

# ISOBS Safety Checklist for Office-Based Anesthesia Crises

## Office-based Emergency Manual

ACLS	3	Critical events	18
1- Cardiac arrest- VF/VT	4	13- Allergies -> Anaphylaxis (adult + ped dosing)	19
2- Cardiac arrest- asystole/PEA	5	14- Difficult airway	20
3- Bradycardia- unstable	6	15- Embolism (fat, venous, clot)	21
4- Tachycardia- unstable	7	16- Hemorrhage	22
PALS	8	17- Hypercapnia	23
5 Cardiac arrest- VF/VT	9	18- Hypotension (adult + ped dosing)	24
6- Cardiac arrest- asystole/PEA	10	19- Hypoxia	25
7- Bradycardia- unstable	11	20- LAST (adult + ped dosing)	26
8 -Tachycardia- unstable	12	21- Loss of access	27
Emergency	13	22- Mental status change	28
9- Fire- airway or surroundings	14	23- MH (adult + ped dosing)	29
10- Evacuation and preparedness	15	24- Spinal Anesthesia: Adverse Events	30
11- Loss of Power	16	Administrative	31
12- Loss of Oxygen	17	25- Transfer of care MH patient	32
		26- Transfer of care non-MH patient	33

# Principles of responding to OBA crises

## ISOBS

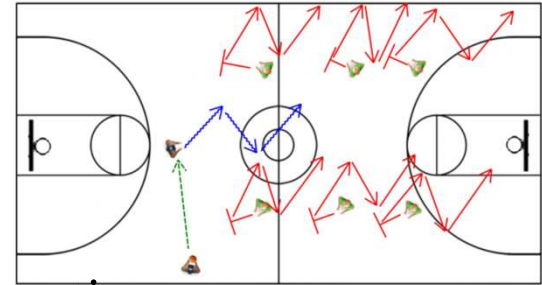
- **I**MMEDIATE call for help



- **S**ECURE a plan for crisis



- **O**BTAIN transfer of care plan/agreements



- **B**EST: PRACTICE = Best practice



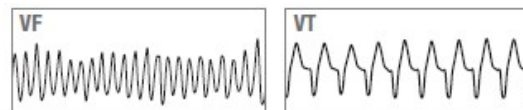
- **S**AFETY = Timely transfer

# ACLS

---

---

# 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 FiO<sub>2</sub> 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 ETCO<sub>2</sub>
    - If <10mmHg: evaluate CPR technique
    - If suddenly >40mmHg: may indicate ROSC
  - Treat reversible causes, consider reading aloud Hs and Ts (see list on right)
  - Check rhythm; if rhythm organized, check pulse
    - If VF/VT continues:
      - Resume CPR – defibrillation – assessment cycle (restart step 4)
    - If asystole/PEA:
      - Resume CPR
      - Go to **CHKLST 2-Asystole/PEA**

## DRUG DOSES and treatments ADULT

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

## ANTIARRHYTHMICS

Amiodarone: 1<sup>st</sup> dose: 300mg/IV/IO  
 2<sup>nd</sup> dose: 150mg/IV/IO  
 Magnesium: 1 to 2 g IV/IO for TdP

## 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

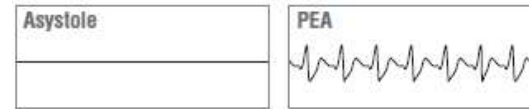
Hydrogen ions (acidosis)	Tamponade (cardiac)
Hyperkalemia	Tension pneumothorax
Hypothermia	Thrombosis (coronary/pulmonary)
Hypovolemia	Toxin (local anesthetic, beta blocker, calcium channel blocker)
Hypoxia	

## During CPR

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

## 2 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 FiO<sub>2</sub> 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 ETCO<sub>2</sub>
    - 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

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

#### TOXIN Treatments

Local Anesthetic Intralipid 1.5ml/kg bolus, repeat for persistent asystole  
Start 0.25-0.5ml/kg/min; 30-60min if refractory

hypotension

Beta-blocker Glucagon 2-4mg IV push

Ca chan blocker Ca chloride 1g IV push

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

#### HYPERKALEMIA treatment

1. Ca gluconate 30mg/kg IV, max 3000mg

--- or ---

Ca chloride 10mg/kg IV, max 2000mg

2. Insulin 10 units regular IV with 1-2 amps D50W

### Hs and Ts: Reversible Causes

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

### During CPR

Airway: Bag-mask sufficient (if ventilation adequate)

Circulation: Confirm adequate IV/IO access

Consider IV fluids wide open

Consider ECMO for select potentially reversible causes

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

Code cart, documentation

# 3 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 FiO<sub>2</sub> to 100%, turn off volatiles anesthetics

- Assess adequate ventilation/oxygenation

### 3 Give atropine

### 4 Stop surgical stimulation (if laparoscopy, desufflate)

### 5 If refractory to atropine

- Start epinephrine or dopamine infusion
- or --
- Start transcutaneous pacing

### 6 Additional Considerations

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

## 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

Atropine	0.5mg IV; max 3mg total
Epinephrine	2-10 MICROgram/min IV
Dopamine	2-20 MICROgram/kg/min IV

### OVERDOSE Treatments

Beta-blocker	Glucagon 2-4mg IV push
Ca chan blocker	Ca chloride 1g IV push
Digoxin	Digoxin Immune FAB; consult pharmacy for patient-specific dosing

## Critical CHANGES

If **PEA** develops (no pulse):

- go to **CHKLST 3-Asystole/PEA**

## During resuscitation

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

# 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 FiO<sub>2</sub> 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 CARADIOVERSION energy levels

