## ISOBS Safety Checklist for Office-Based Anesthesia Crises

### Office-based Emergency Manual

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Principles of responding to OBA crises

ISOBS

- **IMMEDIATE** call for help
- **SECURE** a plan for crisis
- **OBTAIN** transfer of care plan/agreements
- **BEST: PRACTICE** = Best practice
- **SAFETY** = Timely transfer

What’s the plan?
ACLS
Cardiac Arrest – VF/VT

**START**

1. **Call for help and a code cart**
   - Ask: “Who will be the crisis manager”?  
   - Say: “Shock patient as soon as defibrillator arrives”  
   - Call: “Initiate Transfer Protocol”

2. **Put backboard under patient, supine**
3. **Turn FiO\textsubscript{2} to 100%, turn off volatiles anesthetics**
4. **Start CPR – defibrillation – assessment cycle**
   - **Perform CPR**
     - “Hard and fast” 100-120 compressions/min to depth of 2-2.3 inches  
     - Ensure full chest recoil with minimal interruptions  
     - 10 breaths/min, do not overventilate  
   - **Defibrillate**
     - Shock at highest setting (200J biphasic in defibrillator mode)  
     - Resume CPR immediately after shock  
   - **Give epinephrine**
     - Repeat epinephrine every 3-5 min  
     - Consider antiarrhythmics for refractory VF/VT (amiodarone)  
     - Assess every 2 minutes
   - **Consider**
     - Change CPR compression provider  
     - Check ETCO\textsubscript{2}  
       - If <10mmHg: evaluate CPR technique  
       - If suddenly >40mmHg: may indicate ROSC  
     - Treat reversible causes, consider reading aloud Hs and Ts (see list on right)  
     - Check rhythm; if rhythm organized, check pulse  
     - If VF/VT continues:
       - Resume CPR – defibrillation – assessment cycle (restart step 4)  
       - If asystole/PEA:
         - Resume CPR  
         - Go to CHKLST 2-Asystole/PEA

**DRUG DOSES and treatments ADULT**

- **Epinephrine**: 1mg IV, repeat every 3-5 min
- **Amiodarone**: 1\textsuperscript{st} dose: 300mg/IV/IO  
  2\textsuperscript{nd} dose: 150mg/IV/IO
- **Magnesium**: 1 to 2 g IV/IO for TdP

**DEFIBRILLATOR instructions**

- **Place electrodes on chest**
- **Turn defibrillator ON**, set to DEFIB mode, and increase ENERGY LEVEL to highest setting
- **Deliver shock**: press CHARGE, then SHOCK

**Hs and Ts: Reversible Causes**

- **Hydrogen ions (acidosis)**
- **Hyperkalemia**
- **Hypothermia**
- **Hypovolemia**
- **Hypoxia**
- **Tamponade (cardiac)**
- **Tension pneumothorax**
- **Thrombosis (coronary/pulmonary)**
- **Toxin (local anesthetic, beta blocker, calcium channel blocker)**

**During CPR**

- **Airway**: Bag-mask sufficient (if ventilation adequate)
- **Circulation**: Confirm adequate IV/IO access  
  Consider IV fluids wide open  
  Consider ECMO for select potentially reversible causes
- **Assign roles**: Chest compression, Airway, Vascular access, Timing, Code
Cardiac Arrest – PEA/asystole

Non-shockable pulseless cardiac arrest

START

1 Call for help and a code cart
   - Ask: “Who will be the crisis manager”?
   - Say: “High quality CPR”
   - Call: “Initiate Transfer Protocol”

2 Put backboard under patient, supine

3 Turn FiO₂ to 100%, turn off volatiles anesthetics

4 Start CPR and assessment cycle
   - Perform CPR
     - “Hard and fast” 100-120 compressions/min to depth of 2-2.3 inches
     - Ensure full chest recoil with minimal interruptions
     - 10 breaths/min, do not overventilate
   - Give epinephrine
     - Repeat epinephrine every 3-5 min
   - Assess every 2 minutes
     - Change CPR compression provider
     - Check ETCO₂
       - If <10mmHg: evaluate CPR technique
       - If suddenly >40mmHg: may indicate ROSC
     - Check rhythm: if rhythm organized, check pulse
       - If asystole/PEA continues:
         o Resume CPR and assessment cycle (restart Step 4)
         o Read aloud Hs and Ts
       If VF/VT:
         o Resume CPR
         o Go to CHKST 1-VF/VT

DRUG DOSES and treatments ADULT

Epinephrine: 1mg IV, repeat every 3-5 min

TOXIN Treatments
Local Anesthetic Intralipid 1.5ml/kg bolus, repeat for persistent asystole
   Start 0.25-0.5ml/kg/min; 30-60min if refractory
hypotension
Beta-blocker Glucagon 2-4mg IV push
Ca chan blocker Ca chloride 1g IV push

Bicarbonate 1-2mEq/kg, slow IV push; max 50mEq

HYPERKALEMIA treatment
1. Ca gluconate 30mg/kg IV, max 3000mg
   - or -
   Ca chloride 10mg/kg IV, max 2000mg
2. Insulin 10 units regular IV with 1-2 amps D50W

Hs and Ts: Reversible Causes

- Hydrogen ions (acidosis)
- Hyperkalemia
- Hypothermia
- Hypovolemia
- Hypoxia

During CPR

Airway: Bag-mask sufficient (if ventilation adequate)
Circulation: Confirm adequate IV/IO access
Assign roles: Chest compression, Airway, Vascular access, Timing, Code
   - Consider IV fluids wide open
   - Consider ECMO for select potentially reversible causes

Tamponade (cardiac)
Tension pneumothorax
Thrombosis (coronary/pulmonary)
Toxin (local anesthetic, beta blocker, calcium channel blocker)
Bradycardia - Unstable

HR < 50 with hypotension, acute heart failure, ischemic chest pain, or acutely altered mental status

**START**

1. **Call for help and a code cart**
   - Ask: "Who will be the crisis manager"?
   - Call: "Initiate Transfer Protocol"

2. **Turn FiO₂ to 100%, turn off volatiles anesthetics**
   - Assess adequate ventilation/oxygenation

3. **Give atropine**

4. **Stop surgical stimulation** (if laparoscopy, desufflate)

5. **If refractory to atropine**
   - Start epinephrine or dopamine infusion
   - **or**
   - Start transcutaneous pacing

6. **Additional Considerations**
   - Assess for drug-induced causes (beta-blockers, Ca chan blockers, digoxin)
   - Suggest expert consultation, cardiology, during transfer sign-out

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**DRUG DOSES and treatments ADULT**

<table>
<thead>
<tr>
<th>Drug</th>
<th>Dose (Adult)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Atropine</td>
<td>0.5mg IV; max 3mg total</td>
</tr>
<tr>
<td>Epinephrine</td>
<td>2-10 MICROgram/min IV</td>
</tr>
<tr>
<td>Dopamine</td>
<td>2-20 MICROgram/kg/min IV</td>
</tr>
</tbody>
</table>

**OVERDOSE Treatments**

<table>
<thead>
<tr>
<th>Drug</th>
<th>Dose (Adult)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Beta-blocker</td>
<td>2-4mg IV push</td>
</tr>
<tr>
<td>Ca chan blocker</td>
<td>1g IV push</td>
</tr>
<tr>
<td>Digoxin</td>
<td>Digoxin Immune FAB; consult pharmacy for patient-specific dosing</td>
</tr>
</tbody>
</table>

