAUSATIVE AGENTS

- Chlorhexidine
- Latex
- Antibiotics
- Colloids
- Neuromuscular blockers

### DRUG DOSES and treatments

<table>
<thead>
<tr>
<th>Drug</th>
<th>Bolus</th>
<th>Infusion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adrenaline</td>
<td>50-100mcg IV</td>
<td>draw up 5mg in 50mls run at 3-30ml/hr</td>
</tr>
<tr>
<td>Noradrenaline</td>
<td>Infusion draw up 4mg in 40mls run at 3-30ml/hr</td>
<td></td>
</tr>
<tr>
<td>Vasopressin</td>
<td>Bolus 1-2 units</td>
<td>Infusion run at 2units/hr</td>
</tr>
<tr>
<td>Salbutamol</td>
<td>Bolus 250mcg</td>
<td>Infusion 5-25mcg/min</td>
</tr>
<tr>
<td>Glucagon</td>
<td>1-5mg over 5 min</td>
<td></td>
</tr>
</tbody>
</table>
Additional Considerations:

- Consider additional lines and investigations
  - Arterial line
  - Central line
  - ABG, electrolytes, FBC, Coagulation Screen
- Tryptase levels at 1 hour, 4 hours and 24 hours
- Consider steroids
  - Dexamethasone 0.1-0.4mg/kg
  - Hydrocortisone 2-4mg/kg
- Arrange post-operative cares in HDU/ICU
- Referral for allergy testing

If bradycardia occurs: invariably heralds cardiovascular collapse

Other drugs that may be implemented:

- Thiopentone
- Blood products
- Protamine
- Amide-type local anaesthetics
### 3. Bradycardia – Unstable

HR <50bpm with hypotension, acutely altered mental state, shock, ischaemic ECG, acute heart failure

<table>
<thead>
<tr>
<th>Step</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td><strong>Call for help</strong> and the resuscitation trolley from PACU</td>
</tr>
<tr>
<td>2</td>
<td>Who is the “hands-off” leader?</td>
</tr>
<tr>
<td>3</td>
<td>Turn FiO2 to 100% and consider turning off volatile agent</td>
</tr>
<tr>
<td>4</td>
<td>Give <strong>atropine 0.6mg IV</strong> (may repeat up to 3mg)</td>
</tr>
<tr>
<td>5</td>
<td>Stop surgical stimulation (if laparoscopy, desufflate)</td>
</tr>
</tbody>
</table>
| 6    | If atropine ineffective  
  - Start adrenaline infusion  
  - or -  
  - Start transcutaneous pacing |
| 7    | **Confirm pulse present** - if PEA develops **GO to CHKLST 4** |

**Consider:**
- Urgent cardiology consultation
- Transvenous pacing if transcutaneous pacing is ineffective.
- Myocardial infarction
- Drug induced causes eg. β/Ca²⁺ channel blockers, digoxin, LA toxicity

**Critical CHANGES**

If PEA develops: **Go to CHKLST 4 ASYSTOLE/ PEA**  
If LA toxicity: **Go to CHKLST 13 LA TOXICITY**

**During RESUSCITATION**

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Airway</td>
<td>Assess and secure</td>
</tr>
<tr>
<td>Circulation</td>
<td>Confirm IV access, IV fluids wide open</td>
</tr>
</tbody>
</table>

**DRUG DOSES and treatments**

<table>
<thead>
<tr>
<th>Drug</th>
<th>Dose</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adrenaline infusion</td>
<td>3-30ml/hr (5mg in 50mls)</td>
</tr>
</tbody>
</table>

**OVERDOSE treatments**

- Beta blocker: Glucagon 2-4mg IV push
- Ca channel blocker: CaCl₂ 1g IV
- Digoxin: Consider digoxin immune FAB

**TRANSCUTANEOUS PACING instructions**

1. **Select MANUAL ON** on defibrillator
2. Apply **electrodes and pads** & connect to defibrillator
3. Press **PACER**
4. Adjust **RATE to 80/min** – can adjust once established
5. Press **START**
6. Adjust **OUTPUT (mA) until electrical capture**  
   Pacer spikes aligned with QRS complex; normally 65-100mA.  
   Set final milliamperes to 10mA above this level.
7. Confirm mechanical capture - cardiac output

