Appendix 1:

OR Critical Event Checklists

STOP

READ OUT LOUD:
Has somebody called for help?

Who is going to be the team leader?

1: Air Embolism

- Call for help.
- \( \text{FiO}_2 \) increased to 100%?
- Nitrous oxide anesthetic stopped?
- Source of air entry stopped?
  - Surgical site lowered below level of heart, if possible?
  - Wound filled with irrigation?
  - Entry point searched for (including open venous lines)?
  - Intermittent jugular venous compression considered if head or cranial case?
- Transesophageal echocardiography called for (if available)?

Have we considered:
- Left side down once source controlled?
- Aspiration of air from a central line?
- Vasopressors (e.g., dobutamine, norepinephrine)?
- Chest compressions (100/min; to force air through lock, even if not in cardiac arrest)?

Condition: Suspected air embolism (decreased end-tidal \( \text{CO}_2 \) and oxygen saturation).
Objective: Restore normal oxygen saturation and hemodynamic stability and stop source of air entry.
Appendix 1:

OR Critical Event Checklists

STOP

READ OUT LOUD:
Has somebody called for help?
Who is going to be the team leader?

1: Air Embolism

- Call for help.
- FiO2 increased to 100%?
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- Source of air entry stopped?
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  - Wound filled with irrigation?
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  - Intermittent jugular venous compression considered if head or cranial case?
- Transesophageal echocardiography called for (if available)?

Have we considered:
- Left side down once source controlled?
- Vasopressors (e.g., dobutamine, norepinephrine)?
- Chest compressions [100/min; to force air through lock, even if not in cardiac arrest]?
O.R. Critical Event Guide

2: Anaphylaxis

Condition: Suspected anaphylaxis (consistent history, urticaria, hypotension, bronchospasm).
Objective: Restore hemodynamic stability, abort reaction.

- Call for help.
- Potential causative agents removed?
- \( \text{FiO}_2 \) increased to 100%?
- Epinephrine given? (Epinephrine dose may be repeated every 1-2 minutes as clinically indicated).
- Airway established/secured?
- IV access adequate?
- IV fluids opened and/or fluid bolus given at high rate?
- If no response: begin IV epinephrine infusion (rate: 1-4 μg/minute).

Have we considered:
- Termination of the procedure to focus on resuscitation?
- Vasopressin? (40 Units IV; for patients with continued hypotension)
- Albuterol? (if bronchospasm a prominent feature)
- Diphenhydramine (25-50mg IV)?
- \( H_2 \) blockers (e.g. ranitidine 50mg IM/IV; cimetidine 300mg IM/IV)?
- Glucagon? (1-2 mg IV or IM every 5 minutes, in patients taking beta blockers)
- Hydrocortisone (100 mg IV)?
- Tryptase level? (useful to guide future management)

Common causative agents:
- Neurouvascular blocking agents, latex products (gloves, blood pressure cuff, Foley catheter), chlorhexidine, IV colloids.

Drug Doses:
- Epinephrine dose:
  - 1 to 5 cc (0.1-0.5 mg) IV, depending on severity, diluted 1:10,000 before bolus,
  - 0.3 cc (0.3 mg) IM if no IV access (diluted 1:1,000)
- If cardiac arrest: give 1 mg epinephrine IV, begin ACLS and GO TO: Cardiac Arrest – Asystole/PEA Checklist or Cardiac Arrest – VF/VT Checklist.

O.R. Critical Event Guide

3: Bradycardia - Unstable

Condition: Hemodynamic instability, persistent bradycardia with pulses.
Objective: Restore hemodynamic stability, adequate perfusion.

- Call for help.
- Get transcutaneous pacer.
- Give Atrazine (0.5mg IV; may repeat to 3mg total).
- Stop surgical stimulation (if laparoscopy, desufflate).
- If myocardial infarction suspected (e.g. ECG changes), treat accordingly.
  - (e.g. oxygen, nitrates, consider terminating procedure)
- Assess for drug induced causes
  - (e.g., beta blockers, calcium channel blockers, digoxin).
- If persistent bradycardia, begin pacing:
  1. Place pacing electrodes and pads on chest per package instructions.
  2. Turn monitor/defibrillator ON, set to PACER mode.
  3. Set PACER RATE (ppm) to 60/min. (Can be adjusted up or down based on clinical response once pacing is established).
  4. Increase the milliamperes (mA) of PACER OUTPUT until electrical capture (pacer spikes aligned with QRS complex; threshold normally 65-100mA). Set final milliamperes to 10mA above this level.
  5. Confirm pulse present. **
- If pacing ineffective (or while awaiting pacer):
  - Consider Epinephrine (2 to 10 μg/min)
  - Consider Dopamine (2 to 10 μg/kg/min).
- Consider expert consultation.