**Critical CHANGES**

If **PEA** develops (no pulse):
- go to **CHKLST 3-Asystole/PEA**

**During resuscitation**

- **Airway:** Assess and secure
- **Circulation:** Confirm adequate IV/IO access
  - Consider IV fluids wide open
- **Assign roles:** Airway, Vascular access, Timing, Code cart, documentation

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**TRANSCUTANEOUS pacing instructions**

1. Place pacing electrodes on front and back
2. Connect 3-lead ECG from pacing defibrillator to patient
3. Turn monitor to **PACER** mode
4. Set **PACER RATE** to 80/min (adjust based on clinical response once pacing established)
5. Start at 60mA of **PACER OUTPUT** and increase until electrical capture (pacer spikes aligned with QRS complex)
6. Set final current to 10mA above initial capture level
7. Confirm effective capture
   - Electrically: assess ECG tracing
   - Mechanically: palpate femoral pulse (carotid is unreliable)
Tachycardia - Unstable

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

START

1 Call for help and a code cart
   - Ask: “Who will be the crisis manager”?  
   - Call: “Initiate Transfer Protocol”
2 Turn FiO\textsubscript{2} to 100%, turn off volatiles anesthetics
3 Analyze Rhythm
   - If wide complex, irregular: treat as VF, go to CHKLST 1-VF/VT
   - Otherwise continue to Step 4
4 Prepare for immediate synchronized cardioversion
   1. Sedate all conscious patients unless rapid deterioration
   2. Turn defibrillator ON -> DEFIB mode
   3. Place electrodes on chest
   4. Press SYNC
   5. Look for spike on R-wave indicating synchronization mode
   6. Adjust SIZE button if necessary until SYNC spikes seen with each R-wave
5 Cardiovert at appropriate energy level
   1. Determine energy level (table right); begin at lowest and progress
   2. Press ENERGY SELECT until desired energy shown
   3. Press CHARGE
   4. Press and hold SHOCK
   5. Check monitor: if tachycardia persists, increase energy level
   6. Press SYNC after each delivery of shock
6 Additional Considerations
   - Suggest expert consultation during transfer sign-out

BIPHASIC CARDIOVERSION energy levels

<table>
<thead>
<tr>
<th>CONDITION</th>
<th>ENERGY LEVEL -&gt; PROGRESSION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Narrow complex, regular</td>
<td>50 J -&gt; 100 J -&gt; 150 J -&gt; 200 J</td>
</tr>
<tr>
<td>Narrow complex, irregular</td>
<td>120 J -&gt; 150 J -&gt; 200 J</td>
</tr>
<tr>
<td>Wide complex, regular</td>
<td>100 J -&gt; 150 J -&gt; 200 J</td>
</tr>
<tr>
<td>Wide complex, irregular</td>
<td>Treat as VF, go to CHKLST 1-VF/VT</td>
</tr>
</tbody>
</table>

Critical CHANGES

If cardioversion required but unable to synchronize shock, use HIGH-ENERGY unsynchronized shocks

If cardiac arrest:
- VF/VT: Go to CHKLST 1-VF/VT
- Asystole/PEA: Go to CHKLST 2-Asystole/PEA

During resuscitation

- Airway: Assess and secure
- Circulation: Confirm adequate IV/IO access      
  Consider IV fluids wide open
- Assign roles: Airway, Vascular access, Timing, Code cart, documentation
PALS
Cardiac Arrest – VF/VT

**START**

1. **Call for help and a code cart**
   - Ask: “Who will be the crisis manager?”
   - Say: “Shock patient as soon as defibrillator arrives”
   - Call: “Initiate Transfer Protocol”

2. **Put backboard under patient, supine**

3. **Turn FiO₂ to 100%, turn off volatiles anesthetics**

4. **Start CPR – defibrillation – assessment cycle**
   - **Perform CPR**
     - “Hard and fast” 100 compressions/min to depth of 2-2.3 inches
     - Ensure full chest recoil with minimal interruptions
     - 8 breaths/min, do not overventilate
   - **Defibrillate**
     - Shock at highest setting (2-4 J/kg biphasic in defibrillator mode)
     - Resume CPR immediately after shock
   - **Give epinephrine**
     - Repeat epinephrine every 3-5 min
   - **Consider antiarrhythmics for refractory VF/VT (amiodarone)**
   - **Assess every 2 minutes**
     - Change CPR compression provider
     - Check ETCO₂
       - If <10nmHg: evaluate CPR technique
       - If suddenly >40nmHg: may indicate ROSC
     - Treat reversible causes, consider reading aloud Hs and Ts (see list on right)
     - Check rhythm; if rhythm organized, check pulse
       - If VF/VT continues:
         - Resume CPR – defibrillation – assessment cycle (repeat step 4), Shock 4 J/kg
         - If VF/VT continues 2 min after prev attempt: Restart step 4, Shock 4-10 J/kg
         - If asystole/PEA:
           - Go to CHKLST 6-Asystole/PEA

**DRUG DOSES and treatments PEDS**

<table>
<thead>
<tr>
<th>Drug</th>
<th>Dose</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Epinephrine</strong></td>
<td>10 Micrograms IV, repeat every 3-5 min</td>
</tr>
<tr>
<td><strong>ANTIARRHYTHMICS</strong></td>
<td></td>
</tr>
<tr>
<td>Amiodarone</td>
<td>1st and 2nd dose: 5mg/kg bolus</td>
</tr>
<tr>
<td>Lidocaine</td>
<td>1mg/kg bolus</td>
</tr>
</tbody>
</table>

**DEFIBRILLATOR instructions**

1. **Place electrodes on chest**
2. **Turn defibrillator ON, set to DEFIB mode, and increase ENERGY LEVEL to 2-4 J/kg**
3. **Deliver shock: press CHARGE, then SHOCK**

**Hs and Ts: Reversible Causes**

<table>
<thead>
<tr>
<th>Hypothesis</th>
<th>Treatment</th>
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<tbody>
<tr>
<td>Hydrogen ions (acidosis)</td>
<td>Tamponade (cardiac)</td>
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<tr>
<td>Hyperkalemia</td>
<td>Tension pneumothorax</td>
</tr>
<tr>
<td>Hypothermia</td>
<td>Thrombosis (coronary/pulmonary)</td>
</tr>
<tr>
<td>Hypovolemia</td>
<td>Toxic (local anesthetic, beta blocker, calcium channel blocker)</td>
</tr>
<tr>
<td>Hypoxia</td>
<td>Trauma (bleeding)</td>
</tr>
<tr>
<td>Hypoglycemia</td>
<td></td>
</tr>
</tbody>
</table>

**During CPR**

| Airway | Bag-mask sufficient (if ventilation adequate) |
| Circulation | Confirm adequate IV/IO access |
| | Consider IV fluids wide open |
| | Consider ECMO if cardiac arrest > 6min |
| Assign roles | Chest compression, Airway, Vascular access, Timing, Code cart, documentation |
Cardiac Arrest – Asystole/PEA
Non-shockable pulseless cardiac arrest

**START**

1 Call for help and a code cart
   - Ask: “Who will be the crisis manager”?  
   - Say: “High quality CPR”  
   - Call: “Initiate Transfer Protocol”

