

# Operating Room Crisis Checklists

## Management of Adult Emergencies

### Manual for Standard and Customized OR Crisis Checklists

October 2023 version

*This document provides step-by-step guidance on how to access the new version of the Ariadne Labs OR Crisis Checklists (ORCC) (a) in hard copy and downloadable PDF documents with standard, default content (b) standard, default content in a mobile-friendly web version; (c) with customized content created using the editing tool on our ORCC website and (d) an option to edit mobile-friendly customized checklists by editing and locally hosting the source code. This guide is part of the larger package of supplementary materials for the updated ORCC compendium which can be found [here](#).*

## Introduction

Our new ORCC website offers users the opportunity to customize content through an editing tool. This manual is provided for the user to understand the editing tool capacity and guide thinking when customizing the checklists, but edits are ultimately the responsibility of the user.

Before jumping to editing instruction, a quick reminder of the different options we offer to use and customize the new and updated ORCCs, available materials you will need for each option and links to get started:

**Option A** Download the [PDF version](#) of the standard 17-checklist ORCC package and use it either as a printed version in your OR or consult it on an electronic device with a PDF reader.

- This option is best suited for users who are ready to use the compendium as is and may not want to rely on technology. Be sure to review the [Guide to Clinical Use](#) and [Implementation Toolkit](#) before starting any implementation effort.
- Advantage of paper version: does not rely on power or internet and readily available in the OR.
- Advantage of the PDF version: navigation among checklists is simplified via bookmarks

**Option B** Consult the mobile friendly [web version](#) of the standard ORCC package

- This option is best suited for users who want to access the compendium as is and have access to reliable Internet. Be sure to review the [Guide to Clinical Use](#) and [Implementation Toolkit](#) before starting any implementation effort.
- Advantage: can be accessed on any electronic device (desktop, laptop, tablet, smartphone) as long as you have access to the Internet.

**Option C** Use the editing tool on the web version to make institution-specific updates and create PDF versions of customized checklists (one at a time)

- This option is best suited for users who wish to customize the current compendium before implementation. These updates can range from modifying drug dosing instructions to updating protocols to better fit standardized processes at your institution. To get started, review the instructions below covering use of the editing tool on the new website which includes illustrations of the editing options available in each checklist. After reviewing the guide and identifying the changes that need to be made, proceed to the [ORCC website](#) on a desktop, laptop, or tablet device (your browser window needs to be at least 720px wide), make the desired modifications to a given checklist, then save the modified checklist in PDF format. **NOTE:** the changes to your customized checklists will be lost if you do not first save as PDF before exiting the website.

- Advantage: you can customize checklists to the needs of your institution and create your own pdf package or paper version.

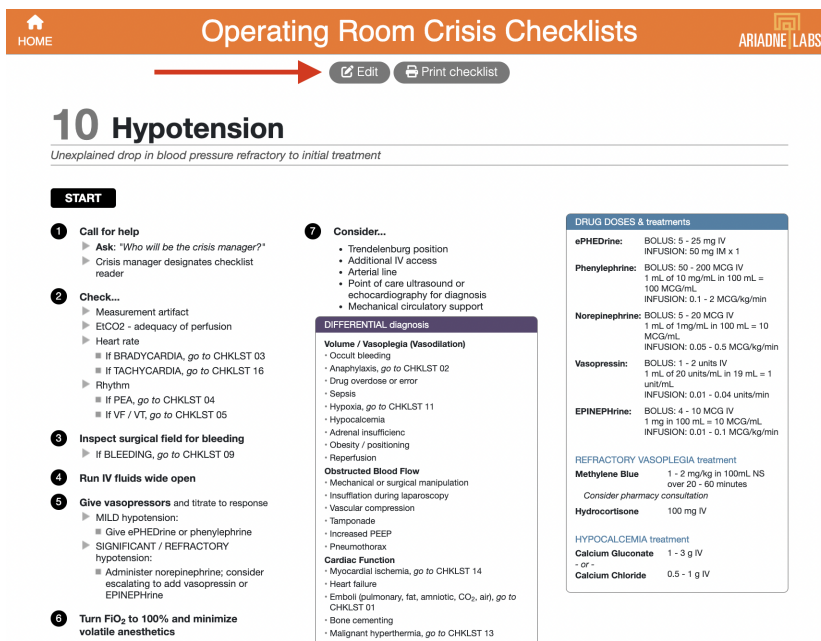
### Option D Download the website code in order to self-host a customized mobile-friendly web version of the ORCC package (requires IT support)

- This option is best suited for organizations interested in self-hosting customized versions of the ORCCs as a responsive, mobile-friendly website. This requires IT resources. To explore this option and understand what is needed to host the code for ORCC at your institution, review the [hosting guide](#).
- Advantage: you can have your own mobile friendly web version of your customized checklists hosted at your institution.