** If PEA develops, GO TO: Cardiac Arrest – Asystole/PEA Checklist

During Resuscitation:
- Airway (access and secure)
- Breathing (100% O₂)
- Circulation (confirm adequate IV or IO access)
  - Consider IV fluids wide open.
  - Consider 12-lead ECG.

OPIOID Treatments:
- Beta-blocker overdose:
  - Glucagon (2-4mg IV push).
- Calcium channel blocker overdose:
  - Calcium chloride (1g IV).
O.R. Critical Event Guide

2: Anaphylaxis

Condition: Suspected anaphylaxis (consistent history, urticaria, hypotension, bronchospasm).

Objective: Restore hemodynamic stability, abort reaction.

- Call for help.
- Potential causative agents removed?
- \( \text{FiO}_2 \) increased to 100%?
- Epinephrine given? (Epinephrine dose may be repeated every 1-2 minutes as clinically indicated).
- Airway established/secured?
- IV access adequate?
- IV fluids opened and/or fluid bolus given at high rate?
- If no response: begin IV epinephrine infusion (rate: 1-4 μg/minute).

Have we considered:
- Termination of the procedure to focus on resuscitation?
- Vasopressin? (40 Units IV, for patients with continued hypotension)
- Albuterol? (if bronchospasm a prominent feature)
- Diphenhydramine (25-50mg IV)?
- H₂ blockers (e.g. ranitidine 50mg IM/IV, cimetidine 300mg IM/IV)?
- Glucagon? (1-2 mg IV or IM every 5 minutes, in patients taking beta blockers)
- Hydrocortisone (100 mg IV)?
- Tryptase level? (useful to guide future management)

Common causative agents:
- Neurovascular blocking agents, latex products (gloves, blood pressure cuff, Foley catheter), chlorhexidine, IV colloids.

Drug Doses:
- Epinephrine dose:
  - 1 to 5 cc (0.1-0.5 mg) IV, depending on severity, diluted 1:100,000 before bolus.
  - 0.1 cc (0.3 mg) IM if no IV access (diluted 1:1,000).
- If cardiac arrest: give 1 mg epinephrine IV, begin ACLS and GO TO: Cardiac Arrest – Asystole/PEA Checklist or Cardiac Arrest – VF/VT Checklist.

O.R. Critical Event Guide

3: Bradycardia - Unstable

Condition: Hemodynamic instability, persistent bradycardia with pulses.

Objective: Restore hemodynamic stability, adequate perfusion.

- Call for help.
- Get transcutaneous pacer.
- Give Atropine (0.5mg IV; may repeat to 3mg total).
- Stop surgical stimulation (if laparoscopy, deaerate).
- If myocardial infarction suspected (e.g. ECG changes), treat accordingly.
- Assess for drug induced causes
  - (e.g. beta blockers, calcium channel blockers, digoxin).
- If persistent bradycardia, begin pacing:
  - Place pacing electrodes and pads on chest per package instructions.
  - Turn monitor/defibrillator ON, set to PACER mode.
  - Set PACER RATE (ppm) to 60/min. (Can be adjusted up or down based on clinical response once pacing is established).
  - 4. Increase the milliamperes (mA) of PACER OUTPUT until electrical capture (pacer spikes aligned with QRS complex; threshold normally 65-100mA).
  - Set final milliamperes to 10mA above this level.
  - Confirm pulse present. **
- If pacing ineffective (or while awaiting pacer):
  - Consider Epinephrine (2 to 10 μg/min)
  - or Dopamine (2 to 10 μg/kg/min).
- Consider expert consultation.

** If PEA develops, GO TO: Cardiac Arrest – Asystole/PEA Checklist
O.R. Critical Event Guide

4: Cardiac Arrest – Asystole/PEA

Condition: Non-shockable pulseless cardiac arrest.
Objective: Restore pulse, hemodynamic stability.

- Call for help.
- CPR (100 chest compressions/min + 8 breaths per minute)*
  - Ensure full chest recoil with minimal interruptions.
- Epinephrine (or Vasopressin).
- Check pulse & rhythm (after every 2 minutes of CPR):
  - If no pulse and shockable (VF/VT): GO TO: Cardiac Arrest - VF/VT Checklist
  - If no pulse and NOT shockable (asystole/PEA):
    - Resume CPR.
    - Read out potential causes (H&Ts).
    - Restart checklist.
  - If pulse:
    - Begin post-resuscitation care.
    - Read out potential causes (H&Ts).