2 Put backboard under patient, supine

3 Turn FiO₂ to 100%, turn off volatiles anesthetics

4 Start CPR and assessment cycle
   - Perform CPR
     - “Hard and fast” 100-120 compressions/min to depth of 2-2.3 inches
     - Ensure full chest recoil with minimal interruptions
     - 8 breaths/min, do not overventilate
     - Do not stop compressions for pulse check, use ETCO₂ for ROSC
   - Give epinephrine
     - Repeat epinephrine every 3-5 min
   - Assess every 2 minutes
     - Change CPR compression provider
     - Check ETCO₂
       - If <10mmHg: evaluate CPR technique
       - If suddenly >40mmHg: may indicate ROSC
     - Check rhythm; if rhythm organized, check pulse
     - If asystole/PEA continues:
       - Resume CPR and assessment cycle (restart Step 4)
       - Read aloud Hs and Ts
       - If VF/VT:
         - Resume CPR
         - Go to CHKLST 5-VF/VT

**DRUG DOSES and treatments Peds**

<table>
<thead>
<tr>
<th>Drug</th>
<th>Dosage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Epinephrine</td>
<td>10 µg IV, repeat every 3-5 min</td>
</tr>
</tbody>
</table>

**TOXIN Treatments**

- Local Anesthetic: Intralipid 1.5ml/kg bolus, repeat for persistent asystole
  - Start 0.25-0.5ml/kg/min; 30-60min if refractory
- Hypotension: Glucagon 2-4mg IV push
- Beta-blocker: Bicarbonate 1-2mEq/kg, slow IV push; max 50mEq

**Hyperkalemia treatment**

1. Ca gluconate: 60mg/kg IV, max 3000mg
   - or -
   Ca chloride: 20mg/kg IV, max 2000mg
2. Insulin: 0.1 units/kg IV with Dextrose 0.25-1g/kg

**Hs and Ts: Reversible Causes**

- Hydrogen ions (acidosis)
- Hyperkalemia
- Hypothermia
- Hypovolemia
- Hypoxia
- Tamponade (cardiac)
- Tension pneumothorax
- Thrombosis (coronary/pulmonary)
- Toxin (local anesthetic, beta blocker, calcium channel blocker)

**During CPR**

- **Airway:** Bag-mask sufficient (if ventilation adequate)
- **Circulation:** Confirm adequate IV/IO access
  - Consider IV fluids wide open
  - Consider ECMO if cardiac arrest > 6min
- **Assign roles:** Chest compression, Airway, Vascular access, Timing, Code, documentation

---

**Epinephrine:** 10 MICROgrams IV, repeat every 3-5 min

---
Bradycardia - Unstable

Bradycardia with hypotension, acute heart failure, ischemic chest pain, or acutely altered mental status

START

1 Call for help and a code cart
   - Ask: “Who will be the crisis manager?”
   - Call: “Initiate Transfer Protocol”

2 Turn FiO₂ to 100%, turn off volatiles anesthetics
   - Assess adequate ventilation/oxygenation

3 Give atropine

4 Stop surgical stimulation (if laparoscopy, desufflate)

5 If refractory to atropine
   - Start epinephrine
   -- or --
   - Start transcutaneous pacing

6 Additional Considerations
   - Assess for drug-induced causes (beta-blockers, Ca channel blockers)
   - Suggest expert consultation, cardiology, during transfer sign-out

DRUG DOSES and treatments PEDS

<table>
<thead>
<tr>
<th></th>
<th>&lt; 30 days</th>
<th>HR</th>
<th>&lt; 100</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>&gt; 30 days &amp; &lt; 1 yr</td>
<td>&lt; 80</td>
<td></td>
</tr>
<tr>
<td></td>
<td>&gt; 1 yr</td>
<td>&lt; 60</td>
<td></td>
</tr>
</tbody>
</table>

Atropine 0.01-0.2mg/kg IV; max 3mg total
Epinephrine 10 MICROgram/kg IV

OVERDOSE Treatments
Beta-blocker Glucagon 0.05mg/kg IV push, then 0.07mg/kg/min IV
Ca channel blocker Ca chloride 10-20mg IV push
--- or ---
Ca gluconate 50mg/kg IV
If ineffective, then Glucagon at above doses

Critical CHANGES
If PEA develops (no pulse)
○ Go to CHKLST 6-Asystole/PEA

During resuscitation
Airway: Assess and secure
Circulation: Confirm adequate IV/IO access
Consider IV fluids wide open
Assign roles: Airway, Vascular access, Timing, Code cart, documentation

TRANSCUTANEOUS pacing instructions

1. Place pacing electrodes on front and back
2. Connect 3-lead ECG from pacing defibrillator to patient
3. Turn monitor to PACER mode
4. Set PACER RATE to desired rate (adjust based on clinical response once pacing established)
5. Start at 65mA of PACER OUTPUT and increase until electrical capture (pacer spikes aligned with QRS complex; threshold about 65-100mA)
6. Set final current to 10mA above initial capture level
7. Confirm effective capture
   Electrically: assess ECG tracing
   Mechanically: palpate femoral pulse (carotid is unreliable)
Tachycardia - Unstable

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

**START**

1. **Call for help and a code cart**
   - Ask: “Who will be the crisis manager”?
   - Call: “Initiate Transfer Protocol”

2. **Turn FiO₂ to 100%, turn off volatiles anesthetics**

3. **Analyze Rhythm**
   - If no pulse, go to CHKLST 6-Asystole/PEA
   - If pulse, see table on right to treatment
   - Otherwise continue to Step 4

4. **Prepare for immediate synchronized cardioversion**
   1. Sedate all conscious patients unless rapid deterioration
   2. Turn defibrillator ON -> DEFIB mode
   3. Place electrodes on chest
   4. Press SYNC
   5. Look for spike on R-wave indicating synchronization mode
   6. Adjust SIZE button if necessary until SYNC spikes seen with each R-wave

5. **Cardiovert at appropriate energy level**
   1. Determine energy level (table right); begin at lowest and progress
   2. Press ENERGY SELECT until desired energy shown
   3. Press CHARGE
   4. Press and hold SHOCK
   5. Check monitor: if tachycardia persists, increase energy level
   6. Press SYNC after each delivery of shock

6. **Additional Considerations**
   - Suggest expert consultation during transfer sign-out

### BIPHASIC CARDIOVERSION energy levels

<table>
<thead>
<tr>
<th>CONDITION</th>
<th>ENERGY LEVEL</th>
<th>PROGRESSION</th>
</tr>
</thead>
<tbody>
<tr>
<td>SVT, tachyarrhythmia</td>
<td>0.5 - 1 J/kg</td>
<td>&gt; 2 J/kg</td>
</tr>
<tr>
<td>Wide complex, irregular</td>
<td>2 J/kg</td>
<td>&gt; 4 J/kg</td>
</tr>
</tbody>
</table>

### CONDITION with pulse PEDS TREATMENT

<table>
<thead>
<tr>
<th>Narrow Complex, regular</th>
<th>Wide complex, regular</th>
<th>Torsades de Pointes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adenosine: 0.1 - 0.3 mg/kg IV push (1st dose 6 mg max, 2nd dose 12 mg max)</td>
<td>Amiodarone: 5 mg/kg IV over 20 - 60 min</td>
<td>MgSO₄: 25 - 50 mg/kg/dose over minutes</td>
</tr>
<tr>
<td>Procaainamide: 15 mg/kg IV over 30 - 60 min</td>
<td>Lidocaine: 1 mg/kg IV</td>
<td>Isoproterenol: 0.05 - 2 MICROgrams/kg/min</td>
</tr>
<tr>
<td>Lidocaine: 1 mg/kg IV</td>
<td></td>
<td>Phenytion</td>
</tr>
<tr>
<td>NaBicarb (for quinidine-related)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Temp placing -&gt; CHKLST 7</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Critical CHANGES