CONDITION	ENERGY LEVEL -> PROGRESSION
Narrow complex, regular	50 J -> 100 J -> 150 J -> 200 J
Narrow complex, irregular	120 J -> 150 J -> 200 J
Wide complex, regular	100 J -> 150 J -> 200 J
Wide complex, irregular	Treat as VF, go to <b>CHKLST 1-VF/VT</b>

## 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

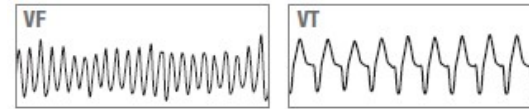
---

---



# 5 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 FiO<sub>2</sub> 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 ETCO<sub>2</sub>
    - 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

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

## ANTIARRHYTHMICS

Amiodarone: 1<sup>st</sup> and 2<sup>nd</sup> 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

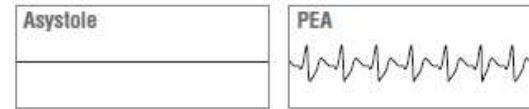
Hydrogen ions (acidosis)	Tamponade (cardiac)
Hyperkalemia	Tension pneumothorax
Hypothermia	Thrombosis (coronary/pulmonary)
Hypovolemia	Toxin (local anesthetic, beta blocker, calcium channel blocker)
Hypoxia	Trauma (bleeding)
Hypoglycemia	

## 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 FiO<sub>2</sub> 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 ETCO<sub>2</sub> for ROSC
- Give epinephrine
  - Repeat epinephrine every 3-5 min
- Assess every 2 minutes
  - Change CPR compression provider
  - Check ETCO<sub>2</sub>
    - If <10mmHg: evaluate CPR technique
    - If suddenly >40mmHg: may indicate ROSC
  - Check rhythm; if rhythm organized, check pulse
    - If asystole/PEA continues:
      - Resume CPR and assessment cycle (restart Step 4)
      - Read aloud Hs and Ts
    - If VF/VT:
      - Resume CPR
      - Go to CHKLST 5-VF/VT

## DRUG DOSES and treatments PEDS

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

### TOXIN Treatments

Local Anesthetic Intralipid 1.5ml/kg bolus, repeat for persistent asystole  
Start 0.25-0.5ml/kg/min; 30-60min if refractory

hypotension

Beta-blocker Glucagon 2-4mg IV push

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

### HYPERKALEMIA treatment

1. Ca gluconate 60mg/kg IV, max 3000mg  
--- or ---  
Ca chloride 20mg/kg IV, max 2000mg

2. Insulin 0.1 units/kg IV with Dextrose 0.25-1g/kg

## Hs and Ts: Reversible Causes

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

## 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
Code	cart, documentation

# 7 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 FiO<sub>2</sub> 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

## 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)

Age	< 30 days	HR	< 100
	> 30 days & < 1 yr		< 80
	> 1 yr		< 60

## DRUG DOSES and treatments PEDI

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

### OVERDOSE Treatments

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

## Critical CHANGES

If **PEA** develops (no pulse)

- Go to **CHKLST 6-Asystole/PEA**

## During resuscitation

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

# 8 Tachycardia - Unstable

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

## START

### 1 Call for help and a code cart

- Ask: "Who will be the crisis manager"?
- Call: "Initiate Transfer Protocol"

### 2 Turn FiO<sub>2</sub> 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 CARADIOVERSION energy levels

CONDITION	ENERGY LEVEL -> PROGRESSION
SVT, tachyarrhythmia	0.5-1J/kg -> 2J/kg
Wide complex, irregular	2J/kg -> 4J/kg -> 6J/kg -> 8J/kg -> 10J/kg

## CONDITION with pulse PEDS TREATMENT

Narrow Complex, regular	Wide complex, regular	Torsades de Pointes
Adenosine: 0.1-0.3mg/kg IV push (1 <sup>st</sup> dose 6mg max, 2 <sup>nd</sup> dose 12mg max)	Amiodarone: 5mg/kg IV over 20-60min Procainamide: 15mg/kg IV over 30-60min Lidocaine: 1mg/kg IV	MgSO <sub>4</sub> : 25-50 mg/kg/dose over minutes Isoproterenol: 0.05-2 MICROgrams/kg/min Lidocaine: 1mg/kg IV Phenytoin NaBicarb (for quinidine-related) Temp placing -> CHKLST 7

## Critical CHANGES

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

If **cardiac arrest**:

VF/VT      Go to CHKLST 5-VF/VT

Asystole/PEA      Go to CHKLST 6-Asystole/PEA

## During resuscitation

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

# EMERGENCY

---

---

# 9 Fire – airway or surroundings

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

## START

**1 Call for help, call 911 and call Code Red at \_\_\_\_\_**

- Ask: "Who will be the crisis manager"?
- Call: "Initiate Transfer Protocol"

**2 Obtain fire extinguisher, if needed**

**If AIRWAY fire**

**Attempt to extinguish fire**

- Shut off medical gases
- Disconnect ventilator
- Remove endotracheal tube
- Remove flammable material from airway
- Pour saline into airway

**After fire extinguished**

- Re-establish ventilation using self-inflating bag with room air
- If unable to re-establish ventilation, go to CHKLST **I4-DIFFICULT AIRWAY**
- Avoid N<sub>2</sub>O and minimize FiO<sub>2</sub>

**FIRE**

**If NON-AIRWAY fire (IE EQUIPMENT, ELECTRICAL)**

- Avoid N<sub>2</sub>O and minimize FiO<sub>2</sub>
- 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**

**Fire PERSISTS after 1 ATTEMPT**

N

Y

- Use fire extinguisher (safe in wounds)