**Reference:** New Zealand Resuscitation Council Guidelines 2011
Conditions at risk of asystole:

- Recent asystole
- Mobitz II AV block
- Complete heart block with broad QRS
- Ventricular pause >3s
4. Asystole/PEA Arrest

**Non-shockable pulseless cardiac arrest**

1. **Call for help and the resuscitation trolley**
2. **Who is the “hands-off” leader?**
3. **Say “The top priority is high-quality CPR”**
4. **Start CPR and assessment cycle**
   - **Perform CPR**
     - “Hard and fast” compressions 100/min
     - Minimal interruptions
     - 8 breaths/min, do not overinflate
   - **Give adrenaline**
     - Repeat every second cycle
   - **Assess every 2 minutes**
     - Change CPR provider
     - Check rhythm; if rhythm is organized, then check pulse
     - If: VF/VT
       - resume CPR and Go to CHECKLIST 5
     - If: PEA continues
       - resume CPR and assessment cycle
       - Read out 4H’s and 4T’s

**Critical CHANGES**

- If VF/VT develops: **GO TO CHECKLIST 5**

**During CPR**

- Airway: Assess and secure
- Circulation: Confirm IV or IO access, IV fluids wide open
- Assign roles: Chest compressions, Airway, Vascular access, Documentation, Drugs

**DRUG DOSES and treatments**

- **Adrenaline:** 1mg IV, repeat every 2nd cycle

<table>
<thead>
<tr>
<th>TOXIN treatment</th>
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</thead>
<tbody>
<tr>
<td><strong>Local anaesthetic</strong></td>
<td>Intralipid 1.5ml/kg IV bolus</td>
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<tr>
<td></td>
<td>Repeat 1-2 times in persistent asystole</td>
<td></td>
</tr>
<tr>
<td><strong>Beta-blocker</strong></td>
<td>Glucagon 2-4mg IV</td>
<td></td>
</tr>
<tr>
<td><strong>Ca channel blocker</strong></td>
<td>Calcium Chloride 1g IV</td>
<td></td>
</tr>
</tbody>
</table>

**HYPERKALAEMIA treatment**

| Calcium Chloride                  | 1g IV                        |
| Insulin                           | 10u actrapid in 50mls of 50% dextrose |
| Sodium bicarbonate                | 0.5-1mmol/kg slow IV          |

**4H’s & 4T’s**

- Hypovolaemia: Tension pneumothorax
- Hypoxia: Tamponade
- Hyper/hypokalaemia/metabolic disorders: Toxins (beta blocker, Ca²⁺ channel blocker, local anaesthetic)
- Hypothermia/hyperthermia: Thrombosis (pulmonary/coronary)

Additional information overleaf

Conditions at risk of asystole:

- Recent asystole
- Mobitz type II AV block
- Complete heart block with broad QRS
- Ventricular pause >3s
5. Cardiac Arrest – VF/VT

*Shockable pulseless cardiac arrest*

1. Call for help and the resuscitation trolley
2. Who is the “hands-off” leader?
3. Say “Start CPR and shock patient as soon as defibrillator arrives”
4. FiO2 100% and stop volatile anaesthetics
5. Start CPR – defibrillation – assessment cycle
   - **Perform CPR**
     - “Hard and fast” compressions 100/min
     - Minimal interruptions
     - 8 breaths/min, do not overinflate
   - **Defibrillate**
     - Shock at 200J
     - Resume CPR immediately after shock
   - **Give adrenaline**
     - Repeat every 2nd cycle
   - **Consider giving amiodarone after 3rd cycle**
   - **Assess every 2 minutes**
     - Change CPR compression provider
     - Treat reversible causes, consider reading out 4H’s & 4T’s
     - Check rhythm; if organised, check pulse
     - If: VF/VT continues, resume CPR – defibrillation – assessment cycle
     - If: Asystole/PEA: Go to † CHECKLIST 4

### Critical CHANGES

If PEA develops: **GO TO † CHECKLIST 4**

### During CPR

| **Airway** | Assess and secure |
| **Circulation** | Confirm IV access, IV fluids wide open |
| **Assign roles** | Chest compressions, Defibrillator, Airway |
|           | IV access, Documentation, Drugs |