If you decide to use the editing tool on the website (Option C), please refer to the editing instructions below.

## Editing instructions

The editing tool can only be accessed on desktop, laptop, and tablet devices with a screen width of at least 720px, which is wider than most mobile phones. Each checklist has unique customization options and editing instructions, which are illustrated in the [Appendix](#). We will look at hypotension (CHKLST 10) as an example.



**Operating Room Crisis Checklists**

Home Edit Print checklist

### 10 Hypotension

*Unexplained drop in blood pressure refractory to initial treatment*

**START**

- 1 Call for help**
  - ▶ Ask: "Who will be the crisis manager?"
  - ▶ Crisis manager designates checklist reader
- 2 Check...**
  - ▶ Measurement artifact
  - ▶ EtCO<sub>2</sub> - adequacy of perfusion
  - ▶ Heart rate
    - If BRADYCARDIA, go to CHKLST 03
    - If TACHYCARDIA, go to CHKLST 16
  - ▶ Rhythm
    - If PEA, go to CHKLST 04
    - If VF / VT, go to CHKLST 05
- 3 Inspect surgical field for bleeding**
  - ▶ If BLEEDING, go to CHKLST 09
- 4 Run IV fluids wide open**
- 5 Give vasopressors and titrate to response**
  - ▶ MILD hypotension:
    - Give ePHEDrine or phenylephrine
  - ▶ SIGNIFICANT / REFRACTORY hypotension:
    - Administer norepinephrine; consider escalating to add vasopressin or EPINEPHrine
- 6 Turn FIO<sub>2</sub> to 100% and minimize volatile anesthetics**
- 7 Consider...**
  - Trendelenburg position
  - Additional IV access
  - Arterial line
  - Point of care ultrasound or echocardiography for diagnosis
  - Mechanical circulatory support

**DIFFERENTIAL diagnosis**

**Volume / Vasoplegia (Vasodilation)**

- Occult bleeding
- Anaphylaxis, go to CHKLST 02
- Drug overdose or error
- Sepsis
- Hypotonia, go to CHKLST 11
- Hypocalcemia
- Adrenal insufficiency
- Obesity / positioning
- Reperfusion

**Obstructed Blood Flow**

- Mechanical or surgical manipulation
- Insufflation during laparoscopy
- Vascular compression
- Tamponade
- Increased PEEP
- Pneumothorax

**Cardiac Function**

- Myocardial ischemia, go to CHKLST 14
- Heart failure
- Emboli (pulmonary, fat, amniotic, CO<sub>2</sub>, air), go to CHKLST 01
- Bone cementing
- Malignant hyperthermia, go to CHKLST 13

**DRUG DOSES & treatments**

**ePHEDrine:** BOLUS: 5 - 25 mg IV  
INFUSION: 50 mg IM x 1

**Phenylephrine:** BOLUS: 50 - 200 MCG IV  
1 mL of 10 mg/mL in 100 mL = 100 MCG/mL  
INFUSION: 0.1 - 2 MCG/kg/min

**Norepinephrine:** BOLUS: 5 - 20 MCG IV  
1 mL of 1mg/mL in 100 mL = 10 MCG/mL  
INFUSION: 0.05 - 0.5 MCG/kg/min

**Vasopressin:** BOLUS: 1 - 2 units IV  
1 mL of 20 units/mL in 19 mL = 1 unit/mL  
INFUSION: 0.01 - 0.04 units/min

**EPINEPHrine:** BOLUS: 4 - 10 MCG IV  
1 mg in 100 mL = 10 MCG/mL  
INFUSION: 0.01 - 0.1 MCG/kg/min

**REFRACTORY VASOPLEGIA treatment**

**Methylene Blue** 1 - 2 mg/kg in 100mL NS over 20 - 50 minutes

Consider pharmacy consultation

**Hydrocortisone** 100 mg IV

**HYPOCALCEMIA treatment**

**Calcium Gluconate** 1 - 3 g IV  
- or -  
**Calcium Chloride** 0.5 - 1 g IV

Click the "Edit" button at the top of the page. Any editable content should now be visible and will be outlined in a thin black box and accompanied by a red information icon.

