### ISOBS Safety Checklist for Office-Based Anesthesia Crises

<table>
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<th>Office-based Emergency Manual</th>
<th></th>
<th>Critical events</th>
</tr>
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<td>18</td>
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<td>1- Cardiac arrest- VF/VT</td>
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<td>13- Allergies -&gt; Anaphylaxis (adult + ped dosing)</td>
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<td>2- Cardiac arrest- asystole/PEA</td>
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<td>14- Difficult airway</td>
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<td>3- Bradycardia- unstable</td>
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<td>15- Embolism (fat, venous, clot)</td>
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<td>4- Tachycardia- unstable</td>
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<td>16- Hemorrhage</td>
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<td><strong>PALS</strong></td>
<td>8</td>
<td>17- Hypercapnia</td>
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<tr>
<td>5 Cardiac arrest- VF/VT</td>
<td>9</td>
<td>18- Hypotension (adult + ped dosing)</td>
</tr>
<tr>
<td>6- Cardiac arrest- asystole/PEA</td>
<td>10</td>
<td>19- Hypoxia</td>
</tr>
<tr>
<td>7- Bradycardia- unstable</td>
<td>11</td>
<td>20- LAST (adult + ped dosing)</td>
</tr>
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<td>8- Tachycardia- unstable</td>
<td>12</td>
<td>21- Loss of access</td>
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<tr>
<td><strong>Emergency</strong></td>
<td>13</td>
<td>22- Mental status change</td>
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<td>9- Fire- airway or surroundings</td>
<td>14</td>
<td>23- MH (adult + ped dosing)</td>
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<tr>
<td>10- Evacuation and preparedness</td>
<td>15</td>
<td>24- Spinal Anesthesia:Adverse Events</td>
</tr>
<tr>
<td>11- Loss of Power</td>
<td>16</td>
<td>25- Transfer of care MH patient</td>
</tr>
<tr>
<td>12- Loss of Oxygen</td>
<td>17</td>
<td>26- Transfer of care non-MH patient</td>
</tr>
</tbody>
</table>

V4 03/07/2018
Principles of responding to OBA crises

ISOBS

• **IMMEDIATE** call for help
  
  ![Phone Icon](image)

• **SECURE** a plan for crisis
  
  ![Basketball Court](image)

What’s the plan?

• **OBTAIN** transfer of care plan/agreements
  
  ![Road Map](image)

• **BEST: PRACTICE** = Best practice
  
  ![Ambulance](image)

• **SAFETY** = Timely transfer
Cardiac Arrest – VF/VT

Shockable pulseless cardiac arrest

**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” 100-120 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
     - Change CPR compression provider
     - Check ETCO₂
       - 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 CHKLIST 2-Asystole/PEA

**DRUG DOSES and treatments ADULT**

<table>
<thead>
<tr>
<th>Drug</th>
<th>Dose</th>
</tr>
</thead>
<tbody>
<tr>
<td>Epinephrine</td>
<td>1mg IV, repeat every 3-5 min</td>
</tr>
<tr>
<td><strong>ANTIARRHYTHMICS</strong></td>
<td></td>
</tr>
<tr>
<td>Amiodarone</td>
<td>1st dose: 300mg IV/IO</td>
</tr>
<tr>
<td></td>
<td>2nd dose: 150mg IV/IO</td>
</tr>
<tr>
<td>Magnesium</td>
<td>1 to 2 g IV/IO for TdP</td>
</tr>
</tbody>
</table>

**DEFIBRILLATOR instructions**

1 Place electrodes on chest
2 Turn defibrillator ON, set to DEFIB mode, and increase ENERGY LEVEL to highest setting
3 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
- **Assign roles:** Chest compression, Airway, Vascular access, Timing, Code
- **Code:** CART, documentation
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:
         - Resume CPR and assessment cycle (restart Step 4)
         - Read aloud Hs and Ts
     - If VF/VT:
       - Resume CPR
       - Go to CHKLST 1-VF/VT