- If **cardioversion required** but unable to synchronize shock, use HIGH-ENERGY unsynchronized shocks
- If **cardiac arrest**:
  - VF/VT Go to CHKLST 5-VF/VT
  - Asystole/PEA Go to CHKLST 6-Asystole/PEA

### During resuscitation

- **Airway**: Assess and secure
- **Circulation**: Confirm adequate IV/IO access
- Consider IV fluids wide open
- **Assign roles**: Airway, Vascular access, Timing, Code cart, documentation
9 Fire – airway or surroundings

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

START

1 Call for help, call 911 and call Code Red at _____
   ▶ Ask: “Who will be the crisis manager”?
   ▶ Call: “Initiate Transfer Protocol”

2 Obtain fire extinguisher, if needed

If AIRWAY fire

Attempt to extinguish fire
   ▶ Shut off medical gases
   ▶ Disconnect ventilator
   ▶ Remove endotracheal tube
   ▶ Remove flammable material from airway
   ▶ Pour saline into airway

After fire extinguished
   ▶ Re-establish ventilation using self-inflating bag with room air
   ▶ If unable to re-establish ventilation, go to CHKLST 14-DIFFICULT AIRWAY
   ▶ Avoid N₂O and minimize FiO₂

If NON-AIRWAY fire (IE EQUIPMENT, ELECTRICAL)

Avoid N₂O and minimize FiO₂
Remove drapes/all flammable materials from patient
Extinguish burning materials with saline/saline-soaked gauze
   DO NOT use Alcohol-based solutions
   Any liquid on energized electrical items (Laser, Bovie, anesthesia machine, etc)

Fire PERSISTS after 1 ATTEMPT

N
Y

After fire extinguished
   ▶ Maintain airway

Confirm no secondary fire
   Check surgical area, drapes, towels
Assess airway for injury or foreign body
   Assess ETT integrity (fragments may still be left in airway
   Consider bronchoscopy, if available
Assess patient status and devise ongoing management plan
Save involved materials/devices for review

If unable to re-establish ventilation, go to CHKLST 14-DIFFICULT AIRWAY

N
Y

Evacuate patient
Close OR door
Turn OFF gas supply to OR room
## 10 Evacuation and Preparedness

Evidence of emergency, disaster, or violence in the office-based setting

### START

<table>
<thead>
<tr>
<th>Emergency or disaster preparedness</th>
<th>Violence in the workplace preparedness</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1 Call for help</strong></td>
<td>➢ <strong>Run</strong> if not directly involved with patient care</td>
</tr>
<tr>
<td>➢ Ask: “Who will be the crisis manager”?</td>
<td>➢ <strong>Have escape route in mind</strong></td>
</tr>
<tr>
<td>➢ Call: “Initiate Transfer Protocol”</td>
<td>➢ <strong>Hide</strong> if running is not safe or patients cannot run</td>
</tr>
<tr>
<td>➢ Activate: “Facility Evacuation Policy”</td>
<td>➢ <strong>Silence</strong> your cell phone/pager</td>
</tr>
<tr>
<td><strong>2 Have designated person call 911</strong></td>
<td>➢ <strong>Fight</strong> if running or hiding is not an option</td>
</tr>
<tr>
<td>➢ Office must have plan in place to ensure EMT arrives within 10 min</td>
<td>➢ As a last resort, to protect your life</td>
</tr>
<tr>
<td><strong>3 Secure airway and ventilation</strong></td>
<td>1 <strong>Take care of yourself first</strong></td>
</tr>
<tr>
<td>➢ Check patient vitals</td>
<td>2 <strong>Help</strong> those in the immediate vicinity</td>
</tr>
<tr>
<td>➢ If time, attach portable vital machine</td>
<td>3 <strong>Alert those who will be affected by the crisis but may have more time to act</strong></td>
</tr>
<tr>
<td><strong>4 Review available resources in the OR or procedure room</strong></td>
<td>4 <strong>Notify public safety, 911</strong></td>
</tr>
<tr>
<td><strong>5 Ensure lines of communication are opened between the Office-based facility and the Receiving Health Care Facility (RHCF)</strong></td>
<td></td>
</tr>
<tr>
<td>➢ Ensure transport team is equipped to monitor patient</td>
<td></td>
</tr>
<tr>
<td><strong>6 Prepare to evacuate</strong></td>
<td></td>
</tr>
<tr>
<td>➢ Bring medications, airway equipment, extra IV</td>
<td></td>
</tr>
</tbody>
</table>
Power Loss

Lights off, loss of suction, loss of ventilation, etc.

START

1 Call for help
   ✔ Ask: “Who will be the crisis manager”?  
   ✔ Activate: “Facility Power Failure Policy”
2 Have designated person call facility administrator
   ✔ Facility must have prior plan in place to ensure backup generator/power is turned on
3 Find portable Flashlights, additional light sources, walkie-talkie, etc.
4 PAUSE surgery
5 Communicate
   ✔ With anesthesia, surgery, administrators, OR staff
6 Check outlets and plugs
   ✔ Mission critical machines normally plugged into RED outlets, uninterruptible
   ✔ If power is off on red outlet, try normal outlet

VENTILATOR on?

Y  N

Switch to 100% O2  Manual ventilation; obtain external O2 source (pipeline, machine, cylinder)

Backup generator on?

Y  N

❖ Determine with surgeon if safe to proceed, depending on duration of surgery, load of backup generator
❖ Cycle mission critical machines, ensure they are on
❖ ABCs of patient, adequate anesthesia/sedation
❖ Monitoring- portable pulse oximeter, manual blood pressure, portable transport vital signs machine
❖ All new generation anesthesia machines have 30-60min backup power (lasts longer if mechanical ventilation turned off); older machines do not
❖ Obtain portable battery for any mission critical machines if possible
❖ Switch any desflurane to either isoflurane, sevoflurane, or IV anesthesia
   ✔ Desflurane vaporizer unreliable in power loss
❖ Obtain adequate drug supplies, do not depend on automated dispensing systems
❖ Start paper anesthetic record
❖ Administration should be obtaining emergency generators, industrial length power cords, etc.
❖ Plan for orderly shutdown of OR suites

Backup generator on?

Y  N

❖ ABCs of patient, adequate anesthesia/sedation
❖ Monitoring- portable pulse oximeter, manual blood pressure, portable transport vital signs machine
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❖ Plan for orderly shutdown of OR suites

VENTILATOR on?

Y  N

Switch to 100% O2  Manual ventilation; obtain external O2 source (pipeline, machine, cylinder)
Oxygen Loss or desaturation

Sudden decrease in oxygen saturation despite flows

1 Call for help

Oxygen Loss or Desaturation

ABCs for patient resuscitation

Airway patent, breathing effort, circulating well

Power Loss?