Potential Causes (H&Ts):
- Hypovolemia
- Hypoxemia
- Hypernatremia
- Hyperkalemia
- Hypoglycemia
- Hypothermia
- Tension Pneumothorax
- Tamponade (Cardiac)
- Thrombosis (Coronary/Pulmonary)
- Trauma (bleding outside the surgical cavity)
- Hypovolemia
- Hypoxemia
- Hypernatremia
- Hyperkalemia
- Hypoglycemia
- Hypothermia
- Tension Pneumothorax
- Tamponade (Cardiac)
- Thrombosis (Coronary/Pulmonary)
- Trauma (bleeding outside the surgical cavity)

* In patient without an advanced airway: Cycle of CPR = 30 compressions at a rate of 100/min, followed by two breaths. Provide 5 cycles of CPR where “CPR x 2 minutes” is noted.

O.R. Critical Event Guide

5: Cardiac Arrest – VF/VT

Condition: Shockable pulseless cardiac arrest.
Objective: Restore pulse, hemodynamic stability.

Top Priority = Early Defibrillation.
- Call for help.
- Get defibrillator.
- CPR (100 chest compressions/minute + 8 breaths per minute)...
  - Ensure full chest recoil with minimal interruptions.
  - Shock at highest setting.
  - Epinephrine.
  - CPR x 2 minutes.
- Check pulse & rhythm [confirm shockable].**
- Shock at highest setting.
- Epinephrine.
- CPR x 2 minutes.
- Check pulse & rhythm [confirm shockable].**
- Shock at highest setting.
- Amiodarone.
- CPR x 2 minutes.
- Check pulse and rhythm [confirm shockable].**

* In patient without an advanced airway: Cycle of CPR = 30 compressions at a rate of 100/min, followed by two breaths. Give 5 cycles of CPR where “CPR x 2 minutes” is noted.
** If Asystole/PEA develops at any point, GO TO Cardiac Arrest: Asystole/PEA checklist
** If pulse at any point, begin post-resuscitation care

During CPR:
- Airway ([bag mask ventilation]),
- Breathing (100% O2),
- Circulation (confirm adequate IV or IO access).
- Consider IV fluids wide open.
- Assign roles for: Chest compressions, airway, vascular access, documentation, code cart, time keeping. Orders should be explicitly acknowledged and repeated.

Defibrillation:
1. Turn defibrillator ON set to 360 J mode.
2. Place electrode on chest per patching instructions.
3. Deliver shock (“Charge” button → “Shock” button)

Drug Doses and additional considerations:
- Epinephrine dosing: 1mg IV, repeat every 3-5 minutes.
- Vasopressin 40 U IV can be given to replace the first or second dose of epinephrine.
- Hyperkalemia treatment:
  - Calcium gluconate (10mg/kg) or Calcium chloride (10mg/kg).
  - Sodium bicarbonate 1-2mg/kg, slow IV push.
  - Insulin (2 units regular IV with 2-3 amps D50W).
- Hypoglycemia treatment:
- Calcium channel blocker overdose:
  - Glucagon (2-4mg IV push).
- Calcium chloride (3-4g).
O.R. Critical Event Guide

4: Cardiac Arrest – Asystole/PEA

Condition: Non-shockable pulseless cardiac arrest.
Objective: Restore pulse, hemodynamic stability.

- Call for help.
- CPR (100 chest compressions/min + 8 breaths per minute)*)
  - Ensure full chest recoil with minimal interruptions.
- Epinephrine (or Vasopressin).
- Check pulse & rhythm (after every 2 minutes of CPR):
  - If no pulse and NOT shockable (VF/VT): GO TO: Cardiac Arrest - VF/VT Checklist
  - If no pulse and SHOCKABLE (asystole/PEA):
    • Resume CPR.
    • Check pulse & rhythm (H&Ts).
    • Reassess.
  - If pulse:
    • Begin post-resuscitation care.
    • Reassess.