# 10 Hypotension

Unexplained drop in blood pressure refractory to initial treatment

**START**

- 1 **Call for help**
  - ▶ Ask: "Who will be the crisis manager?"
  - ▶ Crisis manager designates checklist reader
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  - ▶ Heart rate
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  - ▶ Rhythm
    - If PEA, go to CHKLIST 04
    - If VF / VT, go to CHKLIST 05
- 3 **Inspect surgical field for bleeding**
  - ▶ If BLEEDING, go to CHKLIST 09
- 4 **Run IV fluids wide open**
- 5 **Give vasopressors and titrate to response**
  - ▶ MILD hypotension:
    - Give ePHEDrine or phenylephrine
  - ▶ SIGNIFICANT / REFRACTORY hypotension:
    - Administer norepinephrine; consider escalating to add vasopressin or EPINEPHrine
- 6 **Turn FiO<sub>2</sub> to 100% and minimize volatile anesthetics**

**7 Consider...**

- Trendelenburg position
- Additional IV access
- Arterial line
- Point of care ultrasound or echocardiography
- Mechanical circulatory support

**DIFFERENTIAL diagnosis**

**Volume / Vasoplegia (Vasodilatation)**

- Occult bleeding
- Anaphylaxis, go to CHKLIST 02
- Drug overdose or error
- Sepsis
- Hypoxia, go to CHKLIST 11
- Hypocalcemia
- Adrenal insufficiency
- Obesity / positioning
- Reperfusion

**Obstructed Blood Flow**

- Mechanical or surgical manipulation
- Insufflation during laparoscopy
- Vascular compression
- Tamponade
- Increased PEEP
- Pneumothorax

**Cardiac Function**

- Myocardial ischemia, go to CHKLIST 14
- Heart failure
- Emboli (pulmonary, fat, amniotic, CO<sub>2</sub>, air), go to CHKLIST 01
- Bone cementing
- Malignant hyperthermia, go to CHKLIST 13

**DRUG DOSES & treatments**

**ePHEDrine:** BOLUS: 5 - 25 mg IV  
INFUSION: 50 mg IM x 1

**Phenylephrine:** BOLUS: 50 - 200 MCG IV  
1 mL of 10 mg/mL in 10 mL  
INFUSION: 0.1 - 2 MCG/kg/min

**Norepinephrine:** BOLUS: 5 - 20 MCG IV  
1 mL of 1mg/mL in 10 mL  
INFUSION: 0.05 - 0.5

**Vasopressin:** BOLUS: 1 - 2 units IV  
1 mL of 20 units/mL in 19 mL = 1 unit/mL  
INFUSION: 0.01 - 0.04 units/min

**EPINEPHrine:** BOLUS: 4 - 10 MCG IV  
1 mg in 100 mL = 10  
INFUSION: 0.01 - 0.1

**REFRACTORY VASOPLEGIA treatment**

**Methylene Blue** 1 - 2 mg/kg in 100mL NS over 20 - 60 minutes  
Consider pharmacy consultation

**Hydrocortisone** 100 mg IV

**HYPOCALCEMIA treatment**

**Calcium Gluconate** 1 - 3 g IV  
- or -  
**Calcium Chloride** 0.5 - 1 g IV

Clicking this "i" icon displays the editing guidance.