Go to CHKLST 11-POWER LOSS

Gas contamination

➢ Ventilate manually, with room air if necessary
➢ Obtain backup O2 cylinder
➢ Disconnect pipeline from wall
➢ Monitor vitals

Most frequently:

Inadequate pressure (<30 psi)

➢ Ventilate manually, with room air if necessary
➢ Obtain backup O2 cylinder
➢ Search for source of failure
➢ Monitor vitals
CRITICAL EVENTS
Allergic reaction -> Anaphylaxis

Hypotension, high peak airways pressure, bronchospasm, tachycardia, urticaria, lack of or decreased breath sounds

**START**

1. **Call for help and a code cart**
   - Ask: "Who will be the crisis manager?"
   - Call: "Initiate Transfer Protocol"

2. **Give Epinephrine**

3. **Turn FiO₂ to 100%, turn off volatiles anesthetics**

4. **Open IV fluids and/or give fluid bolus**
   - **ADULTS:** 1000 cc IV/IO push
   - **PEDS:** 20 cc/kg IV/IO push

5. **Remove potential triggers**
   - If Latex suspected, wash area thoroughly

6. **Establish or secure airway**

7. **Additional Considerations**
   - Vasopressin (adults) for patients with continued hypotension refractory to repeated epinephrine
   - Epinephrine infusion for patients who initially responded to epinephrine but continue to experience symptoms
   - Diphenhydramine; H2 blockers; steroids; albuterol (peds)
   - Tryptase level: Check within 1st hour, repeat at 4th hr and 18-24 hours s/p reaction
   - Stop the procedure

---

**Critical CHANGES**

If cardiac arrest **ADULT**

- VF/VT Go to CHKLST 1-VF/VT
- Asystole/PEA Go to CHKLST 2-Asystole/PEA

If cardiac arrest **PEDS:**

- VF/VT Go to CHKLST 5-VF/VT
- Asystole/PEA Go to CHKLST 6-Asystole/PEA

---

**DRUG DOSES and treatments ADULT**

- **Epinephrine:** Bolus – 10-100 MICROgrams, repeat as necessary
  - Infusion – 1-10 MICROgrams/min
- **Vasopressin:** 1-2 units IV
- **Diphenhydramine** 25-50 mg IV
- **H2 Blockers**
  - Ranitidine – 50mg IV
  - Cimetidine – 300mg IV
- **Hydrocortisone** 100mg IV

**DRUG DOSES and treatments PEDS**

- **Epinephrine:** Bolus – 1-10 MICROgrams/kg, repeat as necessary
  - Infusion – 0.02-0.2 MICROgrams/kg/min
- **Albuterol:** 4-10 puffs
- **Diphenhydramine** 1 mg/kg IV/IO; max 50mg
- **H2 Blockers**
  - Ranitidine – 1mg/kg IV
  - Famotidine – 0.25mg/kg IV
- **Methylprednisolone** 2mg/kg IV/IO; max 100mg

**Common causes**

- Neuromuscular blockade
- Latex
- Chlorhexidine
- Antibiotics
- IV contrast or IV colloids
Difficult Airway

2 unsuccessful intubation attempts by airway expert

START

1 Call for help and a code cart
   - Consider initiating transfer protocol
2 Call for airway cart and video laryngoscope
3 Turn FiO₂ to 100%, bag mask ventilate
4 Confirm adequate ventilation

If ventilation NOT ADEQUATE

- Optimize Ventilation
  - Reposition Patient
  - Oral/nasal airway
  - Two-handed mask
- Check Equipment
  - Use 100% O₂
  - Capnography
  - Circuit integrity
- Check Ventilation

If still NOT ADEQUATE

- Place LMA or other supraglottic device or attempt intubation by video laryngoscope
  - If consider trach (if available)
  - Prep neck, call code airway (tracheostomy kit, surgeon)
  - Re-check ventilation

If ventilation ADEQUATE

Consider

- Awakening patient or other means to secure airway
  - LMA or face mask for duration of operation
  - Video laryngoscope
  - LMA as conduit to intubation
  - Spontaneous ventilation
  - Different blades
  - Intubating stylet
  - Light wand
  - Fiberoptic intubation
  - Retrograde intubation
  - Blind oral/nasal intubation
- If awakening patient, try
  - Awake intubation
  - Regional or local for procedure
  - Canceling the case

Still NOT ADEQUATE

- Surgical Airway
- Mandatory transfer
15 Embolism- fat, venous, clot

Decreased end-tidal CO2, decreased oxygen saturation, hypotension

**START**

1 **Call for help and a code cart**
   - Ask: “Who will be the crisis manager”?
   - Call: “Initiate Transfer Protocol”

2 **Turn FiO2 to 100%, bag mask ventilate**

3 **Turn off nitrous oxide and volatile anesthetics**

4 **Secure airway, confirm adequate ventilation**

5 **Monitor vitals**
   - BP, O2, pulse

**Fat embolism:**
   - Look for petechial rash, fever, tachycardia, tachypnea
   - Ask surgeon to irrigate wound with saline
   - Maintain adequate BP while avoiding volume overload
   - Consider labs: ABG, CBC, ESR, fibrinogen serum microglobulin

**Venous/air embolism:**
   - Find source and stop entry of air, including open venous lines
   - Ask surgeon to irrigate wound with saline
   - Turn off all sources of pressurized air (laparoscopy, endoscopy)
   - Lower surgical site below heart, if possible (reverse Trendelenburg)
   - Consider labs: ABG
   - Consider precordial Doppler, TEE if available

**Thromboembolism:**
   - ECG S1Q3T3
   - Vasopressors (norepinephrine) to improve RV function and to maintain BP, titrate to effect
   - Pulmonary vasodilators (nitric oxide) to decrease PA pressure, increase CO, improve gas exchange
   - Anticoagulate on case-by-case basis

6 **If hypotensive, give IV fluids**
   - If severe, give vasopressors
   - Go to CHKLST 18-HYPOTENSION

7 **Consider:**
   - Left lateral decubitus for patient
   - Suggesting TEE, CT during transfer sign-out

**DRUG DOSES and treatments ADULT**

**Anticoagulant treatment for acute PE**

| IV UFH: | bolus: 80U/kg or 5000U (70kg adult) infusion: 18U/kg/hr (adjust to aPTT equivalent of 0.3-0.7 anti-Xa activity) |
| SQ UFH: | bolus: 333U/kg maintenance: 250U/kg BID |
| SQ LMWH Enoxaparin: | 100IU/kg BID or 150IU/kg QD Dalteparin: | 100IU/kg BID or 200IU/kg QD |
| SQ Fondaparinux: | ≤50kg: 5mg QD 50-100kg: 7.5mg QD >100kg: 10mg QD |

**Critical CHANGES**

- If PEA develops (no pulse)
  - Start CPR
  - Adults CHKLST 2-Asystole/PEA
  - Peds CHKLST 6-Asystole/PEA
Hemorrhage

Uncontrolled, acute bleeding

START

1 Call for help and a code cart
   - Ask: “Who will be the crisis manager”?  
   - Call: “Initiate Transfer Protocol”
2 Open IV fluids and ensure adequate access
3 Turn FiO₂ to 100%, turn down volatile anesthetics
4 Hold pressure over area of bleeding
5 Discuss management plan between surgical, anesthesiology, and nursing teams
6 Damage control surgery (pack, close, resuscitate)
7 Keep patient warm
8 Draw labs for transfer
   - CBC, coags, electrolytes, ionized calcium

Suggestions for hospital actions...
   - Electrolyte disturbances
   - Contact blood bank
   - Suggest expert consultation, transfusion medicine, vascular surgery, during transfer-signout
Hypercapnia