### DRUG DOSES and treatments

- **Adrenaline**: 1mg IV, repeat every 2nd cycle

<table>
<thead>
<tr>
<th><strong>ANTIARRHYTHMICS</strong></th>
</tr>
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<tbody>
<tr>
<td>Amiodarone</td>
</tr>
<tr>
<td>Mag: 900mg IV over 24 hours</td>
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</table>

- **Magnesium**: Bolus: 10mmol IV for torsades de pointes

<table>
<thead>
<tr>
<th><strong>4H’s &amp; 4T’s</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Hypovolaemia</td>
</tr>
<tr>
<td>Hypoxia</td>
</tr>
<tr>
<td>Hyper/hypokalaemia/ metabolic disorders</td>
</tr>
<tr>
<td>Hypothermia/hyperthermia</td>
</tr>
<tr>
<td>Tension pneumothorax</td>
</tr>
<tr>
<td>Tamponde</td>
</tr>
<tr>
<td>Toxins (opioid, beta/calcium channel blocker, local anaesthetic)</td>
</tr>
<tr>
<td>Thrombosis (pulmonary/coronary)</td>
</tr>
</tbody>
</table>

### DEFIBRILLATOR instructions

7. Select ENERGY 200J on defibrillator
8. Apply pads to chest & connect to defibrillator
9. Consider SYNC shock if VT
10. Press **CHARGE**
11. Say “Stand Clear” and press **SHOCK**

Additional information overleaf

### Synchronised Cardioversion:

- Requires defibrillator ECG to be attached to the patient
- Pads will not discharge immediately as QRS complex needs to be detected
- Keep the **SYNC** button pressed until shock delivered

### TACHYCARDIA RHYTHMS where synchronisation indicated:

- Atrial fibrillation
- Mono-morphic VT
- Other SVT, atrial flutter
6. Failed Airway

2 unsuccessful intubation attempts by an airway expert with adequate muscle relaxation

1. Call for help and consider calling for surgical/ENT assistance
2. Get difficult intubation trolley and the Glidescope
3. Who is the “hands-off” leader?
4. Bag-mask ventilate with 100% O₂
5. Say “The top priority is oxygenation”
6. Is ventilation adequate?

Ventilation NOT ADEQUATE

- Optimise Ventilation
  - Reposition patient
  - Oral airway/nasal airway
  - Two-handed mask
- Check equipment
  - Using 100% O₂
  - Capnography
  - Circuit
- Check ventilation

Remains NOT ADEQUATE

- Place laryngeal mask airway (LMA/iLMA)
- If unsuccessful, attempt intubation using video laryngoscope
- Prepare for surgical airway
- Paralysis adequate?

Ventilation still NOT ADEQUATE

Implement surgical airway

Ventilation ADEQUATE

Consider

- awakening patient
  - OR
- alternative approaches to secure airway
  - Video laryngoscope
  - LMA as conduit to intubation
  - Fibreoptic intubation

Consider

- Urgency of surgery
- Aspiration risk
- Airway swelling
- Obstetrics - fetal status

Additional information overleaf
Alternative approaches to secure airway

• Operation using LMA, face mask
• Video laryngoscope
• LMA as conduit to intubation
• Return to spontaneous ventilation
• Different blades
• Intubating stylet
• Fibreoptic intubation
• Retrograde intubation
• Blind oral or nasal intubation
7. Fire

Evidence of fire (smoke, odour, flash) on patient or drapes, or in patient’s airway

1. Call for help
2. Who is the “hands-off” leader?
3. Get fire extinguisher and fire blanket
4. Attempt to extinguish fire
   - Shut off medical gases
   - Disconnect ventilator
   - Remove ETT and flammable material from airway
   - Pour saline into airway
5. After fire extinguished
   - Re-establish ventilation using self-inflating bag with room air
     - If unable to re-establish ventilation Go to CHECKLIST 6
     - Avoid NO2 and minimize FiO2
   - Confirm no secondary fire
     - Check surgical field, drapes and towels
   - Assess airway for injury or foreign body
     - Assess ETT integrity (fragments may be left in airway)
     - Consider bronchoscopy
6. Assess patient status and devise ongoing plan
7. Save involved materials/devices for review