Potential Causes (H&Ts):
- Hypovolemia
- Hypoxemia
- Hyperkalemia
- Hypothermia
- Tension Pneumothorax
- Tamponade (Cardiac)
- Toxiin (Coronary/Pulmonary)
- Trauma (bleeding outside the surgical cavity)
- Hypovolemia
- Hypoxemia
- Hyperkalemia
- Hypothermia
- Hypoxemia
- Tension Pneumothorax
- Tamponade (Cardiac)
- Toxiin (Coronary/Pulmonary)
- Trauma (bleeding outside the surgical cavity)

During CPR:
- Airway (Bag mask ventilation).
- Breathing (100% O2).
- Circulation (confirm adequate IV or IO access).
  - Consider IV fluids wide open.
- Assign roles for: Chest compressions, airway, vascular access, documentation, code cart, time keeping. Orders should be explicitly acknowledged and repeated.

Drug Doses and Treatments:
- Epinephrine dosing: 1mg IV, repeat every 3-5 minutes.
- Vasopressin 40 U IV can be given to replace the first or second dose of epinephrine.
- Hyperkalemia treatment:
  - Calcium gluconate (10mg/kg) or Calcium chloride (10mg/kg) IV;
  - Sodium bicarbonate 1-2mEq/kg, slow IV push
  - Insulin 10 units regular IV with 1-2 amps D50W

Top Priority = Early Defibrillation.

Condition: Shockable pulseless cardiac arrest.
Objective: Restore pulse, hemodynamic stability.

**In patient without an advanced airway: Cycle of CPR = 30 compressions at a rate of 100/min, followed by two breaths. Provide 5 cycles of CPR where "CPR x 2 minutes" is noted

O.R. Critical Event Guide

5: Cardiac Arrest – VF/VT

During CPR:
- Airway (Bag mask ventilation).
- Breathing (100% O2).
- Circulation (confirm adequate IV or IO access).
  - Consider IV fluids wide open.
- Assign roles for: Chest compressions, defibrillation, airway, vascular access, documentation, code cart, time keeping. Orders should be explicitly acknowledged and repeated.

Defibrillation:
1. Turn defibrillator ON set to 200 J mode.
2. Place electrode on chest per packing instructions.
3. Deliver shock (“Charge” button → “Shock” button)

Drug Doses and additional considerations:
- Epinephrine dosing: 1mg IV, repeat every 3-5 minutes.
- Vasopressin 40 U IV can be given to replace the first or second dose of epinephrine.
- Amiodarone dosing: 500 mg IV/10 sec, then consider additional 150 mg IV/10 sec.
- Lidocaine can be given if Amiodarone unavailability:
  - 1 to 1.5 mg/kg IV/10 sec, then 0.5 to 0.75 mg/kg IV/10 sec, maximum 3 doses or 3 mg/kg.
- Magnesium dosing: Consider giving loading dose 1 to 2 gm IV/10 sec for tachyarrhythmia.

* In patient without an advanced airway: Cycle of CPR = 30 compressions at a rate of 100/min, followed by two breaths. Provide 5 cycles of CPR where "CPR x 2 minutes" is noted
** If Asystole/PEA develops at any point, GO TO Cardiac Arrest: Asystole/PEA checklist
*** If pulse at any point, begin post-resuscitation care
O.R. Critical Event Guide

6: Failed Airway

Condition: Failed airway (2 unsuccessful attempts or oxygen saturation less than 85%).
Objective: Establish adequate oxygenation/ventilation.

Call for help. Get Airway Cart.

Bag-mask ventilate.

Bag-mask ventilation adequate?

Yes, consider:
- Operation using LMA
- Return to spontaneous ventilation
- Awakening patient
- Different blades
- LMA as conduit
- Videoendoscope
- Fibreoptic intubation
- Intubating stylet
- Light wand
- Retrograde intubation
- Blind oral or nasal intubation

No

Laryngeal Mask Airway (LMA) or other supraglottic (SG) device.

Consider:
- Bronchoscope
- Transtracheal jet ventilation
- Surgical airway

If bag mask ventilation and LMA become inadequate

If alternatives fail, consider:
- Awakening patient (for awake intubation, doing procedure under regional/local, or cancelling case)
- Other options (i.e. surgery using LMA, face-mask)
- Surgical airway if unable to abort case

O.R. Critical Event Guide

7: Fire

Condition: Signs of fire in OR, in the airway, or on patient (smoke, odor, flash).
Objective: Protect patient, contain fire.

Airway Fire

- Stop flow of medical gases (oxygen/Nitrous Oxide).
- Disconnect breathing circuit.
- Remove endotracheal tube (must balance against airway loss).
- Remove flammable material from airway.
- Pour saline into endotracheal tube, if kept.