**Fire STILL PERSISTS**

Y

- Evacuate patient
- Close OR door
- Turn OFF gas supply to OR room

# 10 Evacuation and Preparedness

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

## START

### 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.

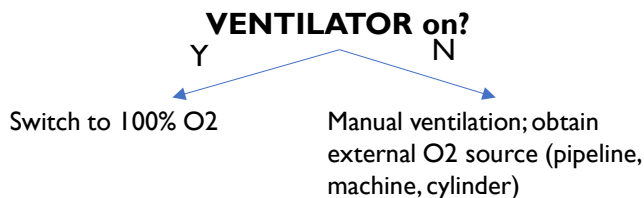
### 4 PAUSE surgery

### 5 Communicate

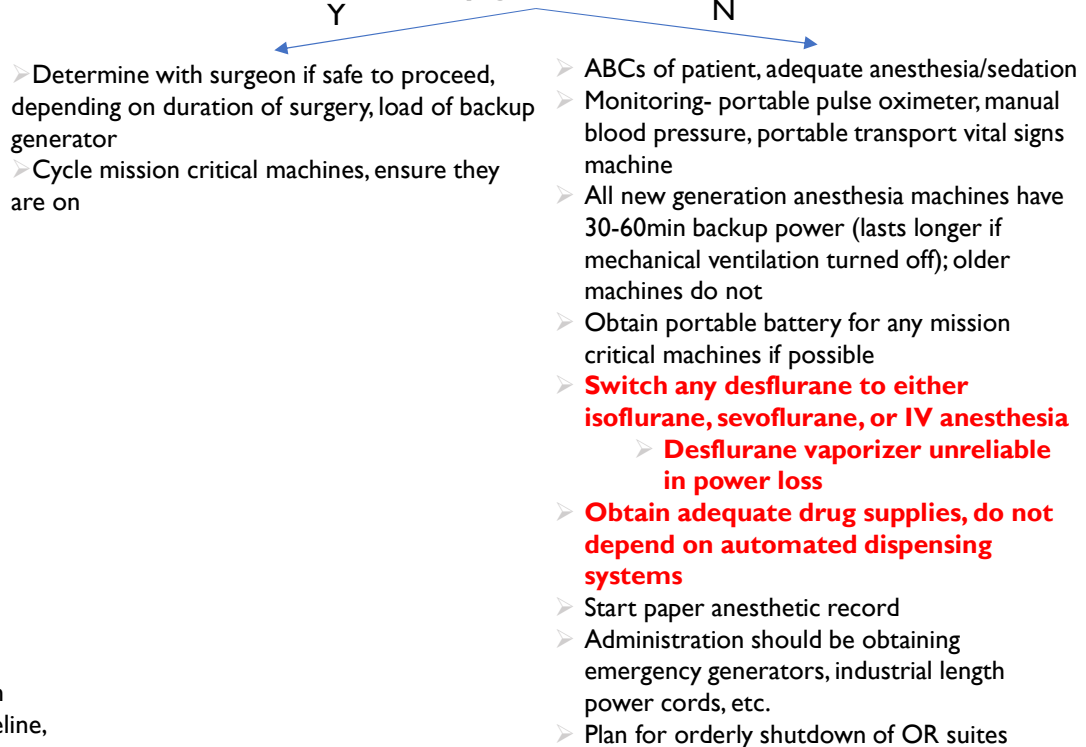
- With anesthesia, surgery, administrators, OR staff

### 6 Check outlets and plugs

- Mission critical machines normally plugged into **RED** outlets, uninterruptible
- If power is off on red outlet, try normal outlet



### Backup generator on?







# CRITICAL EVENTS

---

---

# 13 Allergic reaction -> Anaphylaxis

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

## START

### 1 Call for help and a code cart

- > Ask: "Who will be the crisis manager"?
- > Call: "Initiate Transfer Protocol"

### 2 Give Epinephrine

### 3 Turn FiO<sub>2</sub> 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 1<sup>st</sup> hour, repeat at 4<sup>th</sup> hr and 18-24 hours s/p reaction
- > Stop the procedure

## Critical CHANGES

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

If cardiac arrest **PEDS:**  
 VF/VT Go to CHKLST 5-VF/VT  
 Asystole/PEA Go to CHKLST 6-Asystole/PEA