If AIRWAY fire

If NON-AIRWAY fire

4. Attempt to extinguish fire
   FIRST ATTEMPT
   - Avoid NO2 and minimize FiO2
   - Remove drapes/all flammable materials from patient
   - Extinguish burning materials with saline/saline-soaked swabs
   DO NOT USE
   - Alcohol-based solutions
   - Any liquid on or in energized electrical equipment

5. After fire extinguished
   - Maintain airway
   - Confirm no secondary fire

6. Assess patient status and devise ongoing management plan

7. Save involved materials/devices for review

Additional information overleaf

If piped gases need to be turned off, the Duty Engineer would do this, after consulting with the Clinical Unit Warden, and all staff on the Floor have been notified.

Refer to EMERGENCY MANAGEMENT PLAN.
8. Haemorrhage

Acute massive bleeding

1. Call for help
2. Who will be the hands-off leader?
3. Open IV fluids and assess for adequate IV access
4. FiO2 100% and turn down volatile anaesthetics
5. Inform blood bank (24015)
   - If shocked & uncontrolled bleeding → massive transfusion protocol
   - If controlled bleeding → ask for 4 units RBC
   - If no group and screen → ask for desperate units (O negative)
6. Request rapid infuser or fluid warmer and pressure bags
7. Discuss management plan among surgical, anaesthesia, nursing teams
8. Keep patient warm
9. Send ABG or venous sample, repeat regularly

**TRANSFUSION Goals**
- MAP >50 but do not normalise until surgical control
- Fibrinogen >2.0g/L
- Red blood Cells >70g/L
- Platelets >50 x 10⁹/L

**DRUG DOSES and treatments**

<table>
<thead>
<tr>
<th>LOW CALCIUM</th>
<th>CaCl₂ 10% 10ml IV. Repeat as required</th>
</tr>
</thead>
<tbody>
<tr>
<td>HIGH POTASSIUM</td>
<td></td>
</tr>
<tr>
<td>Calcium Chloride 10%</td>
<td>10ml IV</td>
</tr>
<tr>
<td>Insulin</td>
<td>10u actrapid in 50 ml 50% Dextrose</td>
</tr>
<tr>
<td>Sodium bicarbonate</td>
<td>0.5-1 mmol/kg IV to maintain ph&gt;7.2</td>
</tr>
<tr>
<td>ANTIFIBRINOLYTIC</td>
<td></td>
</tr>
<tr>
<td>Tranexamic acid</td>
<td>1g IV over 10min then 1g over 8 hrs</td>
</tr>
</tbody>
</table>

**CONSIDER**
- Vascular surgery assistance
- Cell saver if non-malignant, non-contaminated
- Damage control surgery (pack, close, resuscitate)
- Formal labs – FBC, coags
- More personnel – techs, PACU nurses

**Reference:** ADHB Massive Transfusion Protocol Dec 2009
9. Hypotension

Unexplained drop in blood pressure refractory to initial treatment

1. Call for help and the resuscitation trolley
2. Who is the “hands-off” leader?
3. Inform the surgeon
4. Turn FiO2 to 100% and turn down volatile agent
5. Check
   - Central pulse
   - Blood pressure equipment working
   - Heart rate – If BRADYCARDIA go to CHECKLIST 3
   - Rhythm – If VT/VF go to CHECKLIST 5, IF PEA go to CHECKLIST 4
6. Run IV fluids wide open
7. Give vasopressors and titrate to response
   - MILD hypotension – give metaraminol or ephedrine
   - SEVERE/REFRACTORY hypotension – give adrenaline
     - Consider adrenaline or noradrenaline infusion
8. Inspect for sources of bleeding
9. Consider
   - Positioning patient to improve venous return
   - More IV access, monitoring, TTE to assess filling & cardiac function
10. Review and treat probable causes

Critical CHANGES

If BRADYCARDIA develops: Go to \(\Rightarrow\) CHECKLIST 3
If PEA develops: Go to \(\Rightarrow\) CHECKLIST 4
If VT/VF develops: Go to \(\Rightarrow\) CHECKLIST 5