Non-airway Fire

- Stop flow of medical gases (oxygen/Nitrous Oxide).
- Remove drapes and flammable materials from patient.
- Extinguish fire with saline, soaked gauze, or other means.
**Do not use alcohol based solutions**
**Do not use any liquid for fires on or in energized electrical equipment (Laser, ECG/IBwave, Anesthesia Machine, etc)**

If Fire Not Extinguished On First Attempt

Use fire extinguisher (CO2) to extinguish fire (Safe in wounds)

If Fire Persists

- Evacuate patient (Per institutional protocol)
- Close OR door
- Turn OFF gas supply to room

Fire Extinguished

- Maintain or reestablish airway
- Avoid oxidizer-rich environment (if possible)
- Assess for inhalation injury, consider bronchoscopy
- Examine ET tube to see if fragments may be left behind
- Discuss continuation of case with surgeon
O.R. Critical Event Guide

6: Failed Airway

Condition: Failed airway (2 unsuccessful attempts or oxygen saturation less than 80%).
Objective: Establish adequate oxygenation/ventilation.

Call for help. Get Airway Cart.

Bag-mask ventilate.

Bag-mask ventilation adequate?

Yes, consider:
• Operation using LMA
• Return to spontaneous ventilation,
• Awakening patient.
• Different blades.
• LMA as conduit.
• Videolaryngoscope.
• Fiberoptic intubation.
• Intubating stylet.
• Light wand.
• Retrograde intubation.
• Blind oral or nasal intubation.

If alternatives fail, consider:
• Awakening patient (for awake intubation, doing procedure under regional/local, or cancelling case).
• Other options (i.e. surgery using LMA, face-mask).
• Surgical airway if unable to abort case.

No

Prepare for surgical airway (prop neck, call airway team).
• Get Tracheostomy Kit.
Consider:
• Bronchoscope.
• Transtracheal jet ventilation.
• Surgical airway.

LMA/NG Ventilation adequate?

Yes, consider:

If bag mask ventilation and LMA become inadequate:

No

O.R. Critical Event Guide

7: Fire

Condition: Signs of fire in OR, in the airway, or on patient (smoke, odor, flash).
Objective: Protect patient, contain fire.

Activate fire alarm/Get fire-extinguisher/Remove source of heat.

Airway Fire
• Stop flow of medical gases (oxygen/Nitrous Oxide).
• Disconnect breathing circuit.
• Remove endotracheal tube (must balance against airway loss).
• Remove flammable material from airway.
• Pour saline into endotracheal tube, if kept.

Non-airway Fire
• Stop flow of medical gases (oxygen/Nitrous Oxide).
• Remove drapes and flammable materials from patient.
• Extinguish fire with saline, soaked gauze, or other means.
**Do not use alcohol based solutions**
**Do not use any liquid for fires on or in energized electrical equipment (Laser, ESU/Bovie, Anesthesia Machine, etc)**

If Fire Not Extinguished On First Attempt

Use fire extinguisher (CO2) to extinguish fire (Safe in wounds)

If Fire Persists
• Evacuate patient (Per institutional protocol).
• Close OR door.
• Turn OFF gas supply to room.

Fire Extinguished
• Maintain or reestablish airway.
• Avoid oxidizer-rich environment (if possible).
• Assess for inhalation injury, consider bronchoscopy.
• Examine ET tube to see if fragments may be left behind.
• Discuss continuation of case with surgeon.
O.R. Critical Event Guide

8: Hemorrage

- Call for help.
- IV fluids opened?
  - IV access adequate?
- Call blood bank:
  - Massive transfusion protocol activated (if available)?
  - Blood products ordered (in addition to PRBCs)?
    - FFP (consider 1:1 ratio with PRBCs).
    - Platelets (if indicated; consider 1:1 ratio with PRBCs).
    - Cryoprecipitate (if indicated; 1 unit).
- Additional lap sponges requested?
- Rapid infusion (or pressure bags) requested?
- Labs sent?
  - CBC, PT/PTT/INR, Fibrinogen, Lactate, ABG, Potassium.

Have we considered:
- Additional surgical techniques and/or personnel?
- Hemostatic agents?
- Vascular instruments or consultation?
- Damage control surgery (pack, close, resuscitate)?
- Warming the room and patient?
- Factor VII (per institution protocol)^

Condition: Acute massive bleeding.
Objective: Stop bleeding, maintain hemodynamic stability, avoid coagulopathy.

