### Operating Room Crisis Checklists

Based on the OR Crisis Checklists at www.projectcheck.org/crisis. All reasonable precautions have been taken to verify the information contained in this publication. The responsibility for the interpretation and use of the materials lies with the reader.

<table>
<thead>
<tr>
<th>Suspected Event</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Air Embolism – Venous</td>
</tr>
<tr>
<td>2. Anaphylaxis</td>
</tr>
<tr>
<td>3. Bradycardia – Unstable</td>
</tr>
<tr>
<td>4. Cardiac Arrest – Asystole / PEA</td>
</tr>
<tr>
<td>5. Cardiac Arrest – VF / VT</td>
</tr>
<tr>
<td>6. Failed Airway</td>
</tr>
<tr>
<td>7. Fire</td>
</tr>
<tr>
<td>8. Hemorrhage</td>
</tr>
<tr>
<td>9. Hypotension</td>
</tr>
<tr>
<td>10. Hypoxia</td>
</tr>
<tr>
<td>11. LAST (local anesthetic systemic toxicity)</td>
</tr>
<tr>
<td>12. Malignant Hyperthermia</td>
</tr>
<tr>
<td>13. Sepsis</td>
</tr>
<tr>
<td>14. Tachycardia – Unstable</td>
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<tr>
<td>15.</td>
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</tbody>
</table>
Air Embolism – Venous

Decreased end-tidal CO₂, decreased oxygen saturation, hypotension

**START**

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

2. **Turn FiO₂ to 100%**

3. **Turn off nitrous oxide**

4. **Stop source of air entry**
   - Fill wound with irrigation
   - Lower surgical site below level of heart, if possible
   - Search for entry point (including open venous lines)

5. **Consider...**
   - Positioning patient with left side down
     - Continue appropriate monitoring while repositioning
   - Placing bone wax or cement on bone edges
   - Transesophageal echocardiography (TEE) if diagnosis unclear
   - Using ETCO₂ to monitor progression and resolution of embolus or for assessment of adequate cardiac output

**Critical CHANGES**

If PEA develops, go to CHKLST 4

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### Anaphylaxis

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

#### START

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

2. **Give epinephrine bolus** (10 – 100 mcg, repeat as needed)

3. **Give fluid bolus**

4. **Remove potential causative agents**

5. **Turn FiO₂ to 100%**

6. **Establish/secure airway**

7. **Consider…**
   - Turning off volatile anesthetics if patient remains unstable
   - Vasopressin for patients with continued hypotension despite repeated doses of epinephrine
   - Epinephrine infusion for patients who initially respond to bolus doses of epinephrine but experience continued symptoms
   - Diphenhydramine
   - H2 blockers
   - Hydrocortisone
   - Tryptase level: Check within first hour, repeat at 4 hr and at 18–24 hrs post reaction
   - Terminate procedure

#### DRUG DOSES and treatments

<table>
<thead>
<tr>
<th>Drug</th>
<th>Bolus Dose</th>
<th>Infusion Dose</th>
</tr>
</thead>
<tbody>
<tr>
<td>Epinephrine</td>
<td>10 – 100 mcg, repeat as necessary</td>
<td>1 – 10 mcg/min</td>
</tr>
<tr>
<td>Vasopressin</td>
<td>1 – 2 units IV</td>
<td></td>
</tr>
<tr>
<td>Diphenhydramine</td>
<td>25 – 50 mg IV</td>
<td></td>
</tr>
<tr>
<td>H2 blockers</td>
<td>Ranitidine: 50 mg IV</td>
<td>Cimetidine: 300 mg IV</td>
</tr>
<tr>
<td>Hydrocortisone</td>
<td>100 mg IV</td>
<td></td>
</tr>
</tbody>
</table>

#### Critical CHANGES

If **cardiac arrest**, go to:
- CHKLST 4 Cardiac Arrest – Asystole / PEA
- CHKLST 5 Cardiac Arrest – VF / VT

#### Common CAUSATIVE AGENTS

- Neuromuscular blocking agents
- Antibiotics
- Latex products
- IV contrast
3 Bradycardia – Unstable

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

**START**

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

2. **Turn FiO₂ to 100%**
   - Verify oxygenation/ventilation adequate

3. **Give atropine**

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

5. **If atropine ineffective:**
   - Start epinephrine or dopamine infusion
   - or –
   - Start transcutaneous pacing