Unexplained elevation of ET PCO2

**START**

1. Call for help
2. Secure airway and ventilate
   - Ensure mechanical ventilation has adequate tidal volumes
3. Assess minute ventilation
   - Ensure adequate tidal volumes
4. Reverse known drug-induced depression of respiratory rate
   - Opioids, benzodiazepines, turn off inhaled halogenated agents

**Check Anesthesia machine**

- Check absorbent CO2 agent
- Check fresh gas circuit
- Check expiratory valve

**Check temperature**

If suspect MH, go to CHKLST 23-MH

**Differential**

- Laparoscopic procedure (consider diaphragmatic incompetence)
- Hypermetabolic state: thyroid storm, pheochromocytoma, sepsis
- Drug-induced respiratory depression: opioids, benzodiazepines, propofol, inhaled halogenated anesthetics
- Malignant hyperthermia
- Physiologic: increased dead space (COPD), hypoventilation
Hypotension

Unexplained drop in blood pressure refractory to initial treatment

**START**

1 Call for help and a code cart
   - Ask: “Who will be the crisis manager?”

2 Check for
   - Pulse, BP, Equipment
   - HR
     - If Bradycardia, adult CHKLST 3-BRADYCARDIA;
       peds CHKLST 8-BRADYCARDIA
     - Rhythm
       - If VF/VT, adult CHKLST 1-VF/VT;
         peds CHKLST 5-VF/VT
       - If asystole/PEA, adult CHKLST 2-Asystole/PEA;
         peds CHKLST 6-Asystole/PEA

3 Run IV fluids wide open

4 Give vasopressors and titrate to response
   - Mild hypotension: give ephedrine or phenylephrine
   - Significant/refractory hypotension: give epinephrine bolus, consider starting epinephrine infusion

5 Turn FiO₂ to 100% and turn off volatile anesthetics

6 Look for external bleeding
   - If bleeding, go to CHKLST 16-HEMORRHAGE

7 Consider...
   - Patient in Trendelenberg
   - Additional IV access
   - Arterial line

**8 Differential Diagnosis**

**Operative field**
- Mechanical/Surgical manipulation
- Insufflation during laparoscopy
- Retraction
- Vagal stimulation
- Vascular compression

**Unaccounted blood loss**
- Blood in suction catheter
- Bloody sponges, blood on the floor
- Internal bleeding

**Drugs/Allergy**
- Anaphylaxis, go to CHKLST 13-ANAPHYLAXIS
- Recent drugs given, ie vasodilators
- Dose error, wrong drug
- Drugs used on field, ie systemic injection of local anesthetic, go to CHKLST 20-LAST

**Breathing**
- Hypoventilation
- Hypoxia, go to CHKLST 19-HYPOXIA
- Increased PEEP
- Persistent hyperventilation
- Pneumothorax
- Pulmonary edema

**Circulation**
- Bradycardia, adult CHKLST 3; peds CHKLST 7
- Malignant hyperthermia, go to CHKLST 23
- Tachycardia, adult CHKLST 4; peds CHKLST 8
- Bone cementing
- Myocardial infarction
- Emboli, go to CHKLST 15
- Severe sepsis
- Tamponade

**DRUG DOSES and treatments ADULT**

- Phenylephrine: 40-200 MICROgrams IV, repeat as necessary
- Ephedrine: 5-25mg IV, repeat as necessary
- Epinephrine: Bolus – 5-10 MICROgrams
  - Infusion – 0.1-1 MICROgrams/kg/min

**DRUG DOSES and treatments PEDS**

- Phenylephrine: 40-200 MICROgrams IV, repeat as necessary
- Ephedrine: 5-25mg IV, repeat as necessary
- Epinephrine: Bolus – 0.1mg/kg (1:1,000 solution), every 3-5 min

<table>
<thead>
<tr>
<th>Age</th>
<th>&lt;5th % systolic BP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Preemie</td>
<td>&lt;57</td>
</tr>
<tr>
<td>0-3 mo</td>
<td>&lt;60</td>
</tr>
<tr>
<td>3-12 mo</td>
<td>&lt;70</td>
</tr>
<tr>
<td>1-10 yr</td>
<td>&lt;70 + (age in years x2)</td>
</tr>
<tr>
<td>&gt;10 yr</td>
<td>&lt;90</td>
</tr>
</tbody>
</table>

**Age**
Hypoxia
Unexplained desaturation in oxygen

START

1 Call for help and a code cart
   ➢ Ask: “Who will be the crisis manager”? 
2 Turn FiO₂ to 100% and turn off volatile anesthetics
   ➢ Confirm inspired FiO₂ = 100% on gas analyzer
   ➢ Confirm ETCO₂ and changes in capnography morphology
3 Hand ventilate to assess compliance
4 Listen to breath sounds

Check for
   ➢ Pulse, BP, PIP
   ➢ ET tube position
   ➢ Pulse oximeter placement
   ➢ Circuit integrity: disconnection, bends, holes

Consider...
   ➢ Draw blood gas for transfer
   ➢ Suction (to clear secretions, mucus plug)
   ➢ Disconnect circuit and hand-mask

Differential Diagnosis

Yes AIRWAY issue suspected

Airway/Breathing
   ➢ Aspiration
   ➢ Atelectasis
   ➢ Bronchospasm
   ➢ Hypoventilation
   ➢ Laryngospasm
   ➢ Obesity/positioning
   ➢ Pneumothorax
   ➢ Pulmonary edema
   ➢ Right mainstem intubation
   ➢ Ventilator settings -> autoPEEP

No AIRWAY issue suspected

Circulation
   ➢ Embolism go to CHKLST 15-EMBOLISM
   ➢ Heart disease
   ➢ Severe sepsis
   ➢ If hypoxia associated with hypotension, go to CHKLST 14-HYPOTENSION

Drugs/Allergies
   ➢ Recent drugs given, ie NMB
   ➢ Dose error/allergy/anaphylaxis, go to CHKLST 11-ANAPHYLAXIS
   ➢ Dyes and abnormal hemoglobin, ie methemoglobinemia, methylene blue

Additional tests to suggest during transfer
   ➢ Fiberoptic bronchoscopy
   ➢ Chest x-ray
   ➢ Electrocardiogram
   ➢ Transesophageal echocardiogram
   ➢ Chest ultrasound
Local anesthetic systemic toxicity (LAST)

Altered mental status, neurological symptoms, cardiovascular instability following regional anesthetic

**START**

1 Call for Physician Anesthesiologist/CRNA/AA help and a code cart
   - Ask: "Who will be the crisis manager"?
   - Call: "Initiate Transfer Protocol"

2 Stop local anesthetics

3 Request for Intralipid kit

4 Secure airway and ventilation
   - Turn FiO₂ to 100% and turn off volatile anesthetics

5 Seizure suppression
   - Benzodiazepines
   - Avoid propofol in patients with cardiovascular instability
   - Alert nearest facility with cardiopulmonary bypass capability
   - Go to CHKLST 26 - Transfer of non-MH patient

6 Check for
   - Pulse, BP, SaO₂
   - If unstable cardiopulmonary system, start CPR
     - If VF/VT, adult CHKLST 1-VF/VT;
       - peds CHKLST 5-VF/VT
     - If asystole/PEA, adult CHKLST 2-Asystole/PEA;
       - peds CHKLST 6-Asystole/PEA

7 Management of cardiac arrhythmias
   - Avoid vasopressin, calcium channel blockers, beta blockers, and local anesthetics
   - Reduce epinephrine to <1 MICROgram/kg for hypotension