Transfusion Considerations:
- Cryoprecipitate to fibrinogen > 100 mg/dL
  - FFP, consider 1:1 ratio with PRBCs.
  - Platelets (if indicated; consider 1:1 ratio with PRBCs).
  - Cryoprecipitate (if indicated; 1 unit).

- Rod blood cells to Hematocrit > 25%
- Platelets to serum platelet level > 50 K/μL
- Fresh frozen plasma to PT/PTT > 1.5 times control
- Cell saver (for normal-sanguinant, noncontaminated cases)

Hemorrhage Treatment:
- Calcium gluconate (10mg/kg) or Calcium chloride
- 10mg/kg IV
- Sodium bicarbonate 1.2-4.0 mEq/kg, slow IV push
- Insulin 10 units regular inf 1-2 amps 5000 (0.1 units insulin/kg and 1.0 units 5000 for pediatric patients)

9: Hypotension

- Call for help.
  - Equipment checked for malfunction (arterial line, blood pressure cuff)?
  - Pulse checked?
- Intravenous fluids opened?
- FiO2 increased to 100%?
- Surgical field inspected for bleeding? If Bleeding GO TO: Hemorrhage Checklist.
- Have we considered:
  - decreasing anestheisa?
  - patient position?
  - additional IV?

Have we considered the following causes:

- Retraction
- Vagal stimulation
- Mechanical/surgical manipulation
- Vascular compression

Nursing
- Other evidence of bleeding:
  - Amount of blood in suction container
  - Number of bloody sponges
  - Blood on the floor
- Drugs used on the field (i.e. Intravascular injection of local drugs)

Anesthesia/DR Team
- Airway:
  - Unexplained Hypoxia (GO TO: Hypoxia Checklist)
  - Increased PEEP
- Breathing:
  - Pneumothorax
  - Pulmonary Edema
  - Persistent hyperventilation
- Circulation:
  - Myocardial ischemia
  - Acrophylaxis
  - Pulmonary Embolism
  - Severe sepsis
- Air embolism (GO TO: Air Embolism Checklist)
  - Other emboli (fat, debris, CO2)
- Tamponade
- Bradycardia (GO TO: Bradycardia – Unstable Checklist)
- Tachycardia (GO TO: Tachycardia – Stable Checklist)
- Bone cementing (Methyl methacrylate effect)
- Malignant hyperthermia (GO TO: Malignant Hyperthermia Checklist)
- Drug/allergy
  - Recent drugs given/dose error/allergy
O.R. Critical Event Guide

8: Hemorrhage

Condition: Acute massive bleeding.
Objective: Stop bleeding, maintain hemodynamic stability, avoid coagulopathy.

**Call for help.**
**IV fluids opened?**
- IV access adequate?

**Call blood bank:**
- Massive transfusion protocol activated (if available)?
  - Blood products ordered (in addition to PRBCs)?
    - FFP (consider 1:1 ratio with PRBCs).
    - Platelets (if indicated; consider 1:1 ratio with PRBCs).
    - Cryoprecipitate (if indicated; 1 unit).
- Additional lap sponges requested?
- Rapid infuser (or pressure bags) requested?
- Labs sent?
  - CBC, PT/PTT/INR, Fibrinogen, Lactate, ABG, Potassium.

**Have we considered:**
- Additional surgical techniques and/or personnel?
- Hemostatic agents?
- Vascular instruments or consultation?
- Damage control surgery (pack, close, resuscitate)?
- Warming the room and patient?
- Factor VII (per institution protocol)?

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O.R. Critical Event Guide

9: Hypotension

Condition: Unexplained drop in blood pressure.
Objective: Restore hemodynamic stability.

**Call for help.**
- Equipment checked for malfunction (arterial line, blood pressure cuff)?
- Pulse checked?
- Intravenous fluids opened?
- FiO₂ increased to 100%?

**Have we considered?**
- Decreasing anesthesia?
- Patient position?
- Additional IV?

**Have we considered the following causes:**

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O.R. Critical Event Guide

10: Hypoxia

**Condition:** Unexplained oxygen desaturation.

**Objective:** Restore oxygenation.

**Suspected Airway/Breathing Issue?**

- Call for help.
- Pulse oximeter placement checked?
- IV, increased to 100%?
- Hand ventilation initiated?
- Oxygen source checked?
- Circuit checked (disconnection, leaks, holes)?
- End tidal CO2 confirmed?
- Breathing sounds checked?
- ET tube position checked?
- Blood gas drawn?