6. **Consider...**
   - Turning off volatile anesthetics if patient remains unstable
   - Calling for expert consultation (e.g., Cardiologist)
   - Assessing for drug induced causes (e.g., beta blockers, calcium channel blockers, digoxin)
   - Calling for cardiology consultation if myocardial infarction suspected (e.g., ECG changes)

**DRUG DOSES and treatments**

- **Atropine:** 0.5 mg IV, may repeat up to 3 mg total
- **Epinephrine:** 2 – 10 mcg/min IV
  - or – **Dopamine:** 2 – 10 mcg/kg/min IV

**OVERDOSE treatments**

- **Beta-blocker:** Glucagon: 2 – 4 mg IV push
- **Calcium channel blocker:** Calcium chloride: 1 g IV
- **Digoxin:** Digoxin Immune FAB; consult pharmacy for patient-specific dosing

**TRANS Cutaneous PACING instructions**

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

**Critical CHANGES**

If PEA develops, go to CHKLST 4

**During RESUSCITATION**

- **Airway:** Assess and secure
- **Circulation:**
  - Confirm adequate IV or IO access
  - Consider IV fluids wide open

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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:** “The top priority is high-quality CPR”

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

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

4. **Start CPR and assessment cycle...**
   - **Perform CPR**
     - “Hard and fast” about 100 compressions/min
     - Ensure full chest recoil with minimal interruptions
     - 8 breaths/minute, do not overventilate
   - **Monitor end-tidal CO₂ (ETCO₂)**
   - **Give epinephrine**
     - Repeat epinephrine every 3 – 5 minutes
     - Can give vasopressin to replace 1st or 2nd dose of epinephrine
   - **Assess every 2 minutes**
     - Change CPR compression provider
     - Check ETCO₂
       - If: < 10 mm Hg, improve CPR
       - If: Sudden increase to > 40 mm Hg, may indicate return of spontaneous circulation
     - Check rhythm; if rhythm organized check pulse
     - If: Asystole / PEA continues:
       - Resume CPR and assessment cycle (restart Step 4)
       - Read aloud Hs & Ts (see list in right column)
     - If: VF / VT
       - Resume CPR
       - go to › CHKLST 5
   - **Epinephrine**: 1 mg IV, repeat every 3 – 5 mins.
   - **Vasopressin**: 40 U IV can replace 1st or 2nd dose of epinephrine

TOXIN treatment
- **Local anesthetic**: Intralipid 1.5 mL/kg IV bolus
  - Repeat 1 – 2 times for persistent asystole
  - Start infusion 0.25 – 0.5 mL/kg/min for 30 – 60 minutes for refractory hypotension
- **Beta-blocker**: Glucagon 2 – 4 mg IV push
- **Calcium channel blocker**: Calcium chloride 1 g IV
- **Calcium gluconate**: 30 mg/kg IV or 10 mg/kg IV
- **Insulin**: 10 units regular IV with 1 – 2 amps D50W as needed
- **Sodium bicarbonate if pH < 7.2**: 1 – 2 mEq/kg slow IV push
- **Epinephrine**: 1 mg IV, repeat every 3 – 5 mins.
- **Vasopressin**: 40 U IV can replace 1st or 2nd dose of epinephrine

HYPERKALEMIA treatment
- **Calcium gluconate**: 30 mg/kg IV
- **Calcium chloride**: 10 mg/kg IV
- **Insulin**: 10 units regular IV with 1 – 2 amps D50W as needed
- **Sodium bicarbonate if pH < 7.2**: 1 – 2 mEq/kg slow IV push

Hs & Ts
- **Hydrogen ion** (acidosis)
- **Hyperkalemia**
- **Hyperthermia**
- **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 or IO access
  - Consider IV fluids wide open
- **Assign roles**: Chest compressions, Airway, Vascular access, Documentation, Code cart, Time keeping
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 defibrillator arrives”