DRUG DOSES and treatments

<table>
<thead>
<tr>
<th>Drug</th>
<th>Bolus:</th>
<th>Infusion:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Metaraminol</td>
<td>0.5-1mg IV</td>
<td>3-30ml/hr IV (5mg in 50mls)</td>
</tr>
<tr>
<td>Ephedrine</td>
<td>3-9mg IV</td>
<td></td>
</tr>
<tr>
<td>Adrenaline</td>
<td>50-100mcg IV</td>
<td>3-30ml/hr IV (4mg in 40mls)</td>
</tr>
<tr>
<td>Noradrenaline</td>
<td>Infusion:</td>
<td></td>
</tr>
</tbody>
</table>

Consider CAUSES

<table>
<thead>
<tr>
<th>Surgical Events</th>
<th>Hypovolaemia</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mechanical/surgical manipulation</td>
<td>Blood loss</td>
</tr>
<tr>
<td>Insufflation during laparoscopy</td>
<td>- visible external or internal</td>
</tr>
<tr>
<td>Retraction and vagal stimulation</td>
<td>Dehydration</td>
</tr>
<tr>
<td>Vascular compression</td>
<td>Sepsis</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Airway/Respiratory</th>
<th>Drugs/Allergy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hypo and hyperventilation</td>
<td>Consider all recent drugs given</td>
</tr>
<tr>
<td>Increased PEEP</td>
<td>Anaphylaxis</td>
</tr>
<tr>
<td>Hypoxia</td>
<td>Malignant hyperthermia</td>
</tr>
<tr>
<td>Pneumothorax</td>
<td>Dose/drug/ampoule error</td>
</tr>
<tr>
<td>Pulmonary Oedema</td>
<td>Local anaesthetic toxicity</td>
</tr>
<tr>
<td></td>
<td>Drugs given by surgeon (GTN)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Cardiac</th>
<th></th>
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</thead>
<tbody>
<tr>
<td>Air Embolism</td>
<td></td>
</tr>
<tr>
<td>Emboli (thrombosis, bone, fat)</td>
<td></td>
</tr>
<tr>
<td>Brady/tachycardia</td>
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</tr>
<tr>
<td>Myocardial ischaemia</td>
<td></td>
</tr>
<tr>
<td>Tamponade</td>
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</tbody>
</table>
10. Hypoxia

Unexplained oxygen desaturation

1. Call for help and the resuscitation trolley
2. Who is the “hands-off” leader?
3. Turn FiO₂ to 100% at high gas flows
   - Confirm FiO₂ = 100% on gas analyzer
   - Confirm ETCO₂ capnography and morphology
4. Hand ventilate and assess compliance
5. Listen to breath sounds
6. Check
   - Pulse oximeter placement
   - ET tube position – exclude endobronchial intubation
   - Circuit - filter, tubing, one-way valves, anaesthetic machine
   - Circulation - Blood pressure, pulse, heart rate
7. Consider actions to assess possible respiratory problem
   - Suction (to clear secretions, mucus plug)
   - Reintubation
   - Remove circuit and use ambu-bag
   - Blood gas analysis
8. Review and treat possible other causes

<table>
<thead>
<tr>
<th>Is an AIRWAY/BREATHING issue suspected?</th>
</tr>
</thead>
<tbody>
<tr>
<td>YES airway issue suspected</td>
</tr>
<tr>
<td><strong>Airway / Breathing Causes</strong></td>
</tr>
<tr>
<td>Aspiration</td>
</tr>
<tr>
<td>Obesity/positioning</td>
</tr>
<tr>
<td>Atelectasis</td>
</tr>
<tr>
<td>Pulmonary oedema</td>
</tr>
<tr>
<td>Bronchospasm</td>
</tr>
<tr>
<td>Pneumothorax</td>
</tr>
<tr>
<td>Hypoventilation</td>
</tr>
<tr>
<td>Endobronchial intubation</td>
</tr>
<tr>
<td>Ventilator associated</td>
</tr>
</tbody>
</table>

| NO airway issue suspected              |
| **Circulation**                        |
| Embolism – air, thromboembolic, fat, cement |
| Heart disease – CHF, IHD, MI, Tamponade, Congenital |
| Severe sepsis                          |
| **Drugs/allergy**                      |
| Drug or dose error/anaphylaxis         |
| Dyes and abnormal haemoglobin states   |

<table>
<thead>
<tr>
<th>Additional DIAGNOSTIC TESTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fibreoptic bronchoscope</td>
</tr>
<tr>
<td>Chest xray</td>
</tr>
<tr>
<td>ECG</td>
</tr>
<tr>
<td>Transoesophageal echocardiogram (TOE)</td>
</tr>
</tbody>
</table>
11. Malignant Hyperthermia

In presence of triggering agent: unexpected increase in end-tidal CO₂, unexplained tachycardia/tachypnoea. Prolonged masseter muscle spasm after succinylcholine. Hyperthermia is a late sign.