## DRUG DOSES and treatments ADULT

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

## DRUG DOSES and treatments PEDS

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

## Common causes

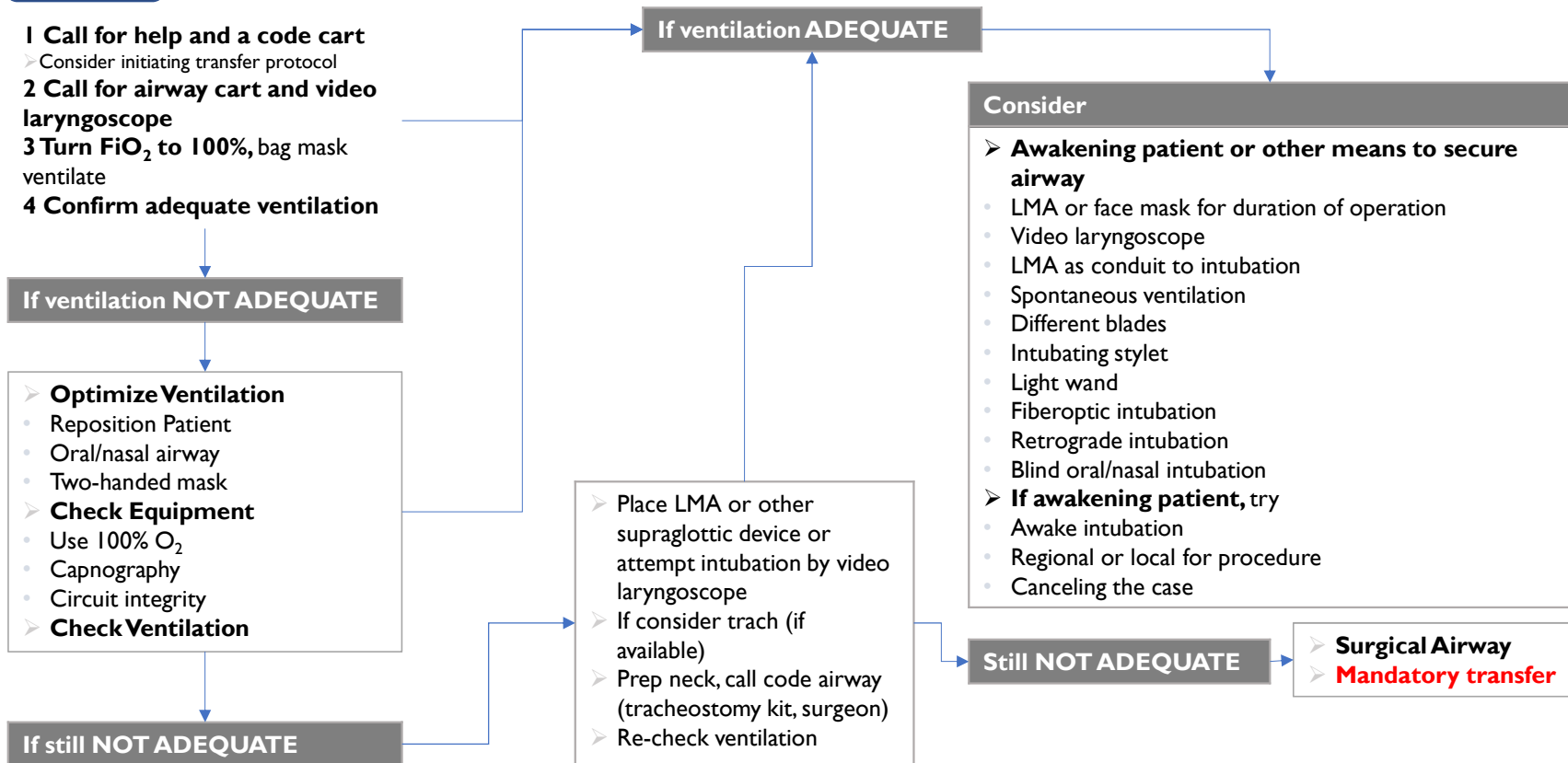
Neuromuscular blockade  
 Latex  
 Chlorhexidine  
 Antibiotics  
 IV contrast or IV colloids

# 14 Difficult Airway

2 unsuccessful intubation attempts by airway expert

## START

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



# 15 Embolism- fat, venous, clot

Decreased end-tidal CO<sub>2</sub>, decreased oxygen saturation, hypotension

## START

### 1 Call for help and a code cart

- Ask: "Who will be the crisis manager"?
- Call: "Initiate Transfer Protocol"

### 2 Turn FiO<sub>2</sub> to 100%, bag mask ventilate

### 3 Turn off nitrous oxide and volatile anesthetics

### 4 Secure airway, confirm adequate ventilation

### 5 Monitor vitals

- BP, O<sub>2</sub>, 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 **SIQ3T3**
- 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: Dalteparin:	100IU/kg BID or 150IU/kg QD 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**

# 16 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  $\text{FiO}_2$  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**

# 17 Hypercapnia

Unexplained elevation of ET PCO<sub>2</sub>

## START

**1 Call for help**

**2 Secure airway and ventilate**

- Ensure mechanical ventilation has adequate tidal volumes

**Assess minute ventilation**

**Ensure adequate tidal volumes**

**Reverse known drug-induced depression of respiratory rate**

- Opioids, benzodiazepines, turn off inhaled halogenated agents

**Check Anesthesia machine**

- Check fresh gas circuit
- Check absorber CO<sub>2</sub> 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

# 18 Hypotension

Unexplained drop in blood pressure refractory to initial treatment

## START

### 1 Call for help and a code cart

➤ Ask: "Who will be the crisis manager"?

### 2 Check for

➤ Pulse, BP, Equipment

➤ HR

If Bradycardia, adult **CHKLST 3-BRADYCARDIA**;  
peds **CHKLST 8-BRADYCARDIA**

➤ Rhythm

If VF/VT, adult **CHKLST 1-VF/VT**;  
peds **CHKLST 5-VF/VT**

If asystole/PEA, adult **CHKLST 2-Asystole/PEA**;  
peds **CHKLST 6-Asystole/PEA**

### 3 Run IV fluids wide open

### 4 Give vasopressors and titrate to response

➤ Mild hypotension: give ephedrine or phenylephrine

➤ Significant/refractory hypotension: give epinephrine bolus, consider starting epinephrine infusion

### 5 Turn FiO<sub>2</sub> to 100% and turn off volatile anesthetics

### 6 Look for external bleeding

➤ If bleeding, go to **CHKLST 16-HEMORRHAGE**

### 7 Consider...

➤ Patient in Trendelenberg

➤ Additional IV access

➤ Arterial line

## 8 Differential Diagnosis

### Operative field

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

### Unaccounted blood loss

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

### Drugs/Allergy

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

### Breathing

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

### Circulation

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

## DRUG DOSES and treatments ADULT

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

## DRUG DOSES and treatments PEDS

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

Age	<5 <sup>th</sup> % systolic BP
Preemie	<57
0-3 mo	<60
3-12 mo	<70
1-10 yr	<70 + (age in years x2)
>10 yr	<90



# 19 Hypoxia

Unexplained desaturation in oxygen

## START

### 1 Call for help and a code cart

➤ Ask: "Who will be the crisis manager"?

### 2 Turn FiO<sub>2</sub> to 100% and turn off volatile anesthetics

➤ Confirm inspired FiO<sub>2</sub> = 100% on gas analyzer  
 ➤ Confirm ETCO<sub>2</sub> 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...