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

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

4. **Start CPR — defibrillation — assessment cycle**
   - **Perform CPR**
     - “Hard and fast” about 100 compressions/min
     - Ensure full chest recoil with minimal interruptions
     - 8 breaths/minute, do not overventilate
   - **Monitor end-tidal CO₂ (ETCO₂)**
   - **Defibrillate**
     - Shock at highest setting
     - Resume CPR immediately after shock
   - **Give epinephrine**
     - Repeat epinephrine every 3 – 5 minutes
     - Can give vasopressin to replace 1st or 2nd dose of epinephrine
   - **Consider giving antiarrhythmics for refractory VF/VT**
     (amiodarone preferred, if available)
   - **Assess every 2 minutes**
     - Change CPR compression provider
     - Check ETCO₂
       - If: < 10 mm Hg, improve CPR
       - If: Sudden increase to > 40 mm Hg, may indicate return of spontaneous circulation
     - Treat reversible causes, considering aloud Hs & Ts (see list in right column)
     - Check rhythm; if rhythm organized check pulse
     - If: VF/VT continues: Resume CPR — defibrillation — assessment cycle (restart Step 4)
     - If: Asystole/PEA: go to CHKLST 4

**DRUG DOSES and treatments**

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**ANTIARRHYTHMICS**

<table>
<thead>
<tr>
<th>Drug</th>
<th>Dose</th>
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<tbody>
<tr>
<td>Amiodarone</td>
<td>1st dose: 300 mg/IV/IO</td>
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<td></td>
<td>2nd dose: 150 mg/IV/IO</td>
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<tr>
<td>Magnesium</td>
<td>1 to 2 g IV/IO for Torsades de Pointes</td>
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</table>

**DEFIBRILLATOR instructions**

1. Place electrodes on chest.
2. Turn defibrillator ON, set to DEFIB mode, and increase ENERGY LEVEL...
   - Biphasic: Follow manufacturer recommendation; if unknown use highest setting
   - Monophasic: 360J
3. Deliver shock: press CHARGE then press SHOCK.

**Hs & Ts**

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

**During CPR**

<table>
<thead>
<tr>
<th>Airway:</th>
<th>Bag-mask sufficient (if ventilation adequate)</th>
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<tbody>
<tr>
<td>Circulation:</td>
<td>Confirm adequate IV or IO access</td>
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<tr>
<td></td>
<td>Consider IV fluids wide open</td>
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<tr>
<td>Assign roles:</td>
<td>Chest compressions, Airway, Vascular access, Documentation, Code cart, Time keeping</td>
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6 Failed Airway

2 unsuccessful intubation attempts by an airway expert

START

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

2. Get Difficult Airway Cart and a video laryngoscope

3. Bag-mask ventilate with 100% oxygen

4. Is ventilation adequate?

   Ventilation NOT ADEQUATE

   NOT ADEQUATE
   - Optimize ventilation
     - Reposition patient
     - Oral airway/nasal airway
     - Two-handed mask
   - Check equipment
     - Using 100% O₂
     - Capnography
     - Circuit integrity
   - Check ventilation

   Remains NOT ADEQUATE
   - Attempt intubation using video laryngoscope
   - Place laryngeal mask airway (LMA)
   - Check endotracheal/LMA ventilation
   - Prepare for surgical airway
     (call surgeon, prep neck, get tracheostomy kit)
   - Re-check ventilation

   Still NOT ADEQUATE
   - Perform percutaneous cricothyroidotomy

   Ventilation ADEQUATE

   - Consider awakening patient or alternative approaches to secure airway...
     - Video laryngoscope
     - LMA as conduit to intubation
     - Intubating stylet (Bougie)
     - Fiberoptic intubation
     - Blind oral or nasal intubation

   - If awakening patient, consider:
     - Awake intubation
     - Cancel the case

Switch list if ventilation status changes
7 Fire

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

START

1 Call for help and activate fire alarm
   ▶ Ask: “Who will be the crisis manager?”

2 Get fire extinguisher to have if needed

If AIRWAY fire

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

4 After fire extinguished
   ▶ Re-establish ventilation using self-inflating bag with room air
     ▶ If unable to re-establish ventilation, go to > CHKLST 6
     ▶ Avoid N₂O and minimize FiO₂
   ▶ Confirm no secondary fire
     ▶ Check surgical field, drapes and towels
   ▶ Assess airway for injury or foreign body
     ▶ Assess ETT integrity (fragments may be left in airway)
     ▶ Consider bronchoscopy

5 Assess patient status and devise ongoing management plan

6 Save involved materials/devices for review

If NON-AIRWAY fire

3 Attempt to extinguish fire

FIRST ATTEMPT
   ▶ Avoid N₂O and minimize FiO₂
   ▶ Remove drapes/all flammable materials from patient
   ▶ Extinguish burning materials with saline or saline-soaked gauze

   DO NOT use
   ▶ Alcohol-based solutions
   ▶ Any liquid on or in energized electrical equipment (Laser, ESU/Bovie, anesthesia machine, etc.)