**DRUG DOSES and treatments ADULT**

<table>
<thead>
<tr>
<th></th>
<th>ADULT</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Epinephrine</strong></td>
<td>1mg IV, repeat every 3-5 min</td>
</tr>
<tr>
<td><strong>TOXIN Treatments</strong></td>
<td></td>
</tr>
<tr>
<td>Local Anesthetic</td>
<td>Intralipid 1.5ml/kg bolus, repeat for persistent asystole</td>
</tr>
<tr>
<td></td>
<td>Start 0.25-0.5ml/kg/min; 30-60min if refractory</td>
</tr>
<tr>
<td>Hypotension</td>
<td></td>
</tr>
<tr>
<td>Beta-blocker</td>
<td>Glucagon 2-4mg IV push</td>
</tr>
<tr>
<td>Ca channel blocker</td>
<td>Ca chloride 1g IV push</td>
</tr>
<tr>
<td>Bicarbonate</td>
<td>1-2mEq/kg, slow IV push; max 50mEq</td>
</tr>
<tr>
<td><strong>HYPERKALEMIA treatment</strong></td>
<td></td>
</tr>
<tr>
<td>1. Ca gluconate</td>
<td>30mg/kg IV, max 3000mg</td>
</tr>
<tr>
<td>or Ca chloride</td>
<td>10mg/kg IV, max 2000mg</td>
</tr>
<tr>
<td>2. Insulin</td>
<td>10 units regular IV with 1-2 amps D50W</td>
</tr>
</tbody>
</table>

**Hs and Ts: Reversible Causes**

<table>
<thead>
<tr>
<th>Hydrogen ions (acidosis)</th>
<th>Hyperkalemia</th>
<th>Hypothermia</th>
<th>Hypovolemia</th>
<th>Hypoxia</th>
<th>Tamponade (cardiac)</th>
<th>Tension pneumothorax</th>
<th>Thrombosis (coronary/pulmonary)</th>
<th>Toxin (local anesthetic, beta blocker, calcium channel blocker)</th>
</tr>
</thead>
</table>

During CPR

<table>
<thead>
<tr>
<th>Airway:</th>
<th>Bag-mask sufficient (if ventilation adequate)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Circulation:</td>
<td>Confirm adequate IV/IO access</td>
</tr>
<tr>
<td></td>
<td>Consider IV fluids wide open</td>
</tr>
<tr>
<td></td>
<td>Consider ECMO for select potentially reversible causes</td>
</tr>
<tr>
<td>Assign roles:</td>
<td>Chest compression, Airway, Vascular access, Timing, cart, documentation</td>
</tr>
</tbody>
</table>
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 channel blockers, digoxin)
   - Suggest expert consultation, cardiology, during transfer sign-out

**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)

---

**DRUG DOSES and treatments ADULT**

<table>
<thead>
<tr>
<th>Drug</th>
<th>Dosage</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>Dosage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Beta-blocker</td>
<td>Glucagon 2-4mg IV push</td>
</tr>
<tr>
<td>Ca channel blocker</td>
<td>Ca chloride 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 CHKLIST 3-Asystole/PEA

**During resuscitation**

<table>
<thead>
<tr>
<th>Role</th>
<th>Task</th>
</tr>
</thead>
<tbody>
<tr>
<td>Airway</td>
<td>Assess and secure</td>
</tr>
<tr>
<td>Circulation</td>
<td>Confirm adequate IV/IO access</td>
</tr>
<tr>
<td></td>
<td>Consider IV fluids wide open</td>
</tr>
<tr>
<td>Assign roles</td>
<td>Airway, Vascular access, Timing, Code cart, documentation</td>
</tr>
</tbody>
</table>

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6
4 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 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

Shockable pulseless cardiac arrest

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 <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 (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>Epinephrine</td>
<td>10 mcg IV, repeat every 3-5 min</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>

ANTIARRHYTHMICS

- Amiodarone: 1st and 2nd dose: 5mg/kg bolus
- Lidocaine: 1mg/kg bolus

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

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

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
6 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