**Have we considered:**

- Suctioning (maxus bag)
- Removing circuit and using ambu-bag
- Bronchoscopy
- Pulling ET and Mastr Ventilation/re-intubation

**Consider causes:**

- Airway:
  - Right mainstem intubation
  - Bronchospasm?
  - Ventilator settings, leading to auto-PEEP

- Breathing:
  - Aspiration
  - Airleak?
  - Obesity/positioning
  - Pneumothorax
  - Chest X-ray, chest tube, needle decompression considered
  - Hyperventilation
  - Pulmonary Edema

**Simulation:**

- Embolemia
  - Pulmonary Embolus
  - Air Embolism
  - Other Emboli (e.g. fat, septic, CO2)

- Heart disease?
  - Congestive Heart Failure
  - Coronary Artery Disease
  - Myocardial Infarction
  - Cardiac Tamponade
  - Congenital/anatomic Defect
  - Electrocardiogram, Transesophageal echocardiogram, bypass considered?

- Severe Septis?
  - If hypoxia associated with hypotension GO TO Hypotension Checklist
  - Shock/Arrest?
  - Recent drugs given
    - Dose error/ allergy/anaphylaxis

O.R. Critical Event Guide

11: Malignant Hyperthermia

**Condition:** Unexplained, unexpected increase in end-tidal CO2; prolonged muscle spasm after succinylcholine; unexpected, unexplained tachycardia

**Objective:** Restore normal hemodynamic parameters, metabolic function, temperature.

**Call for help.**

- Get Malignant Hyperthermia (MH) Kit
- Volatile Anesthetics stopped/transitional to non-triggering anesthetics?
  - Don’t delay treatment to change circuit or CO2 absorbor.
  - Request chilled IV saline.

- FIO2 increased to 100%?

- Hyperventilation initiated?
  - 10 L/min or more (or 2-4x patient’s minute ventilation).

- Dantrolene given?
  - Assign dedicated person to mix dantrolene.
  - MH hotline called? 1-800-664-9737.
  - Procedure terminated (if possible)?

- Bicarbonate given for suspected metabolic acidosis?
  - Maintain pH > 7.2.

- Patient cooled if temperature > 38.5°C?
  - Lavage open body cavities.
  - NG lavage with cold water.
  - Apply ice externally.
  - Cold saline infused intravenously.
  - **Stop cooling if temperature < 38°C.**

- Hyperkalemia treated if suspected?
  - Dysrhythmias treated if present?
  - Standard antiarrhythmics are acceptable; don’t use Calcium Channel Blockers.

- Labs sent? (ABG, venous blood gas, electrolytes, serum CK, serum/urine myoglobin, coagulation profile)

- Foley catheter placed?
  - Monitor urine output.

- ICU called/disposition arranged?
O.R. Critical Event Guide

10: Hypoxia

Condition: Unexplained oxygen desaturation.
Objective: Restore oxygenation.

Call for help.
* Pulse oximeter placement checked?
* FiO2 increased to 100%?
* Hand ventilation initiated?
* Oxygen source checked?
* Circuit checked (disconnection, kinks, holes)
* End tidal CO2 confirmed?
* Breath sounds checked?
* ET tube position checked?
* Blood gas drawn?

Consider causes:
* Suctioning (maxilla plug)
* Removing circuit and using ambu-bag
* Bronchoscopy
* Pulling ET and Most Ventilation/Re-intubation

Airway: Right mainstem intubation
Bronchospasm
Ventilator settings, leading to auto-PEEP
Breathing: Aspiration
Anesthesia
Obesity/Positioning
Pneumothorax
Central/Incised chest tube/needle decompression considered
Hyperventilation
Pulmonary Edema

Considerations:
- Pulmonary Embolus
- Air Embolism (GO TO: Air embolism Checklist)
- Other Emboli (e.g., fat, septic CO2)
- Heart disease?
  - Congestive Heart Failure
  - Coronary Artery Disease
  - Myocardial Ischemia
  - Cardiac Tamponade
  - Congential/Anatomic Defect
  - Electrocardiogram, Transesophageal echocardiogram, bypass considered?
- Severe Sepsis
  - If hypoxia associated with hypotension (GO TO: Hypotension Checklist)
  - Septic Shock
  - Recent drugs given
    - Dose error/allergy/anaphylaxis

Have we considered:

O.R. Critical Event Guide

11: Malignant Hyperthermia

Condition: Unexplained increase in end-tidal CO2 prolonged muscle spasm after succinylcholine; unexplained tachycardia.
Objective: Restore normal hemodynamic parameters, metabolic function, temperature.