4 After fire extinguished
   ▶ Maintain airway
   ▶ Assess patient for injury at site of fire, and for inhalational injury if not intubated
   ▶ Confirm no secondary fire
     ▶ Check surgical field, drapes and towels

5 Assess patient status and devise ongoing management plan

6 Save involved materials/devices for review

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Hemorrhage

Acute massive bleeding

START

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

2. **Open IV fluids** and assess for adequate IV access

3. **Turn FiO₂ to 100%** and turn down volatile anesthetics

4. **Call blood bank**
   - Activate massive transfusion protocol
   - Assign 1 person as primary contact for blood bank
   - Order blood products (in addition to PRBCs)
     - Mimic whole blood, 1 FFP : 1 PRBC : 1 platelets
     - 1 pheresis unit = 6 units platelets

5. **Request rapid infuser** (or pressure bags)

6. **Discuss management plan** between surgical, anesthesiology, and nursing teams

7. **Call for surgery consultation**

8. **Keep patient warm**

9. **Send labs**
   - CBC, PT/PTT/INR, fibrinogen, lactate, arterial blood gas, potassium, and ionized calcium

10. **Consider…**
    - Electrolyte disturbances (hypocalcemia and hyperkalemia)
    - Uncrossmatched type O blood if crossmatched blood not available
    - Damage control surgery (pack, close, resuscitate)
    - Special patient populations (see considerations below)

11. **When MTP no longer required,** call blood bank and cancel MTP

<table>
<thead>
<tr>
<th>SPECIAL PATIENT POPULATIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>OBSTETRIC:</strong></td>
</tr>
<tr>
<td>- Empirical administration of 1 pool of cryoprecipitate (10 cryo units)</td>
</tr>
<tr>
<td>- Check fibrinogen (goal is &gt; 100 mg/dL)</td>
</tr>
<tr>
<td>If first fibrinogen level &lt; 100 mg/dL, order 2 more pools of cryoprecipitate</td>
</tr>
</tbody>
</table>

| **TRAUMA:**                  |
| Give either…                |
| - Antifibrinolytic tranexamic acid: 1000 mg IV over 10 minutes followed by 1000 mg over the next 8 hours |
|     - or -                   |
| - Aminocaproic acid: 4–5 g in 250 mL NS/RL IV over first hour followed by a continuing infusion of 1 g in 50 mL NS/RL IV per hour over 8 hours |

| **NON-SURGICAL**             |
| UNCONTROLLED BLEEDING        |
| despite massive transfusion of PRBC, FFP, platelets and cryo: |
| - Consider giving Recombinant Factor VIIa: 40 mcg/kg IV |
|     - Surgical bleeding must first be controlled |
|     - use with CAUTION in patients at risk for thrombosis |
| - DO NOT use when PH is < 7.2 |

DRUG DOSES and treatments

**HYPOCALCEMIA treatment**
Give calcium to replace deficit (calcium chloride or calcium gluconate)

**HYPERKALEMIA treatment**

<table>
<thead>
<tr>
<th>Drug</th>
<th>Dose</th>
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<tr>
<td>Calcium gluconate</td>
<td>30 mg/kg IV</td>
</tr>
<tr>
<td>Calcium chloride</td>
<td>10 mg/kg IV</td>
</tr>
<tr>
<td>Insulin</td>
<td>10 units regular IV with 1–2 amps D50W as needed</td>
</tr>
<tr>
<td>Sodium bicarbonate</td>
<td>1–2 mEq/kg slow IV push</td>
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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...
   - Pulse
   - Blood pressure
   - Equipment
   - Heart rate
     - If BRADYCARDIA, go to CHKLST 3
   - Rhythm
     - If VF / VT, go to CHKLST 5
     - If PEA, go to CHKLST 4