1. Call for help and notify surgeon
2. Get Malignant Hyperthermia (MH) Box
   Assign task cards to individuals
3. Say “Dantrolene administration is the priority”
4. Turn off volatile agent and remove triggering agents
5. Hyperventilate with 100% oxygen and high fresh gas flows (>15L/min)
   Add vapour-clean filters. Do not change machine.
6. Commence non triggering anaesthesia
7. Dantrolene administration in progress?
8. Lines and investigations (ABG) in progress?
9. IV fluids running? 0.9% saline

Simultaneously treat life threatening effects:
- Hyperthermia
- Acidosis
- Hyperkalaemia
- Arrhythmias

TRIGGERING AGENTS
- Volatile anaesthetic agents
- Succinylcholine

DRUG DOSES and treatments
- Dantrolene 2.5mg/kg IV bolus
  Repeat up to 30mg/kg
- Sodium Bicarbonate 0.5 – 1mmol/kg IV PRN to maintain pH>7.2

ARRHYTHMIAS
- Amiodarone 3mg/kg slowly IV
- Lignocaine 1mg/kg
- Avoid Ca channel blockers as can precipitate profound hypotension with dantrolene

HIGH POTASSIUM
- Insulin 10u actrapid in 50mls 50% dextrose
- Calcium chloride 6.8mmol IV

COOLING - stop if temp<38°C
- Lavage open body cavities
- Apply ice externally
- Infuse cold saline intravenously

Reference: Malignant Hyperthermia Australia and New Zealand (MHANZ)
### Differential Diagnosis

- Inadequate anaesthesia or machine malfunction
- Sepsis or infection
- Thyroid storm
- Ecstasy or other recreational drug use
- Phaeochromocytoma
- Neuroleptic malignant syndrome
- Intracerebral infection or haemorrhage
12. Tachycardia - Unstable

Persistent tachycardia with hypotension, ischaemic chest pain, altered mental status or shock

1. Call for help and the resuscitation trolley
2. Who is the “hands-off” leader?
3. Turn FiO<sub>2</sub> to 100% and turn down volatile anaesthetics
4. Analyze rhythm
   - If wide-complex, irregular: Treat as VF \( \Rightarrow \) GO to CHECKLIST 5
   - Otherwise: prepare for immediate synchronized cardioversion
5. Sedate conscious patients unless deteriorating rapidly
6. Perform cardioversion
7. Check monitor
   - If tachycardia persists, repeat cardioversion
8. Confirm adequate circulation
9. Is this a reactive tachycardia to a secondary case? See overleaf
10. Consider urgent cardiology consultation

Critical CHANGES

If PEA develops: GO to \( \Rightarrow \) CHECKLIST 4
If VT/VF develops: GO to \( \Rightarrow \) CHECKLIST 5

During RESUSCITATION

<table>
<thead>
<tr>
<th>Airway</th>
<th>Assess and secure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Circulation</td>
<td>Confirm IV access, IV fluids wide open</td>
</tr>
</tbody>
</table>

CARDIOVERSION defibrillator instructions

12. Move ENERGY SELECT knob to 200J
13. Place pads on chest and connect to patient cable
14. Press SYNC button to engage synchronization mode
15. Look for mark on the R-wave indicating synchronization mode
16. Press CHARGE
17. Say STAND CLEAR and press SHOCK

If SYNCHRONISATION NOT POSSIBLE

Use high-energy unsynchronized shocks.
Press SYNC button again to disengage synchronization.