Call for help.
* Get Malignant Hyperthermia (MHI) Kit.
* Volatile Anesthetics stopped/transitional to non-triggering anesthetics?
  - Don’t delay treatment to change circuit or CO2 absorber.
  - Request chilled IV saline.
* FiO2 increased to 100%?
* Hyperventilation initiated?
  - 10 L/min or more (or 2-4x patient’s minute ventilation).
* Dantrolene given?
  - Assign dedicated person to mix dantrolene.
* MHI hotline called? 1-800-664-9737.
* Procedure terminated (if possible)?
* Bicarbonate given for suspected metabolic acidosis?
  - Maintain pH > 7.2.
* Patient cooled if temperature > 38.5°C?
  - Lavage open body cavities.
  - NG lavage with cold water.
  - Apply ice externally.
  - Cold saline infused intravenously.
  **Stop cooling if temperature < 38°C.**
* Hyperkalemia treated if suspected?
* Dysrhythmias treated if present?
  - Standard antarrhythmics are acceptable; don’t use Calcium Channel Blockers.
* Labs sent? (ABG, venous blood gas, electrolytes, serum CK, serum/urine myoglobin, coagulation profile)
* Foley catheter placed?
  - Monitor urine output.
* ICU called/disposition arranged?

Dose, Dose and Treatments:

- Dantrolene: 1.5mg/kg (1.5mg/30kg) 1x every 5 minutes until symptoms subside. Mix each ampule with 60cc saline water. May require up to 10mg/kg.
- Bicarbonate: 1-2mEq/lkr for suspected metabolic acidosis (may give even if blood gas values not available).

Hyperkalemia Treatment:
- Calcium gluconate (10mg/kg) or Calcium chloride (10mg/kg) IV.
- Sodium bicarbonate 1-2mEq/kg, slow IV push.
- Insulin: 10 units regular IR with 1 amp 505W (0.1 units insulin/kg and 1uE/kg D5W for pediatric patients).
Appendix 2: Key processes tracked for the Agency for Healthcare Research and Quality Operating Room Crisis Checklist Project

**Key processes for cardiac arrest: VF/VT**

1. After onset of pulseless VF/VT, chest compressions (once initiated) are given without prolonged interruption(s) (no pause >30 seconds, except for when explicitly clearing patient and delivering shocks).\(^1,2\)

2. Patient receives a shock within 3 minutes of onset of pulseless VF/VT.\(^1,3-5\)

3. Patient receives the appropriate joule setting when all shocks delivered.\(^4\)

4. Initial dose of epinephrine (or vasopressin) given within 5 minutes of onset of pulseless VF/VT.\(^5\)

5. Initial dose of amiodarone (or lidocaine) given after epinephrine (or vasopressin).\(^5,6\)

6. Repeat dose of epinephrine (or vasopressin) given within 3 to 5 minutes after the first dose.\(^5,6\)

7. At least 1 team member in the room explicitly calls for outside help (eg, phone call) within 1 minute of onset of pulseless VF/VT.\(^5\)

8. At least 1 team member calls for the defibrillator within 1 minute of the onset of VF/VT.\(^3-5\)

**Key processes for cardiac arrest: asystole/pulseless electrical activity (PEA)**

9. After onset of asystole/PEA, chest compressions (once initiated) are given without prolonged interruption(s) (no pause >30 seconds).\(^1,2\)

10. Patient does not receive shock if pulse/rhythm indicates asystole/PEA.\(^4\)

11. Initial dose of epinephrine (or vasopressin) given within 3 minutes of onset of asystole/PEA.\(^5,6\)

12. Atropine given (or explicitly considered) within 5 minutes of start of asystole/PEA.\(^5\)

13. Repeat dose of epinephrine (or vasopressin) given within 3 to 5 minutes after the first dose.\(^5,6\)

14. At least 1 team member in the room explicitly calls for outside help (eg, phone call) within 1 minute of onset of asystole/PEA.\(^5\)

15. At least 1 member reads aloud the Hs and Ts (or explicitly discusses the causes in any order) within 10 minutes of the start of asystole/PEA.\(^5\)

**Key processes for air embolism**

16. FiO\(_2\) increased to 100% within 3 minutes of air embolism (indicative signs are substantially decreased end-tidal CO\(_2\) and oxygen desaturation).\(^7,9\)