During CPR

Assign roles: Chest compression, Airway, Vascular access, Timing, cart, documentation

DRUG DOSES and treatments PEDS

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

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

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

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, cart, documentation

Hydrogen ions (acidosis)
Hyperkalemia
Hypothermia
Hypovolemia
Hypoxia

--- or ---
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 chan blockers)
   - Suggest expert consultation, cardiology, during transfer sign-out

---

**DRUG DOSES and treatments PEDS**

<table>
<thead>
<tr>
<th>Drug</th>
<th>Dose</th>
</tr>
</thead>
<tbody>
<tr>
<td>Atropine</td>
<td>0.01-0.2mg/kg IV; max 3mg total</td>
</tr>
<tr>
<td>Epinephrine</td>
<td>10 MICROgram/kg IV</td>
</tr>
</tbody>
</table>

**OVERDOSE Treatments**

<table>
<thead>
<tr>
<th>Drug</th>
<th>Dose</th>
</tr>
</thead>
<tbody>
<tr>
<td>Beta-blocker</td>
<td>Glucagon 0.05mg/kg IV push, then 0.07mg/kg/min IV</td>
</tr>
<tr>
<td>Ca chan blocker</td>
<td>Ca chloride 10-20mg IV push</td>
</tr>
<tr>
<td>--- or ---</td>
<td>Ca gluconate 50mg/kg IV</td>
</tr>
<tr>
<td>---</td>
<td>If ineffective, then Glucagon at above doses</td>
</tr>
</tbody>
</table>

**Critical CHANGES**

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

**During resuscitation**

<table>
<thead>
<tr>
<th>Role</th>
<th>Task</th>
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<tbody>
<tr>
<td>Airway</td>
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</tr>
<tr>
<td>Circulation</td>
<td>Confirm adequate IV/IO access</td>
</tr>
<tr>
<td>---</td>
<td>Consider IV fluids wide open</td>
</tr>
<tr>
<td>Assign roles</td>
<td>Airway, Vascular access, Timing, Code cart, documentation</td>
</tr>
</tbody>
</table>

---

**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 -&gt; PROGRESSION</th>
</tr>
</thead>
<tbody>
<tr>
<td>SVT, tachyarrhythmia</td>
<td>0.5-1 J/kg -&gt; 2 J/kg</td>
</tr>
<tr>
<td>Wide complex, irregular</td>
<td>2 J/kg -&gt; 4 J/kg -&gt; 6 J/kg -&gt; 8 J/kg -&gt; 10 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></td>
</tr>
<tr>
<td>Procainamide: 15 mg/kg IV over 30-60 min</td>
<td>Lidocaine: 1 mg/kg IV</td>
<td></td>
</tr>
<tr>
<td>MgSO₄: 25-50 mg/kg/dose over minutes</td>
<td>Isoproterenol: 0.03-2 μg/kg/min</td>
<td></td>
</tr>
<tr>
<td>Lactated Ringer’s (for quinidine-related)</td>
<td>NaBicarb (for quinidine-related)</td>
<td></td>
</tr>
<tr>
<td>Temp placing -&gt; CHKLST 7</td>
<td></td>
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</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/OO access |
| Consider IV fluids wide open |
| Assign roles: Airway, Vascular access, Timing, Code cart, documentation |
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-DIFFCULT AIRWAY
   • Avoid N₂O and minimize FiO₂

If NON-AIRWAY fire (IE EQUIPMENT, ELECTRICAL)

If PERSISTS after 1 ATTEMPT
   • 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)

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

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

Fire STILL PERSISTS
   • Use fire extinguisher (safe in wounds)

Y

N

Y

N

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

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

START

**Emergency or disaster preparedness**

1 **Call for help**
   - Ask: “Who will be the crisis manager”?
   - Call: “Initiate Transfer Protocol”
   - Activate: “Facility Evacuation Policy”