# 10 Hypotension

Unexplained drop in blood pressure refractory to initial treatment

**START**

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  - ▶ Ask: "Who will be the crisis manager?"
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    - Give ePHEDrine or phenylephrine
  - ▶ SIGNIFICANT / REFRACTORY hypotension:
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- 6 **Turn FiO<sub>2</sub> to 100% and minimize volatile anesthetics**

**Call for help**  
You may add details about how to call for extra help at your facility, such as overhead page or call a specific phone number.  
done

**7 Consider...**

- Trendelenburg position
- Additional IV access
- Arterial line
- Point of care ultrasound or echocardiography
- Mechanical circulatory support

**DIFFERENTIAL diagnosis**

**Volume / Vasoplegia (Vasodilatation)**

- Occult bleeding
- Anaphylaxis, go to CHKLIST 02
- Drug overdose or error
- Sepsis
- Hypoxia, go to CHKLIST 11
- Hypocalcemia
- Adrenal insufficiency
- Obesity / positioning
- Reperfusion

**Obstructed Blood Flow**

- Mechanical or surgical manipulation
- Insufflation during laparoscopy
- Vascular compression
- Tamponade
- Increased PEEP
- Pneumothorax

**Cardiac Function**

- Myocardial ischemia, go to CHKLIST 14
- Heart failure
- Emboli (pulmonary, fat, amniotic, CO<sub>2</sub>, air), go to CHKLIST 01
- Bone cementing
- Malignant hyperthermia, go to CHKLIST 13

**DRUG DOSES & treatments**

**ePHEDrine:** BOLUS: 5 - 25 mg IV  
INFUSION: 50 mg IM x 1

**Phenylephrine:** BOLUS: 50 - 200 MCG IV  
1 mL of 10 mg/mL in 10 mL  
INFUSION: 0.1 - 2 MCG/kg/min

**Norepinephrine:** BOLUS: 5 - 20 MCG IV  
1 mL of 1mg/mL in 10 mL  
INFUSION: 0.05 - 0.5

**Vasopressin:** BOLUS: 1 - 2 units IV  
1 mL of 20 units/mL in 19 mL = 1 unit/mL  
INFUSION: 0.01 - 0.04 units/min

**EPINEPHrine:** BOLUS: 4 - 10 MCG IV  
1 mg in 100 mL = 10  
INFUSION: 0.01 - 0.1

**REFRACTORY VASOPLEGIA treatment**

**Methylene Blue** 1 - 2 mg/kg in 100mL NS over 20 - 60 minutes  
Consider pharmacy consultation

**Hydrocortisone** 100 mg IV

**HYPOCALCEMIA treatment**

**Calcium Gluconate** 1 - 3 g IV  
- or -  
**Calcium Chloride** 0.5 - 1 g IV

After reviewing the editing guidance, close the popup by clicking the "done" button.



# 10 Hypotension

Unexplained drop in blood pressure refractory to initial treatment

**START**

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**7 Consider...**

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**DRUG DOSES & treatments**

**ePHEDrine:** BOLUS: 5 - 25 mg IV  
INFUSION: 50 mg IM x 1

**Phenylephrine:** BOLUS: 50 - 200 MCG IV  
1 mL of 10 mg/mL in 11  
INFUSION: 0.1 - 2 MCG/kg/min

**Norepinephrine:** BOLUS: 5 - 20 MCG IV  
1 mL of 1mg/mL in 11  
INFUSION: 0.05 - 0.5

**Vasopressin:** BOLUS: 1 - 2 units IV  
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**Methylene Blue** 1 - 2 mg/kg in 100mL NS over 20 - 60 minutes  
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**HYPOCALCEMIA treatment**

**Calcium Gluconate** 1 - 3 g IV - or -  
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Once edits to action items within the checklist are complete, look to the reference boxes to make the next round of edits. Click on the information icon in the drug box to view editing instructions.

# 10 Hypotension

Unexplained drop in blood pressure refractory to initial treatment

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- 6 **Turn FiO<sub>2</sub> to 100% and minimize volatile anesthetics**

**Phenylephrine:**  
This is a drop down menu where you can select from dose ranges for MCG/min or MCG/kg/min. You can delete the dilution instructions if desired.

**7 Consider...**

- Additional IV access
- Arterial line
- Point of care ultrasound or echocardiography
- Mechanical circulatory support

**DIFFERENTIAL diagnosis**

**Volume / Vasoplegia (Vasodilation)**

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**DRUG DOSES & treatments**

**BOLUS:** 5 - 25 mg IV  
**INFUSION:** 50 mg IM x 1

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**REFRACTORY VASOPLEGIA treatment**

**Methylene Blue** 1 - 2 mg/kg in 100mL NS over 20 - 60 minutes  
Consider pharmacy consultation

**Hydrocortisone** 100 mg IV

**HYPOCALCEMIA treatment**

**Calcium Gluconate** 1 - 3 g IV - or -  
**Calcium Chloride** 0.5 - 1 g IV

After reviewing the editing instructions, click "done," and proceed to select the best option from the dropdown.