Additional information overleaf

### Tachycardia Rhythms where synchronisation indicated:

- Atrial fibrillation
- Mono-morphic VT
- Other SVT, atrial flutter

### Review and Treat Secondary Causes:

<table>
<thead>
<tr>
<th>Category</th>
<th>Cause</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hypovolaemia</td>
<td>Blood loss, Dehydration, diuresis, sepsis</td>
</tr>
<tr>
<td>Drugs</td>
<td>Induction and inhalational agents, LA toxicity, Vasopressors, atropine, adrenaline</td>
</tr>
<tr>
<td>Airway</td>
<td>Hypoventilation, hypoxia</td>
</tr>
<tr>
<td>Anaphylaxis</td>
<td>Antibiotics, suxamethonium, chlorhexidine, latex</td>
</tr>
<tr>
<td>Reflex stimulation</td>
<td>Laryngoscopy, CVL insertion, surgical manipulation</td>
</tr>
<tr>
<td>Cardiopulmonary</td>
<td>Tension pneumothorax, haemothorax, tamponade, embolism, sepsis, myocardial irritability, pulmonary oedema</td>
</tr>
</tbody>
</table>
13. Local Anaesthetic Toxicity

Sudden alteration in mental status, tonic-clonic seizure, cardiovascular arrhythmias or collapse

1. Stop injecting the local anaesthetic
2. Call for help and the resuscitation trolley
3. Get the Intralipid from the pharmacy store room
4. Who is the “hands-off” leader?
5. FiO₂ increased to 100% and secure airway
6. Control seizures with midazolam or propofol
7. Assess cardiovascular status
   - If circulatory arrest
     • Start CPR – defibrillation – assessment cycle
     • Administer Intralipid
     • Manage arrhythmias
   - If not in circulatory arrest
     • Treat hypotension, bradycardia, tachyarrhythmias
     • Consider Intralipid

Consider:
   • Cardiopulmonary bypass (in refractory arrest if available)

**INTRALIPID TREATMENT**

<table>
<thead>
<tr>
<th>IMMEDIATELY</th>
<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td>Bolus 20% Intralipid</td>
<td>1.5ml/kg over 1 min (100ml/70kg)</td>
<td></td>
</tr>
<tr>
<td>Infusion 20% Intralipid</td>
<td>15ml/kg/hr (1000ml/hr for 70kg)</td>
<td></td>
</tr>
</tbody>
</table>

**AFTER 5 MIN IF CVS REMAINS UNSTABLE**

| Repeat Boluses | Up to 3 total, 5 mins between |
| Double infusion rate | 30ml/kg/hr (2000ml/hr for 70kg) |

**DO NOT EXCEED MAXIMUM DOSE** 12ml/kg (840ml/70kg)

**DRUG DOSES and treatments**

| **Adrenaline** | 1mg IV, repeat every 2nd cycle |
| **ANTIARRHYTHMICS** |                           |                           |
| Amiodarone | Bolus: 300mg IV after 3rd cycle |
| Infusion: 900mg IV over 24 hours |
| Atropine | Bolus: 0.6mg IV |
| Avoid using lignocaine |
| Propofol is not a substitute for intralipid |

Reference: AAGBI Safety Guideline: Management of Severe Local Anaesthetic Toxicity 2010
14. High airway pressure

Persistent increased PAWP >40cmH₂O, hypoxaemia, inadequate ventilation

1. Call for help and the resuscitation trolley
2. Who is the “hands-off” leader?
3. Inform surgeon and stop stimulation
4. Turn FiO₂ to 100%
5. Switch to manual ventilation
6. Disconnect ETT/LMA from the circuit and squeeze the reservoir bag

Is there high airway pressure in the circuit?