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 down volatile anesthetics

6. Inspect surgical field for bleeding
   - If BLEEDING, go to CHKLST 8

7. Consider actions...
   - Place patient in Trendelenberg position
   - Obtain additional IV access
   - Place arterial line

8. Consider causes...
   - **Operative field**
     - Mechanical or surgical manipulation
     - Insufflation during laparoscopy
     - Retraction
     - Vagal stimulation
     - Vascular compression
   - **Unaccounted blood loss**
     - Blood in suction canister
     - Bloody sponges
     - Blood on the floor
     - Internal bleeding
   - **Drugs / Allergy**
     - Anaphylaxis, go to CHKLST 2
     - Recent drugs given
     - Dose error
     - Drugs used on the field (i.e., intravascular injection of local anesthetic drugs)
     - Wrong drug

Breathing
- Increased PEEP
- Hypoventilation
- Hypoxia, go to CHKLST 10
- Persistent hyperventilation
- Pneumothorax
- Pulmonary edema

Circulation
- Air embolism, go to CHKLST 1
- Bradycardia, go to CHKLST 3
- Malignant hyperthermia, go to CHKLST 11
- Tachycardia, go to CHKLST 12
- Bone cementing (methylmethacrylate effect)
- Myocardial ischemia
- Emboli (pulmonary, fat, septic, amniotic, CO₂)
- Severe sepsis
- Tamponade

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**DRUG DOSES and treatments**

- Ephedrine: 5 – 25 mg IV, repeat as needed
- Phenylephrine: 100 – 500 mcg IV, repeat as needed
- Epinephrine: BOLUS: 5 – 10 mcg IV
  INFUSION: 0.1 – 1 mcg/kg/min IV

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# Hypoxia

**Unexplained oxygen desaturation**

## START

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

2. **Turn FiO\textsubscript{2} to 100%** at high gas flows
   - Confirm inspired FiO\textsubscript{2} = 100% on gas analyzer
   - Confirm presence of end-tidal CO\textsubscript{2} and changes in capnogram morphology

3. **Hand-ventilate** to assess compliance

4. **Listen** to breath sounds

5. **Check...**
   - Blood pressure, PIP, pulse
   - ET tube position
   - Pulse oximeter placement
   - Circuit integrity: look for disconnection, kinks, holes

6. **Consider actions to assess possible breathing issue...**
   - Draw blood gas
   - Suction (to clear secretions, mucus plug)
   - Remove circuit and use ambu-bag
   - Bronchoscopy
   - Assess compliance with volume/pressure loops or spirometry

7. **Consider causes...**
   - Is Airway / Breathing issue suspected?

### NO airway issue suspected

#### Circulation
- Embolism
  - Pulmonary embolus
  - Air embolism—Venous *go to ▶ CHKLST 1*
  - Other emboli (fat, septic, CO\textsubscript{2}, amniotic fluid)
- Heart disease
  - Congestive heart failure
  - Coronary heart disease
  - Myocardial ischemia
  - Cardiac tamponade
  - Congenital/anatomical defect
- Severe sepsis
- If hypoxia associated with hypotension, *go to ▶ CHKLST 9*

#### Drugs / Allergy
- Recent drugs given
- Dose error/allergy/anaphylaxis
- Dyes and abnormal hemoglobin (e.g., methemoglobinemia, methylene blue)

### YES airway issue suspected

#### Airway / Breathing
- Aspiration
- Atelectasis
- Bronchospasm
- Hypoventilation
- Obesity/positioning
- Pneumothorax
- Pulmonary Edema
- Right mainstem intubation
- Ventilator settings, leading to auto-peep

### Additional DIAGNOSTIC TESTS
- Fiberoptic bronchoscope
- Chest xray
- Electrocardiogram
- Transesophageal echocardiogram
Local Anesthetic Systemic Toxicity (LAST)

Altered mental status or neurological or cardiovascular symptoms after local anesthetic injection

1. Get help
2. Ventilate with 100% oxygen and consider intubation
3. Suppress seizures with benzodiazepines
4. Begin CPR (30:2), if necessary
5. REDUCE epinephrine dose to < 1mcg/kg
6. 20% Lipid Emulsion therapy (do NOT use propofol)
   - 1.5 ml/kg bolus over 1 min followed by 0.25 ml/kg/min infusion
   - Repeat bolus after 5 minutes if hemodynamic instability persists, MAX 3 boluses
   - Increase infusion to 0.5ml/kg/min (max 10 ml/kg in 1st 30 minutes of treatment)
   - Continue infusion at least 10 minutes after return of hemodynamic stability