HOME **Operating Room Crisis Checklists** ARIADNE LABS

2 → Done editing Save as PDF/Print

## 10 Hypotension

Unexplained drop in blood pressure refractory to initial treatment

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Norepinephrine: 1 mL of 10 mg/mL in 100 mL = 100 MCG/mL  
 1 mL of 10mg/mL in 250 mL = 40 MCG/mL  
 2 mL of 10mg/mL in 250 mL = 80 MCG/mL  
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HYPOCALCEMIA treatment

Hydrocortisone 100 mg IV

Calcium Gluconate 1 - 3 g IV  
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 Calcium Chloride 0.5 - 1 g IV

When making edits to the drug boxes, it's important to note that drug information cannot be edited with free text, only through the dropdown lists. In some instances, the content may be deleted if not helpful in your setting (see trash can icon on the left). Once you've finished making all edits in the reference boxes, click the "Done editing" button at the top of the page. Your changes should now appear and be integrated into the checklist.

HOME **Operating Room Crisis Checklists** ARIADNE LABS

Edit Save as PDF/Print

## 10 Hypotension

Unexplained drop in blood pressure refractory to initial treatment

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Hydrocortisone 100 mg IV

Calcium Gluconate 1 - 3 g IV  
 - or -  
 Calcium Chloride 0.5 - 1 g IV

Print 1 page

Destination: hpeprint.com

Pages: All

More settings

Cancel Save

You should now "Save as PDF/Print" the customized checklist using the print dialog box (see below). We strongly encourage people to use the "Save as PDF" function as a way to keep a digital version of your edits to each checklist.

Please note that changes will not be saved after reloading the page or closing the editing tool. If at any point you would like to reset your changes, press the refresh button on your browser. Pressing the refresh button will remove ALL changes made, not just the most recent edit.

You can also print the customized checklist to share with your facility. While we tried to optimize for different browsers and printers, the checklists can still render differently depending on the device and settings being used. For best results, use Google Chrome, select the landscape orientation, scale the content down to fit on one page if necessary, and uncheck the option to print headers and footers.

When you create your customized checklists, you will be creating individual checklists (pdf or paper) to create your package. If you like, you can use a PDF software to compile your customized checklists into a single document (“bundle”). We recommend including the Guide to Clinical Use in your compendium. The edited PDF documents will not support navigation from one checklist to another.

That’s it! Each checklist has different options for editing, and following the instructions should provide an efficient option for customizing the content.

# Operating Room Crisis Checklists

## Management of Adult Emergencies

### Visual Editing Guide (Appendix I)

October 2023 version

*This guide details the editing options available for each checklist as well as instructions to help guide the editing process. This is a helpful tool to use in deciding what edits your institutio would like to make before proceeding to the online editing tool. It is part of the larger package of supplementary materials for the updated ORCC compendium which can be found [here](#).*

**i** Please add details about how to call for extra help at your facility, such as overhead page or call a specific phone number.



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## 01 Air Embolism - Venous

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

### START

- 1 Call for help**
  - ▶ Ask: "Who will be the crisis manager?"
  - ▶ Crisis manager designates checklist reader
- 2 Turn FiO<sub>2</sub> to 100%**
  - ▶ Turn off nitrous oxide
- 3 Stop source of gas entry**
  - ▶ Fill wound with irrigation and/or apply bone wax to bone edges
  - ▶ Lower surgical site below level of heart if possible
  - ▶ Search for entry point (including open venous lines)
  - ▶ Desufflate if concern for CO<sub>2</sub> embolism
- 4 Support hemodynamics**
  - ▶ Escalate vasopressor support as needed
  - ▶ Turn down anesthetic agents
- 5 Consider...**
  - ▶ Positioning patient with left side down
    - Continue monitoring during positioning
  - ▶ Removing PEEP in patients with PFO at risk for paradoxical embolism
  - ▶ Avoid spontaneous ventilation; paralyze as needed
  - ▶ Using ET/CO<sub>2</sub> to monitor progression and resolution of embolism or for assessment of cardiac output
  - ▶ If diagnosis is unclear, call for TEE
  - ▶ If ongoing hemodynamic instability, call for ECMO or cardiopulmonary bypass
- 6 Continuing care**
  - ▶ Consider hyperbaric oxygen treatment within 6 hours for evidence of paradoxical embolism