<table>
<thead>
<tr>
<th>HIGH PRESSURE IN CIRCUIT</th>
<th>NORMAL PRESSURE IN CIRCUIT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ventilate with Ambubag</td>
<td>Check airway</td>
</tr>
<tr>
<td>Replace or repair circuit/machine</td>
<td>- laryngospasm</td>
</tr>
<tr>
<td>Consider intravenous anaesthesia</td>
<td>- check position ETT/LMA</td>
</tr>
<tr>
<td></td>
<td>- pass suction catheter down ETT</td>
</tr>
<tr>
<td></td>
<td>- check filter for obstruction</td>
</tr>
<tr>
<td></td>
<td>- replace or secure airway</td>
</tr>
<tr>
<td></td>
<td>Auscultate both sides of chest</td>
</tr>
<tr>
<td></td>
<td>Consider -</td>
</tr>
<tr>
<td></td>
<td>- anaphylaxis</td>
</tr>
<tr>
<td></td>
<td>- bronchospasm</td>
</tr>
<tr>
<td></td>
<td>- pulmonary oedema</td>
</tr>
<tr>
<td></td>
<td>- aspiration</td>
</tr>
<tr>
<td></td>
<td>- atelectasis</td>
</tr>
<tr>
<td></td>
<td>- pneumothorax</td>
</tr>
<tr>
<td></td>
<td>Consider chest x-ray</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>CRITICAL CHANGES</th>
</tr>
</thead>
<tbody>
<tr>
<td>If PEA develops: Go to ☐ CHECKLIST 4</td>
</tr>
<tr>
<td>If ANAPHYLAXIS Go to ☐ CHECKLIST 2</td>
</tr>
<tr>
<td>If MALIGNANT HYPERTHERMIA Go to ☐ CHECKLIST 11</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>DURING RESUSCITATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Airway Assess and secure</td>
</tr>
<tr>
<td>Breathing Auscultate, tracheal deviation</td>
</tr>
<tr>
<td>Circulation Confirm IV access, IV fluids wide open</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>DRUG DOSES and treatments</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>BRONCHOSPASM</strong></td>
</tr>
<tr>
<td>Salbutamol Bolus – 250mcg</td>
</tr>
<tr>
<td>Infusion 5-25mcg/min</td>
</tr>
<tr>
<td>Adrenaline Bolus - 50-100mcg IV</td>
</tr>
<tr>
<td>Infusion – Draw up 5mg in 50mls</td>
</tr>
<tr>
<td>Run at 3-30ml/hr</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>PULMONARY OEDEMA</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Frusemide 20mg IV</td>
</tr>
<tr>
<td>GTN Infusion – 20mg in 50mls</td>
</tr>
<tr>
<td>Run at 1-20ml/hr</td>
</tr>
<tr>
<td>Airway PEEP</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>OTHER CAUSES decreased chest compliance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inadequate depth of anaesthesia/muscle relaxation</td>
</tr>
<tr>
<td>Malignant hyperthermia</td>
</tr>
<tr>
<td>Abnormal patient anatomy</td>
</tr>
</tbody>
</table>
## 15. Debriefing after a critical incident

**Objectives:** Reflection of facts and processes, sharing emotions, learning experience, reporting

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td><strong>Who is the “debriefer”</strong> – the chair of the meeting?</td>
</tr>
<tr>
<td>2</td>
<td><strong>State the confidentiality</strong> of the meeting</td>
</tr>
</tbody>
</table>
| 3 | **Identify and introduce** each member of the team  
  ➢ Say “All should have an opportunity to contribute.” |
| 4 | **Clarifying what happened**  
  ➢ Try to establish what happened during the incident response |
| 5 | **Invite sharing of emotional reactions**  
  ➢ Recognise and acknowledge stress |
| 6 | **What are the learning points and any changes for the future?**  
  ➢ Consider review of structure/processes  
  ➢ Consider review of policy/guidelines  
  ➢ Further education |
| 7 | **Discuss reporting/investigation of the event**  
  ➢ Consider Risk MonitorPro, Coroner, Duty Manager, Clinical Directors, WebAirs |
| 8 | Conclude by restating confidentiality of the debriefing |

### Ideal Meeting Conditions
- Occur as soon as possible after the event
- Large room to accommodate all participants
- Not in hallway or over the phone
- Arrange takeover/postpone/cancel cases to enable debrief

### Other considerations
- Communication with family
- Completion of documentation

### Support for ADHB Staff Members

**Critical incident Stress Management (CISM)**
1. **Defusing process**
   - initially be facilitated by a trained Duty/RC Manager
2. **Specialised support**
   - formal debrief is facilitated by an EAPworks counsellor
   - phone 0800 SELF HELP (0800 735 343)
   - or contact Occupational Health
3. **Ensure follow-up**

### Reference:
Simulation in Healthcare 2007; 2(2):117-125