8 Give Lipid emulsion 20% therapy
   - Bolus 1.5 ml/kg over 1 min
   - Start continuous infusion
   - Repeat bolus for persistent cardiovascular collapse
   - Double infusion rate if BP remains low
   - Continue infusion for at least 10 min after stable vitals
   - Max 10ml/kg over first 30 min

9 Post LAST events at
   - www.lipidrescue.org

10 Report use of LIPID at
    - www.lipidregistry.org

**DRUG DOSES and treatment ADULT**

<table>
<thead>
<tr>
<th>Drug</th>
<th>Dose</th>
</tr>
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<tbody>
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<td>Lipid emulsion</td>
<td>bolus 1.5 ml/kg IV over 1 min continue infusion 0.25 ml/kg/min increase infusion to 0.5 ml/kg/min if BP remains low</td>
</tr>
<tr>
<td>Midazolam</td>
<td>2mg</td>
</tr>
<tr>
<td>Epinephrine</td>
<td>&lt;1 MICROgram/kg</td>
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**DRUG DOSES and treatment PEDS**

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</table>
Loss of access

Fluids on floor, no change in vitals after drug administration

1 Call for help
2 Communicate to surgeon
3 Check lines
   - Look for kinks in tubing
   - Ensure fluids are dripping
   - Look for fluid extravasation into surrounding tissue
   - Look for infiltration
4 Re-establish access
   - Choose another site starting distal to proximal in each limb:
     - different hand, arm, legs,
     - Use smaller gauge needle
5 If unable to establish access
   Call for ultrasound
   - If still refractory, consider central access or intraosseous
     depending on access to patient and patient needs
   - If endotracheal tube, inject: lidocaine, atropine, narcan
     epinephrine LANE
   - IM- midazolam, succinylcholine, ketamine, glycopyrrolate,
     atropine
   - SQ- epinephrine
6 When successful, secure IV well
22 Mental status change

Delirium, obtundation, coma, confusion, speech deficit

START

1 Call for help and a code cart
   - Ask: "Who will be the crisis manager"?
   - Call: "Initiate Transfer Protocol"

2 Secure airway and ventilation
3 Consider additional IV access
4 Draw labs for potential transfer
   - Point of care glucose

5 Treat reversible causes
6 Stroke assessment
   - Consider expert consultation, neurology, during transfer sign-out

7 Review medications and antagonists

Consider LABs during transfer sign-out
- Complete blood count, metabolic panel, electrolytes, liver function tests
- Urinalysis, urine toxicology

STROKE assessment
- Facial droop: Smile, show teeth
- Arm drift: Close eyes, extend arms forward, palms up for 10 sec
- Speech: Say “It is a sunny day in Boston”
- Time: Recognize symptoms fast

Critical CHANGES

If bleeding
   - Go to CHKLST 16- HEMORRHAGE
If hemodynamically unstable
   - Start CPR

- If VF/VT, adult CHKLST 1-VF/VT:
  - peds CHKLST 5-VF/VT
- If asystole/PEA, adult CHKLST 2-Asystole/PEA:
  - peds CHKLST 6-Asystole/PEA
- If Bradycardia, adult CHKLST 3-BRADYCARDIA:
  - peds CHKLST 8-BRADYCARDIA

DRUG DOSES and treatment ADULT
- Naloxone 0.4-2mg IV/IM/SC, repeat every 3 min as necessary
- Flumazenil 0.2mg IV, repeat as necessary
- Dextrose 50 cc D50W IV
- Glucagon 1mg IV/IM/SC

Reversible Causes

Hypoglycemia
hyperglycemia
Opioids
Benzodiazepines
Acid-base disturbance
Electrolyte abnormalities
Hypoxia, go to CHKLST 19-HYPOXIA
Hyperventilation, go to CHKLST 17-HYPERCAPNIA
Azotemia
Hypovolemia
Hypotension, go to CHKLST 18-HYPOTENSION
Acute blood loss, go to CHKLST 16-HEMORRHAGE
Urinary retention
Infection, ie pneumonia, UTI
Steroids
Anticholinergics
DKA

Critical CHANGES

If bleeding
   - Go to CHKLST 16- HEMORRHAGE
If hemodynamically unstable
   - Start CPR

- If VF/VT, adult CHKLST 1-VF/VT:
  - peds CHKLST 5-VF/VT
- If asystole/PEA, adult CHKLST 2-Asystole/PEA:
  - peds CHKLST 6-Asystole/PEA
- If Bradycardia, adult CHKLST 3-BRADYCARDIA:
  - peds CHKLST 8-BRADYCARDIA
Malignant Hyperthermia

In presence of triggering agent: unexpected increase in ETCO2, unexplained tachycardia/tachypnea, prolonged masseter muscle spasm after succinylcholine. Hyperthermia is a LATE sign.

START

1 Call for help and a code cart
   ➢ Ask: “Who will be the crisis manager”? Call: “Initiate MH Transfer Protocol”
2 Get MH kit
3 Call MH Hotline 1.800.644.9737
4 Assign dedicated person to start mixing Dantrolene
5 Request chilled IV saline
6 Turn off volatile anesthetics and transition to non-triggering anesthetics
   ➢ DO NOT delay treatment to change circuit/CO2 absorber
7 Turn FiO2 to 100%
8 Hyperventilate patient at flows > 10L/min
9 Terminate procedure, if possible
10 Give Ryanodex/dantrolene
11 Give bicarbonate for suspected metabolic acidosis (maintain pH > 7.2)
12 Treat hyperkalemia, if suspected
13 Treat dysrhythmias, if present
   ➢ Standard antiarrhythmics; DO NOT use calcium channel blockers
14 Draw labs for transfer
   ➢ Arterial blood gas
   ➢ Electrolytes
   ➢ Serum creatinine kinase
   ➢ Serum/urine myoglobin
   ➢ Coagulation profile
15 Initiate supportive care
   ➢ Consider cooling patient if T > 38.5°C
   ➢ Place Foley catheter, monitor urine output

DRUG DOSES and treatments ADULT

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<tbody>
<tr>
<td>Dantrolene</td>
<td>Reconstitute 20mg vial in 60cc sterile water (shake until dilute)</td>
</tr>
<tr>
<td>Ryanodex</td>
<td>Reconstitute 250mg vial with 5 cc sterile water (shake until orange and opaque)</td>
</tr>
<tr>
<td></td>
<td>Give 2.5mg/kg, repeat up to 10mg/kg until symptoms subside</td>
</tr>
<tr>
<td></td>
<td>Rarely may require up to 30mg/kg</td>
</tr>
<tr>
<td>Bicarbonate</td>
<td>1-2mEq/kg, slow IV push max 50mEq</td>
</tr>
</tbody>
</table>

HYPERKALEMIA treatment
1. Ca gluconate 30mg/kg IV, max 3000mg
   ➢ or ➢ Ca chloride 10mg/kg IV, max 2000mg
2. Insulin 10 units regular IV 1-2 amps D50W

TRIGGERING AGENTS

Inhalational (volatile) anesthetics
Succinylcholine

DIFFERENTIAL diagnosis (consider if refractory to high doses of dantrolene)