2 **Have designated person call 911**
   - Office must have plan in place to ensure EMT arrives within 10 min

3 **Secure airway and ventilation**
   - Check patient vitals
   - If time, attach portable vital machine

4 **Review available resources in the OR or procedure room**

5 **Ensure lines of communication are opened between the Office-based facility and the Receiving Health Care Facility (RHCF)**
   - Ensure transport team is equipped to monitor patient

6 **Prepare to evacuate**
   - Bring medications, airway equipment, extra IV

**Violence in the workplace preparedness**

- Run if not directly involved with patient care
- Have escape route in mind
- Hide if running is not safe or patients cannot run
- Silence your cell phone/pager
- Fight if running or hiding is not an option
- As a last resort, to protect your life

1 **Take care of yourself first**

2 **Help those in the immediate vicinity**

3 **Alert those who will be affected by the crisis but may have more time to act**

4 **Notify public safety, 911**
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?

Backup generator on?

Y
Determine with surgeon if safe to proceed, depending on duration of surgery, load of backup generator
Cycle mission critical machines, ensure they are on

N

Y
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

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

START

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

Most frequently:

Gas contamination

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

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 -&gt; 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

<table>
<thead>
<tr>
<th><strong>Critical CHANGES</strong></th>
<th><strong>Drug Doses and Treatments ADULT</strong></th>
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<tbody>
<tr>
<td><strong>If cardiac arrest</strong></td>
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<tr>
<td><strong>ADULT</strong></td>
<td><strong>PEDS:</strong></td>
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<tr>
<td>Asystole/PEA</td>
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<tr>
<td>Go to CHKLST 1-VF/VT</td>
<td>Go to CHKLST 5-VF/VT</td>
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<td><strong>H2 Blockers</strong>:</td>
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<tr>
<td><strong>Methylprednisolone</strong>:</td>
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<th><strong>Common causes</strong></th>
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<tr>
<td>Neuromuscular blockade</td>
</tr>
<tr>
<td>Latex</td>
</tr>
<tr>
<td>Chlorhexidine</td>
</tr>
<tr>
<td>Antibiotics</td>
</tr>
<tr>
<td>IV contrast or IV colloids</td>
</tr>
</tbody>
</table>
Difficult Airway

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
Embolism- fat, venous, clot

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
     - 200U/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 $PCO_2$

**START**

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

**Check Anesthesia machine**

- Check fresh gas circuit
- Check absorbent CO2 agent
- 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

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

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<thead>
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<th>Dose/Dosage</th>
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<td>40-200 MICROgrams IV, repeat as necessary</td>
</tr>
<tr>
<td>Ephedrine</td>
<td>5-25mg IV, repeat as necessary</td>
</tr>
<tr>
<td>Epinephrine</td>
<td>Bolus – 5-10 MICROgrams IV, Infusion – 0.1-1 MICROgrams/kg/min</td>
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DRUG DOSES and treatments PEDS

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<td>Epinephrine</td>
<td>Bolus – 0.1mg/kg (1:1,000 solution) IV every 3-5 min</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Age</th>
<th>&lt;5th % systolic BP</th>
</tr>
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<tbody>
<tr>
<td>Preemie</td>
<td>&lt;50</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>
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

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

NO AIRWAY issue suspected

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

Additional tests to suggest during transfer
Fiberoptic bronchoscopy
Chest x-ray
Electrocardiogram
Transepophageal 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

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**DRUG DOSES and treatment ADULT**

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<tr>
<td>Midazolam</td>
<td>2 mg IV</td>
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<td>&lt;1 MICROgram/kg IV</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

START

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
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