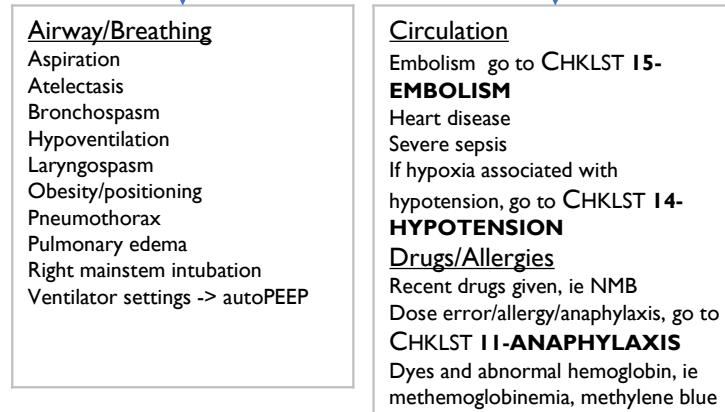
- Draw blood gas for transfer
- Suction (to clear secretions, mucus plug)
- Disconnect circuit and hand-mask

### Additional tests to suggest during transfer

- Fiberoptic bronchoscopy
- Chest x-ray
- Electrocardiogram
- Transesophageal echocardiogram
- Chest ultrasound

### Differential Diagnosis

YES **AIRWAY** issue suspected      NO **AIRWAY** issue suspected



# 20 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 FiO<sub>2</sub> 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, SaO<sub>2</sub>
- > 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](http://www.lipidrescue.org)

### 10 Report use of LIPID at

- > [www.lipidregistry.org](http://www.lipidregistry.org)

## DRUG DOSES and treatment ADULT

Lipid emulsion	bolus 1.5 ml/kg IV over 1 min continue infusion 0.25 ml/kg/min increase infusion to 0.5 ml/kg/min if BP remains low
Midazolam	2mg IV
Epinephrine	<1 MICROgram/kg IV

## DRUG DOSES and treatment PEDS

Lipid emulsion	bolus 1.5 ml/kg IV over 1 min continue infusion 0.25 ml/kg/min increase infusion to 0.5 ml/kg/min if BP remains low
Midazolam	0.05-1 mg/kg IV
Epinephrine	<1 MICROgram/kg IV

# 21 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

# 22 Mental status change

Delirium, obtundation, coma, confusion, speech deficit

## START

### 1 Call for help and a code cart

- Ask: "Who will be the crisis manager"?
- Call: "Initiate Transfer Protocol"

### 2 Secure airway and ventilation

### 3 Consider additional IV access

### 4 Draw labs for potential transfer

- Point of care glucose

### 5 Treat reversible causes

### 6 Stroke assessment

- Consider expert consultation, neurology, during transfer sign-out

### 7 Review medications and antagonists

### Consider LABs during transfer sign-out

Complete blood count, metabolic panel, electrolytes, liver function tests  
Urinalysis, urine toxicology

### STROKE assessment

**Facial droop** Smile, show teeth  
**Arm drift** Close eyes, extend arms forward, palms up for 10 sec  
**Speech** Say "It is a sunny day in Boston"  
**Time** Recognize symptoms fast

### DRUG DOSES and treatment ADULT

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

### Critical CHANGES

If bleeding

- Go to **CHKLST 16- HEMORRHAGE**

If hemodynamically unstable

- **Start CPR**

If VF/VT, adult **CHKLST 1-VF/VT**;  
peds **CHKLST 5-VF/VT**

If asystole/PEA, adult **CHKLST 2-Asystole/PEA**;  
peds **CHKLST 6-Asystole/PEA**

If Bradycardia, adult **CHKLST 3-BRADYCARDIA**;

peds **CHKLST 8-BRADYCARDIA**

### Reversible Causes

Hypoglycemia  
hyperglycemia  
Opioids  
Benzodiazepines  
Acid-base disturbance  
Electrolyte abnormalities  
Hypoxia, go to **CHKLST 19-HYPOXIA**  
Hypercapnia, go to **CHKLST 17-HYPERCAPNIA**  
Azotemia

Hypovolemia  
Hypotension, go to **CHKLST 18-HYPOTENSION**  
Acute blood loss, go to **CHKLST 16-HEMORRHAGE**  
Urinary retention  
Infection, ie pneumonia, UTI  
Steroids  
Anticholinergics  
DKA

# 23 Malignant Hyperthermia

In presence of triggering agent: unexpected increase in ETCO<sub>2</sub>, unexplained tachycardia/tachypnea, prolonged masseter muscle spasm after succinylcholine. Hyperthermia is a LATE sign

## START

### 1 Call for help and a code cart

- Ask: "Who will be the crisis manager"?
- Call: "Initiate MH Transfer Protocol"

### 2 Get MH kit

### 3 Call MH Hotline 1.800.644.9737

### 4 Assign dedicated person to start mixing Dantrolene

### 5 Request chilled IV saline

### 6 Turn off volatile anesthetics and transition to non-triggering anesthetics

- **DO NOT** delay treatment to change circuit/CO<sub>2</sub> absorber

### 7 Turn FiO<sub>2</sub> to 100%

### 8 Hyperventilate patient at flows > 10L/min

### 9 Terminate procedure, if possible

### 10 Give Ryanodex/dantrolene

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

### 12 Treat hyperkalemia, if suspected

### 13 Treat dysrhythmias, if present

- Standard antiarrhythmics; **DO NOT** use calcium channel blockers

### 14 Draw labs for transfer

- Arterial blood gas
- Electrolytes
- Serum creatinine kinase
- Serum/urine myoglobin
- Coagulation profile

### 15 Initiate supportive care

- Consider cooling patient if T > 38.5C
- Place Foley catheter, monitor urine output