<table>
<thead>
<tr>
<th>Cardiopulmonary</th>
<th>Iatrogenic</th>
<th>Neurologic</th>
<th>Toxins</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hypoventilation</td>
<td>Exogenous CO2 source</td>
<td>Meningitis</td>
<td>Radiologic contrast</td>
</tr>
<tr>
<td>Sepsis</td>
<td>Overwarming</td>
<td>Intracranial bleed</td>
<td>Anticholinergic syndrome</td>
</tr>
<tr>
<td>Endocrine</td>
<td>Neuroleptic Malignant Syndrome</td>
<td>Hypoxic encephalopathy</td>
<td>Cocaine, amphetamine,</td>
</tr>
<tr>
<td>Thyrotoxicosis</td>
<td></td>
<td>Traumatic brain injury</td>
<td>salicylate, alcohol</td>
</tr>
<tr>
<td>Pheochromocytoma</td>
<td></td>
<td></td>
<td>withdrawal</td>
</tr>
</tbody>
</table>

DIFFERENTIAL diagnosis (consider if refractory to high doses of dantrolene)
Spinal Anesthesia: Adverse reactions

Hypotension, decreased respiratory effort, bradycardia, numbness or tingling in the fingers and hands, cardiopulmonary instability after spinal procedure

**START**

1. **Call for help and a code cart**
   - Ask: “Who will be the crisis manager”?
   - Call: “Initiate Transfer Protocol”

2. **Secure airway and ventilation**
   - Turn on FiO2 100%

3. **Consider additional IV access**

**Treat hypotension**
- Ephedrine and then phenylephrine first line
- Epinephrine second line

**Treat bradycardia**
- Reverse with atropine
- Go to CHKLST 3-BRADYCARDIA

**Treat respiratory insufficiency**
- Reverse with naloxone, flumazenil

**Draw labs for transfer**
- CBC, electrolytes, ABG

**Differential Diagnosis**

**Drugs/Allergy**
- Anaphylaxis, go to CHKLST 13-ANAPHYLAXIS
- Recent drugs given, ie vasodilators
- Dose error, wrong drug
- Drugs used on field, ie systemic injection of local anesthetic, go to CHKLST 20-LAST

**Circulation**
- Bradycardia, adult CHKLST 3-BRADYCARDIA; peds CHKLST 7-BRADYCARDIA
- Malignant hyperthermia, go to CHKLST 23-MH
- Tachycardia, adult CHKLST 4-TACHYCARDIA; peds CHKLST 8-TACHYCARDIA
- Bone cementing
- Myocardial infarction
- Emboli, go to CHKLST 15-EMBOLI
- Tamponade

**Breathing**
- High Spinal
- Hypoventilation
- Hypoxia, go to CHKLST 19-HYPOXIA
- Increased PEEP
- Increased valsalva
- Persistent hyperventilation
- Pneumothorax
- Pulmonary edema

**Drug DOSES and treatments ADULT**

<table>
<thead>
<tr>
<th>Drug</th>
<th>Dose/Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Atropine</td>
<td>0.5mg IV; max 3mg total</td>
</tr>
<tr>
<td>Naloxone</td>
<td>0.4-2mg IV/IM/SC, repeat every 3 min as necessary</td>
</tr>
<tr>
<td>Flumazenil</td>
<td>0.2mg IV, repeat every 3 min</td>
</tr>
<tr>
<td>Ephedrine</td>
<td>5-25mg IV, repeat as necessary</td>
</tr>
<tr>
<td>Phenylephrine</td>
<td>40-200 MICROgrams IV, repeat as necessary</td>
</tr>
<tr>
<td>Epinephrine</td>
<td>2-10 MICROgram/min IV</td>
</tr>
</tbody>
</table>
ADMINISTRATIVE
Transfer of care Malignant Hyperthermia patient

In presence of triggering agent: unexpected increase in ETCO₂, unexplained tachycardia/tachypnea, prolonged masseter muscle spasm after succinylcholine. Hyperthermia is a LATE sign

START

1 Recognize suspected MH
- Have designated person call 911 and EMT # upon recognition
- Indicate that it is an "Immediate Arrest Situation"
- Call MHAUS MH Hotline 1.800.MH.HYPER (644.9737) for additional assistance 24/7/365
- Use MHAUS “Emergency Therapy for MH” protocol poster criteria once MH diagnosis is made or suspected
- Qualified on-site Anesthesia Care Provider at OBA facility will serve as primary consultants for recognition and treatment of MH and decisions regarding TT and receiving health care facility (RHCF) and timing of transfer

2 Discontinue triggering agents, initiate treatment
- IV Dantrolene 2.5mg/kg (dissolved in sterile preservative-free water) should be given immediately
- See CKLST 23-MH; initiate pending transfer
- 36 vials of Dantrolene sodium must be available wherever MH triggering agents are used

3 Implement Emergent MH Transfer plan
- Collect patient data: vital signs, temperature, ETCO₂ trends, electrolytes, ECG
- Do not delay transfer!
- Emergency transfer is mandatory

4 Notify Receiving Healthcare Facility (RHCF):
- coordinate communication
- Direct personal communication is ideal between Anesthesia Care Provider at OBA facility Receiving Physician (critical care, primary or emergency medicine providers at RHCF)
- Coordination of anticipated post-resuscitation needs is ESSENTIAL between Anesthesia Care Provider to Receiving Physician
26 Transfer of care non-Malignant Hyperthermia patient

In need of emergency transfer for cardiopulmonary reasons or unable to provide necessary and required care at current ambulatory facility

START

1 Recognize signs of an emergency
2 Initiate Facility Transfer Protocol
3 Have designated person call 911 and contact EMT # for emergency
4 Office must have prior plan/transfer of care agreement in place to ensure EMT arrives within 10 min
5 Qualified Office-based facility Anesthesia care provider must serve as primary provider for the patient

6 Implement Emergent non-MH Facility Transfer plan
   > Collect patient data: vital signs, temperature, ETCO₂ trends, labs, ECG
7 Notify Receiving Healthcare Facility (RHCF):
   coordinate communication
   > Direct personal communication is ideal between
     Anesthesia Care Provider at OBA facility
     Receiving Physician (critical care, primary or emergency medicine providers at RHCF)
   > Coordination of anticipated post-resuscitation needs is ESSENTIAL
     between Anesthesia Care Provider to Receiving Physician
Credits

- Steven Young MD
- Alex Hannenberg, MD
- Rich Urman, MD
- Fred Shapiro, MD
References

• ACLS

• PALS


References

- Fire
  - Daane SP, Toth BA. Fire in the Operating Room: Principles and Prevention. *Plastic Surgery and Reconstruction* 2015. doi: 10.1097/01.PRS.0000157015.82342.21

- Evacuation and Preparedness
  - http://www.calhospitalprepare.org/evacuation
References

- **Power Loss**

- **Oxygen Loss**

- **Anaphylaxis**
  - Newton Wellesley Hospital
References

• Difficult airway
• Emboli
References

- Hemorrhage

- Hypercapnia

- Hypotension
References

- Hypoxia

- Local Anesthetic Systemic Toxicity

- Mental Status Change
References

• Malignant Hyperthermia
• Spinal anesthesia – Adverse Events
• MH Transfer
• Malignant Hyperthermia Association of United States. "Developing an Emergent Transfer Care Plan for Suspected Malignant Hyperthermia". Doi: 10.1213/ANE.0b013e3182373b4a
• Society for Ambulatory Anesthesia. " Developing an Emergent Transfer Care Plan for Suspected Malignant Hyperthermia". Copyright SAMBA and MHAUS. 2012
• Non-MH Transfer