- Alert nearest cardiopulmonary bypass facility.
- Continue CPR for a prolonged time (>60 min)
- AVOID Propofol, if patient hemodynamically unstable
- AVOID vasopressin, calcium channel blockers, beta blockers, and lidocaine
- Amiodarone is first line drug for arrhythmias
- AFTER resuscitation: transfer to ICU for >12 hours of observation
Malignant Hyperthermia

**In presence of triggering agent: unexpected, unexplained increase in end-tidal CO₂, 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?”

2. **Get Malignant Hyperthermia 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 or CO₂ absorber

7. **Turn FiO₂ to 100%**

8. **Hyperventilate patient** at flows of 10 L/min or more

9. **Terminate procedure**, if possible

10. **Give dantrolene**

11. **Give bicarbonate** for suspected metabolic acidosis (maintain pH > 7.2)

12. **Treat hyperkalemia**, if suspected

13. **Treat dysrhythmias**, if present  
   - Standard antiarrhythmics are acceptable; **DO NOT use** calcium channel blockers

14. **Send labs**  
   - Arterial blood gas
   - Electrolytes
   - Serum creatine kinase (CK)
   - Serum/urine myoglobin
   - Coagulation profile

15. **Initiate supportive care**  
   - Consider cooling patient if temperature > 38.5°C:  
     - **STOP** cooling if temperature < 38°C
     - Lavage open body cavities
     - Nasogastric lavage with cold water
     - Apply ice externally
     - Infuse cold saline intravenously
   - Place Foley catheter, monitor urine output
   - Call ICU

**DRUG DOSES and treatments**

<table>
<thead>
<tr>
<th>Drug</th>
<th>Dose/Preparation</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Dantrolene</strong></td>
<td>• Mix each ampule with 60 cc sterile water</td>
</tr>
<tr>
<td></td>
<td>• 2.5 mg/kg IV every 5 minutes until symptoms subside</td>
</tr>
<tr>
<td></td>
<td>(for 70 kg person, this is 9 vials)</td>
</tr>
<tr>
<td></td>
<td>• May require up to 30 mg/kg</td>
</tr>
<tr>
<td><strong>Bicarbonate</strong></td>
<td>• 1 – 2 mEq/kg, slow IV push (for suspected metabolic acidosis)</td>
</tr>
<tr>
<td><strong>Calcium gluconate</strong></td>
<td>• 30 mg/kg</td>
</tr>
<tr>
<td><strong>Calcium chloride</strong></td>
<td>• 10 mg/kg IV</td>
</tr>
<tr>
<td><strong>Insulin</strong></td>
<td>• 10 units regular IV</td>
</tr>
<tr>
<td></td>
<td>• 1 – 2 amps D50W</td>
</tr>
</tbody>
</table>

**TRIGGERING AGENTS**

- Inhalational (volatile) anesthetics
- Succinylcholine

**DIFFERENTIAL diagnosis**

<table>
<thead>
<tr>
<th>Cardiorespiratory</th>
<th>Latrogenic</th>
<th>Neurologic</th>
<th>Toxicology</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Hypoventilation</td>
<td>• Exogenous CO₂ source (e.g., laparoscopy)</td>
<td>• Meningitis</td>
<td>• Radiologic contrast neurotoxicity</td>
</tr>
<tr>
<td>• Sepsis</td>
<td>• Overwarming</td>
<td>• Intracranial bleed</td>
<td>• Anticholinergic syndrome</td>
</tr>
<tr>
<td><strong>Endocrine</strong></td>
<td>• Neuroleptic Malignant Syndrome</td>
<td>• Hypoxic encephalopathy</td>
<td>• Cocaine, amphetamine, salicylate toxicity</td>
</tr>
<tr>
<td>• Thyrotoxicosis</td>
<td></td>
<td>• Traumatic brain injury</td>
<td>• Alcohol withdrawal</td>
</tr>
<tr>
<td>• Pheochromocytoma</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Sepsis
Fever, tachypnea, tachycardia, hypotension, or alteration in mental status