## TRIGGERING AGENTS

Inhalational (volatile) anesthetics  
Succinylcholine

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

### Cardiopulmonary

Hypoventilation  
Sepsis

### Endocrine

Thyrototoxicosis  
Pheochromocytoma

### Iatrogenic

Exogenous CO<sub>2</sub> source  
Overwarming  
Neuroleptic Malignant Syndrome

### Neurologic

Meningitis  
Intracranial bleed  
Hypoxic encephalopathy  
Traumatic brain injury

### Toxins

Radiologic contrast  
Anticholinergic syndrome  
Cocaine, amphetamine, salicylate, alcohol withdrawal

## DRUG DOSES and treatments ADULT

Dantrolene:	Reconstitute 20mg vial in 60cc sterile water (shake until dilute)
--- or ---	
Ryanodex:	Reconstitute 250mg vial with 5 cc sterile water (shake until orange and opaque)
Give 2.5mg/kg IV, repeat up to 10mg/kg until symptoms subside	
Rarely may require up to 30mg/kg	
Bicarbonate	1-2mEq/kg, slow IV push max 50mEq
<b>HYPERKALEMIA treatment</b>	
1. Ca gluconate	30mg/kg IV, max 3000mg
--- or ---	
Ca chloride	10mg/kg IV, max 2000mg
2. Insulin	10 units regular IV 1-2 amps D50W

# 24 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

## DRUG DOSES and treatments ADULT

Atropine	0.5mg IV; max 3mg total
Naloxone	0.4-2mg IV/IM/SC, repeat every 3 min as necessary
Flumazenil	0.2mg IV, repeat as necessary
Ephedrine	5-25mg IV, repeat as necessary
Phenylephrine	40-200 MICROgrams IV, repeat as necessary
Epinephrine	2-10 MICROgram/min IV

## 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**

### Breathing

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

### 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

# ADMINISTRATIVE

---

---

# 25 Transfer of care Malignant Hyperthermia patient

In presence of triggering agent: unexpected increase in ETCO<sub>2</sub>, unexplained tachycardia/tachypnea, prolonged masseter muscle spasm after succinylcholine. Hyperthermia is a LATE sign

## START

### 1 Recognize suspected MH

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

### 2 Discontinue triggering agents, initiate treatment

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

### 3 Implement Emergent MH Transfer plan

- Collect patient data: vital signs, temperature, ETCO<sub>2</sub> trends, electrolytes, ECG

- Do not delay transfer!

- **Emergency transfer is mandatory**

### 4 Notify Receiving Healthcare Facility (RHCF): coordinate communication

- Direct **personal communication** is ideal between
  - Anesthesia Care Provider at OBA facility
  - Receiving Physician (critical care, primary or emergency medicine providers at RHCF)
- Coordination of anticipated post-resuscitation needs is **ESSENTIAL** between Anesthesia Care Provider to Receiving Physician



## 26 Transfer of care non-Malignant Hyperthermia patient

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

### START

**1 Recognize signs of an emergency**

**2 Initiate Facility Transfer Protocol**

**3 Have designated person call 911 and contact EMT # for emergency**

**4 Office must have prior plan/transfer of care agreement in place to ensure EMT arrives within 10 min**

**5 Qualified Office-based facility Anesthesia care provider must serve as primary provider for the patient**

**6 Implement Emergent non-MH Facility Transfer plan**

➤ Collect patient data: vital signs, temperature, ETCO<sub>2</sub> 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
- Neumar RW, Otto CW, Link MS, Kronick SL, Shuster M, Callaway CW, Kudenchuk PJ, Ornato JP, McNally B, Silvers SM, Passman RS, White RD, Hess EP, Tang W, Davis D, Sinz E, Morrison LJ. Part 8: adult advanced cardiovascular life support: 2010 American Heart Association Guidelines for Cardiopulmonary Resuscitation and Emergency Cardiovascular Care. *Circulation*. 2010;122(suppl 3):S729–S767
- Ariadne Labs. Crisis Checklist. <https://www.ariadnelabs.org/areas-of-work/safe-surgery/resources/#Downloads&Tools>
- PALS
- de Caen AR, Berg MD, Chameides L, Gooden CK, Hickey RW, Scott HF, Sutton RM, Tijssen JA, Topjian A, van der Jagt E, Schexnayder SM, Samson RA. Part 12: pediatric advanced life support: 2015 American Heart Association Guidelines Update for Cardiopulmonary Resuscitation and Emergency Cardiovascular Care. *Circulation*. 2015;132(suppl 2):S526–S542
- Society for Pediatric Anesthesia. Critical Event Checklists. [http://www.pedsanesthesia.org/wp-content/uploads/2015/02/Critical\\_Event\\_Checklists.pdf](http://www.pedsanesthesia.org/wp-content/uploads/2015/02/Critical_Event_Checklists.pdf)
- Ariadne Labs. Crisis Checklist. <https://www.ariadnelabs.org/areas-of-work/safe-surgery/resources/#Downloads&Tools>