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<td>Hypotension, go to CHKLIST 18-HYPOTENSION</td>
</tr>
<tr>
<td>Opioids</td>
<td>Acute blood loss, go to CHKLIST 16-HEMORRHAGE</td>
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<tr>
<td>Benzodiazepines</td>
<td>Urinary retention</td>
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<tr>
<td>Acid-base disturbance</td>
<td>Infection, ie pneumonia, UTI</td>
</tr>
<tr>
<td>Electrolyte abnormalities</td>
<td>Steroids</td>
</tr>
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<td>Hypoxia, go to CHKLIST 19-HYPOXIA</td>
<td>Anticholinergics</td>
</tr>
<tr>
<td>Hypercapnia, go to CHKLIST 17-HYPERCAPNIA</td>
<td>DKA</td>
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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

DRUG DOSES and treatment ADULT

<table>
<thead>
<tr>
<th>Drug</th>
<th>Dose</th>
</tr>
</thead>
<tbody>
<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 as necessary</td>
</tr>
<tr>
<td>Dextrose</td>
<td>50 cc D50W IV</td>
</tr>
<tr>
<td>Glucagon</td>
<td>1mg IV/IM/SC</td>
</tr>
</tbody>
</table>

Critical CHANGES

- If bleeding
  ➢ Go to CHKLIST 16-HEMORRHAGE
- If hemodynamically unstable
  ➢ Start CPR

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

In presence of triggering agent: unexpected increase in ETCO2, unexplained tachycardia/tachypnea, prolonged masseter muscle spasm after succinylcholine. Hyperthermia may be 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 or Ryanodex**
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 Dantrolene or Ryanodex**
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**

<table>
<thead>
<tr>
<th>Dantrolene:</th>
<th>Reconstitute 20mg vial in 60cc sterile water (shake until dilute)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ryanodex:</td>
<td>Reconstitute 250mg vial with 5 cc sterile water (shake until orange and opaque)</td>
</tr>
<tr>
<td>Give 2.5mg/kg IV, repeat up to 10mg/kg until symptoms subside</td>
<td></td>
</tr>
<tr>
<td>Rarely may require up to 30mg/kg</td>
<td></td>
</tr>
</tbody>
</table>

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

**HYPERKALEMIA treatment**

1. Ca gluconate 30mg/kg IV, max 3000mg
   - or -
2. Ca chloride 10mg/kg IV, max 2000mg

<table>
<thead>
<tr>
<th>Insulin</th>
<th>10 units regular IV</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1-2 amps D50W</td>
</tr>
</tbody>
</table>

**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, salicylate, alcohol withdrawal</td>
</tr>
<tr>
<td>Thyrotoxicosis</td>
<td></td>
<td>Traumatic brain injury</td>
<td></td>
</tr>
<tr>
<td>Pheochromocytoma</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**TRIGGERING AGENTS**

- Inhalational (volatile) anesthetics
- Succinylcholine
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>成人剂量</th>
<th>备注</th>
</tr>
</thead>
<tbody>
<tr>
<td>Atropine</td>
<td>0.5mg IV; max 3mg total</td>
<td></td>
</tr>
<tr>
<td>Naloxone</td>
<td>0.4-2mg IV/IM/SC, repeat every 3 min as necessary</td>
<td></td>
</tr>
<tr>
<td>Flumazenil</td>
<td>0.2mg IV, repeat as necessary</td>
<td></td>
</tr>
<tr>
<td>Ephedrine</td>
<td>5-25mg IV, repeat as necessary</td>
<td></td>
</tr>
<tr>
<td>Phenylephrine</td>
<td>40-200 MICROgrams IV, repeat as necessary</td>
<td></td>
</tr>
<tr>
<td>Epinephrine</td>
<td>2-10 MICROgram/min IV</td>
<td></td>
</tr>
</tbody>
</table>
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 or 3 vials of Ryanodex 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
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, ETCO$_2$ 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
  - Malignant Hyperthermia Association of United States. How much Dantrolene should be available in facilities where volatiles agents are not available or administered and succinylcholine is only stocked on site for emergency purposes. http://www.mhaus.org/healthcare-professionals/mhaus-recommendations/how-much-dantrolene-should-be-available-in-facilities-where-volatile-agents-are-not-available-or-administered-and-succinylcholine-is-only-stocked-on-site-for-emergency-purposes/
- 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