1. Check lactate
2. Lactate ≥ 4.0 or SBP < 90 after 20-30 ml/kg IV fluid bolus:
   - Volume resuscitate with up to 40 ml/kg IV fluid bolus
   - Broad spectrum antibiotics in 1st hour
   - Supplemental oxygen
   - CVP/ScvO2 catheter insertion within 2 hours
   - Consider arterial line placement
   - Volume Status: CVP 8-12 within 6 hours
     a. IF CVP is less than 8, infuse 500 mL LR or NS within 30 minutes
     b. IF CVP is 8-12, infuse at 200 mL/hr
   - Blood Pressure control: MAP ≥ 65 within 6 hours
     a. If MAP ≤ 65, start norepinephrine 0.05-0.5 mcg/kg/min
     b. If Norepinephrine required more than 1 hour, give hydrocortisone 50 mg IV every 6 hours.
   - Optimize oxygen delivery: ScvO2 ≥ 70% within 6 hours
     a. If Hct < 30, consider PRBC transfusion
     b. If Hct > 30, start dobutamine 2.5-20 mcg/kg/min
   - Follow serial lactates for clearance every 3-6 hours

Sepsis = suspected infection and 2 or more of the following:
- T > 38 or < 36
- HR > 90
- RR > 20
- WBC > 12K, < 4K or > 10% bands

Look for laboratory confirmation of sepsis:
- Lactic acid
- BUN/Cr
- Electrolytes
- Blood/Pan cultures
- Glucose
- Coags
- CBC with diff
- LFT’s
- CXR

Intermediate Lactate (2.0-3.9)
- 40 ml/kg fluid bolus
- Early antibiotics
- Repeat lactate in 3-6 hours
### Tachycardia – Unstable

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

#### START

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

2. **Turn FiO₂ to 100% and turn down volatile anesthetics**

3. **Analyze rhythm**
   - If wide complex, irregular: treat as VF, **go to CHKLST 5**
   - Otherwise: prepare for cardioversion

4. **Prepare for immediate synchronized cardioversion**
   1. Sedate all conscious patients unless deteriorating rapidly
   2. Turn monitor/defibrillator ON, set to defibrillator mode
   3. Place electrodes on chest
   4. Engage synchronization mode
   5. Look for mark/spike on the R-wave indicating synchronization mode
   6. Adjust if necessary until SYNC markers seen with each R-wave

5. **Cardiovert at appropriate energy level**
   1. Determine appropriate energy level using Biphasic Cardioversion table at right; begin with lowest energy level and progress as needed
   2. Select energy level
   3. Press charge button
   4. Clear all providers away from patient
   5. Engage synchronization mode (confirm sync by looking for QRS markers) before delivery of each shock
   6. Press and hold shock button
   7. Check monitor; if tachycardia persists, increase energy level

6. **Consider expert consultation**

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#### BIPHASIC CARDIOVERSION energy levels

<table>
<thead>
<tr>
<th>CONDITION</th>
<th>ENERGY LEVEL (progression)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Narrow complex, regular</td>
<td>50 J → 100 J → 150 J → 200 J</td>
</tr>
<tr>
<td>Narrow complex, irregular</td>
<td>120 J → 150 J → 200 J</td>
</tr>
<tr>
<td>Wide complex, regular</td>
<td>100 J → 150 J → 200 J</td>
</tr>
<tr>
<td>Wide complex, irregular</td>
<td>Treat as VF: go to CHKLST 5</td>
</tr>
</tbody>
</table>

#### Critical CHANGES

If cardioversion needed and impossible to synchronize shock, use high-energy unsynchronized shocks

- **Defibrillation doses:**
  - Biphasic: Follow manufacturer recommendation; if unknown use highest setting
  - Monophasic: 360J

If **cardiac arrest**, go to:
- CHKLST 5 Cardiac Arrest – VF/VT
- CHKLST 4 Cardiac Arrest – Asystole / PEA

#### During RESUSCITATION

- **Airway:** Assess and secure
- **Circulation:**
  - Confirm adequate IV or IO access
  - Consider IV fluids wide open

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Based on the OR Crisis Checklists at www.ProjectCheck.org/crisis. All reasonable precautions have been taken to verify the information contained in this publication. The responsibility for the interpretation and use of the materials lies with the reader. Revised Dec 2013 (120913.1)