# References

- Fire
- Ariadne Labs. Crisis Checklist. <https://www.ariadnelabs.org/areas-of-work/safe-surgery/resources/#Downloads&Tools>
- Stanford Anesthesia Cognitive Aid Group. Howard SK, Chu LF, Goldhaber-Fiebert SN, Gaba DM, Harrison TK. Emergency Manual: Cognitive aids for perioperative critical events. 2016 (Version 3). <http://emergencymanual.stanford.edu/>
- Society for Pediatric Anesthesia. Critical Event Checklists. [http://www.pedsanesthesia.org/wp-content/uploads/2015/02/Critical\\_Event\\_Checklists.pdf](http://www.pedsanesthesia.org/wp-content/uploads/2015/02/Critical_Event_Checklists.pdf)
- Hart SR, Yajnik A, Ashford J, Springer R, Harvey S. Operating room fire safety. *Ochsner Journal*. 2011;11(1):37–42
- 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
- Urman, R. D., Punwani, N., & Shapiro, F. E. (2012). Patient safety and office-based anesthesia. *Current Opinion in Anaesthesiology*, 25(6), 1. <https://doi.org/10.1097/ACO.0b013e3283593094>
- Evacuation and Preparedness
- [http://www.calhospitalprepare.org/sites/main/files/file-attachments/as\\_active-shooter-planning-and-response-in-a-healthcare-setting\\_1.pdf](http://www.calhospitalprepare.org/sites/main/files/file-attachments/as_active-shooter-planning-and-response-in-a-healthcare-setting_1.pdf)
- [http://www.dhs.gov/sites/default/files/publications/active\\_shooter\\_pocket\\_card\\_508.pdf](http://www.dhs.gov/sites/default/files/publications/active_shooter_pocket_card_508.pdf)
- [http://www.jointcommission.org/assets/1/23/Quick\\_Safety\\_Issue\\_Four\\_July\\_2014\\_Final.pdf](http://www.jointcommission.org/assets/1/23/Quick_Safety_Issue_Four_July_2014_Final.pdf)
- <https://www.osha.gov/Publications/osha3088.pdf>
- <http://www.calhospitalprepare.org/evacuation>

# References

- Power Loss

- Holland, E. L., Hoaglan, C. D., Carlstead, M. A., Beecher, R. P., & Porteous, G. H. (2016). How do I Prepare for OR Power Failure. *APSF*, 6. Retrieved from <http://www.apsf.org/newsletters/html/2016/February/pdf/Feb2016.pdf>
- Eichhorn, J. H., & Hessel, E. A. (2010). Editorial: Electrical power failure in the operating room: A neglected topic in anesthesia safety. *Anesthesia and Analgesia*, 110(6), 1519–1521. <https://doi.org/10.1213/ANE.0b013e3181dce129>

- Oxygen Loss

- Weller J, Merry A, Warman G, Robinson B. Anaesthetists' management of oxygen pipeline failure: room for improvement\*. *Anaesthesia* 2007, 62: 122–126. doi:10.1111/j.1365-2044.2006.04899.x
- Bateman NT, Leach RM. Acute oxygen therapy. *BMJ* 1998; 317 :798 doi: 10.1136/bmj.317.7161.798

- Anaphylaxis

- Ariadne Labs. Crisis Checklist. <https://www.ariadnelabs.org/areas-of-work/safe-surgery/resources/#Downloads&Tools>
- Society for Pediatric Anesthesia. Critical Event Checklists. [http://www.pedsanesthesia.org/wp-content/uploads/2015/02/Critical\\_Event\\_Checklists.pdf](http://www.pedsanesthesia.org/wp-content/uploads/2015/02/Critical_Event_Checklists.pdf)
- Newton Wellesley Hospital
- Stanford Anesthesia Cognitive Aid Group. Howard SK, Chu LF, Goldhaber-Fiebert SN, Gaba DM, Harrison TK. Emergency Manual: Cognitive aids for perioperative critical events. 2016 (Version 3). <http://emergencymanual.stanford.edu/>

# References

- Difficult airway
  - Ariadne Labs. Crisis Checklist. <https://www.ariadnelabs.org/areas-of-work/safe-surgery/resources/#Downloads& Tools>
  - Society for Pediatric Anesthesia. Critical Event Checklists. [http://www.pedsanesthesia.org/wp-content/uploads/2015/02/Critical\\_Event\\_Checklists.pdf](http://www.pedsanesthesia.org/wp-content/uploads/2015/02/Critical_Event_Checklists.pdf)
  - Stanford Anesthesia Cognitive Aid Group. Howard SK, Chu LF, Goldhaber-Fiebert SN, Gaba DM, Harrison TK. Emergency Manual: Cognitive aids for perioperative critical events. 2016 (Version 3). <http://emergencymanual.stanford.edu/>
- Emboli
  - Ariadne Labs. Crisis Checklist. <https://www.ariadnelabs.org/areas-of-work/safe-surgery/resources/#Downloads& Tools>
  - Society for Pediatric Anesthesia. Critical Event Checklists. [http://www.pedsanesthesia.org/wp-content/uploads/2015/02/Critical\\_Event\\_Checklists.pdf](http://www.pedsanesthesia.org/wp-content/uploads/2015/02/Critical_Event_Checklists.pdf)
  - Newton Wellesley Hospital. Labor and Delivery Crisis Checklist. [http://www.emergencymanuals.org/uploads/1/0/9/0/1090835/obcc\\_nwh\\_2016\\_final.pdf](http://www.emergencymanuals.org/uploads/1/0/9/0/1090835/obcc_nwh_2016_final.pdf)
  - Stanford Anesthesia Cognitive Aid Group. Howard SK, Chu LF, Goldhaber-Fiebert SN, Gaba DM, Harrison TK. Emergency Manual: Cognitive aids for perioperative critical events. Creative Commons BY-NC-ND. 2016 (Version 3). <http://creativecommons.org/licenses/by-nc-nd/3.0/legalcode>
  - Desciak ME, Martin DE. Perioperative pulmonary embolism: diagnosis and anesthetic management. *J Clin Anesth* 2011 Mar;23(2):153-65. doi: 10.1016/j.jclinane.2010.06.011

# References

- Hemorrhage
  - Ariadne Labs. Crisis Checklist. <https://www.ariadnelabs.org/areas-of-work/safe-surgery/resources/#Downloads&Tools>
  - Newton Wellesley Hospital. Labor and Delivery Crisis Checklist. [http://www.emergencymanuals.org/uploads/1/0/9/0/1090835/obcc\\_nwh\\_2016\\_final.pdf](http://www.emergencymanuals.org/uploads/1/0/9/0/1090835/obcc_nwh_2016_final.pdf)
  - Stanford Anesthesia Cognitive Aid Group. Howard SK, Chu LF, Goldhaber-Fiebert SN, Gaba DM, Harrison TK. Emergency Manual: Cognitive aids for perioperative critical events. Creative Commons BY-NC-ND. 2016 (Version 3). <http://creativecommons.org/licenses/by-nc-nd/3.0/legalcode>
- Hypercapnia
  - Open Anesthesia. <http://www.openanesthesia.org/hypercapnia-causes/>
- Hypotension
  - Ariadne Labs. Crisis Checklist. <https://www.ariadnelabs.org/areas-of-work/safe-surgery/resources/#Downloads&Tools>
  - Society for Pediatric Anesthesia. Critical Event Checklists. [http://www.pedsanesthesia.org/wp-content/uploads/2015/02/Critical\\_Event\\_Checklists.pdf](http://www.pedsanesthesia.org/wp-content/uploads/2015/02/Critical_Event_Checklists.pdf)
  - Newton Wellesley Hospital. Labor and Delivery Crisis Checklist. [http://www.emergencymanuals.org/uploads/1/0/9/0/1090835/obcc\\_nwh\\_2016\\_final.pdf](http://www.emergencymanuals.org/uploads/1/0/9/0/1090835/obcc_nwh_2016_final.pdf)
  - <https://chemm.nlm.nih.gov/pediatricmedications.htm>
  - Stanford Anesthesia Cognitive Aid Group. Howard SK, Chu LF, Goldhaber-Fiebert SN, Gaba DM, Harrison TK. Emergency Manual: Cognitive aids for perioperative critical events. 2016 (Version 3). <http://emergencymanual.stanford.edu/>

# References

- Hypoxia
  - Ariadne Labs. Crisis Checklist. <https://www.ariadnelabs.org/areas-of-work/safe-surgery/resources/#Downloads&Tools>
  - Society for Pediatric Anesthesia. Critical Event Checklists. [http://www.pedsanesthesia.org/wp-content/uploads/2015/02/Critical\\_Event\\_Checklists.pdf](http://www.pedsanesthesia.org/wp-content/uploads/2015/02/Critical_Event_Checklists.pdf)
  - Stanford Anesthesia Cognitive Aid Group. Howard SK, Chu LF, Goldhaber-Fiebert SN, Gaba DM, Harrison TK. Emergency Manual: Cognitive aids for perioperative critical events. 2016 (Version 3). <http://emergencymanual.stanford.edu/>
- Local Anesthetic Systemic Toxicity
  - American Society for Regional Anesthesia. Checklist for Treatment of Local Anesthetic Systemic Toxicity. [https://www.asra.com/content/documents/asra\\_last\\_checklist.2011.pdf](https://www.asra.com/content/documents/asra_last_checklist.2011.pdf)
  - Society for Pediatric Anesthesia. Critical Event Checklists. [http://www.pedsanesthesia.org/wp-content/uploads/2015/02/Critical\\_Event\\_Checklists.pdf](http://www.pedsanesthesia.org/wp-content/uploads/2015/02/Critical_Event_Checklists.pdf)
  - Newton Wellesley Hospital. Labor and Delivery Crisis Checklist. [http://www.emergencymanuals.org/uploads/1/0/9/0/1090835/obcc\\_nwh\\_2016\\_final.pdf](http://www.emergencymanuals.org/uploads/1/0/9/0/1090835/obcc_nwh_2016_final.pdf)
  - Stanford Anesthesia Cognitive Aid Group. Howard SK, Chu LF, Goldhaber-Fiebert SN, Gaba DM, Harrison TK. Emergency Manual: Cognitive aids for perioperative critical events. 2016 (Version 3). <http://emergencymanual.stanford.edu/>
- Mental Status Change
  - Newton Wellesley Hospital. Labor and Delivery Crisis Checklist. [http://www.emergencymanuals.org/uploads/1/0/9/0/1090835/obcc\\_nwh\\_2016\\_final.pdf](http://www.emergencymanuals.org/uploads/1/0/9/0/1090835/obcc_nwh_2016_final.pdf)



# References

- Malignant Hyperthermia
  - Malignant Hyperthermia Association of United States. Managing a Crisis. <http://www.mhaus.org/healthcare-professionals/managing-a-crisis/>
  - Ariadne Labs. Crisis Checklist. <https://www.ariadnelabs.org/areas-of-work/safe-surgery/resources/#Downloads&Tools>
  - Stanford Anesthesia Cognitive Aid Group. Howard SK, Chu LF, Goldhaber-Fiebert SN, Gaba DM, Harrison TK. Emergency Manual: Cognitive aids for perioperative critical events. 2016 (Version 3). <http://emergencymanual.stanford.edu/>
- Spinal anesthesia – Adverse Events
  - Practice guidelines for the prevention, detection, and management of respiratory depression associated with neuraxial and opioid administration. American Society of Anesthesiologists Task Force on Neuraxial Opioids. <https://www.guideline.gov/summaries/summary/50071/practice-guidelines-for-the-prevention-detection-and-management-of-respiratory-depression-associated-with-neuraxial-opioid-administration-an-updated-report-by-the-american-society-of-anesthesiologists-task-force-on-neuraxial-opioids-and-the-american-society-of>
  - Millers 8<sup>th</sup> edition 2015. High Spinal OR “Total Spinal” Anesthesia
- MH Transfer
  - Malignant Hyperthermia Association of United States. “Developing an Emergent Transfer Care Plan for Suspected Malignant Hyperthermia”. Doi: 10.1213/ANE.0b013e3182373b4a
  - Society for Ambulatory Anesthesia. “Developing an Emergent Transfer Care Plan for Suspected Malignant Hyperthermia”. Copyright SAMBA and MHAUS. 2012
- Non-MH Transfer