**DIFFERENTIAL diagnosis**

- Amniotic Fluid Embolism
- Cement Embolism
- Venous Thromboembolism/Pulmonary Embolism
- Non-embolic causes of hypotension (CHKLST 10)
- Non-embolic causes of hypoxia (CHKLST 11)

**Critical CHANGES**

If PEA develops, go to CHKLST 04

**i** If your facility has access to a hyperbaric oxygen chamber, you can add details here about how to contact them and coordinate this care. If your facility does not have access, you may delete all of step 6.

**i** Please add details about how to obtain a TEE at your facility here, such as phone numbers or paging groups. If you do not have access to TEE, delete this bullet point.

**i** Please add details about how to coordinate ECMO at your facility here, such as phone numbers or paging groups. If you do not have access to ECMO, delete this bullet point.

**i** Please add details about how to call for extra help at your facility, such as overhead page or call a specific phone number.

## 02 Anaphylaxis

*Hypotension, bronchospasm, high peak-airway pressures, decreased breath sounds, tachycardia, urticaria*

### START

- 1 Call for help**
  - ▶ Ask: "Who will be the crisis manager?"
  - ▶ Crisis manager designates checklist reader
- 2 Give EPINEPHrine bolus**
  - ▶ Repeat bolus with increasing dose as needed
  - ▶ Consider EPINEPHrine infusion
- 3 Establish/secure airway**
  - ▶ Turn FiO<sub>2</sub> to 100% or start supplemental oxygen
- 4 Remove potential causative agents**
- 5 Give fluid bolus**
- 6 Consider...**
  - ▶ Minimize volatile anesthetics if patient remains unstable
  - ▶ Consider albuterol as adjunctive therapy for bronchospasm unresponsive to EPINEPHrine
  - ▶ Vasopressin bolus and/or infusion for patients with hypotension unresponsive to EPINEPHrine
  - ▶ Terminate procedure
  - ▶ Once hemodynamically stable:
    - Supplemental treatment with diphenhydrAMINE and corticosteroids
    - Tryptase level: Check within first hour, repeat at 4 and 18-24 hours

**i** This is a drop down menu where you can select from methods of preparing dilute EPINEPHrine for bolus administration. You can delete the dilution instructions if desired.

**DRUG DOSES & treatments**

<b>EPINEPHrine</b>	BOLUS- 10 - 50 MCG IV 1 mg in 100 mL = 10 MCG/mL INFUSION: 0.01- 0.1 MCG/kg/min If no IV access, 0.3 mg IM
<b>Vasopressin</b>	BOLUS: 1-2 units IV 1 mL of 20 units/mL in 10 mL = 1 unit/mL INFUSION: 0.03 units/min
<b>Albuterol</b>	2-3 puffs MDI 2.5 mg via nebulizer
<b>Supplemental Treatment</b>	
<b>diphenhydrAMINE</b>	25 - 50 mg IV
<b>Corticosteroids</b>	Hydrocortisone 100 mg IV Methylprednisolone 1 mg/kg IV

**i** This is a drop down menu where you can select from dose ranges for MCG/min or MCG/kg/min.

**Common CAUSATIVE AGENTS**

- Neuromuscular blocking agents
- Antibiotics
- Latex products
- IV contrast and dyes
- Sugammadex
- Allogenic blood components (go to CHKLST 17)
- Chlorhexidine

**i** You can delete this dilution instruction if desired.

**Critical CHANGES**

If **Cardiac Arrest** develops:

- Asystole/PEA, go to CHKLST 04
- VF/VT, go to CHKLST 05

If **airway obstruction** develops, go to CHKLST 07

## 03 Bradycardia – Unstable

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

### START

- Call for help and a code cart**
  - Ask: "Who will be the crisis manager?"
  - Crisis manager designates checklist reader
- Turn FIO<sub>2</sub> to 100%**
  - Verify oxygenation/ventilation adequate
  - Consider securing airway
- Administer atropine**
- Stop surgical stimulation** (if laparoscopy, desufflate)
- If atropine ineffective:**
  - Consider EPINEPHrine or DOPamine
  - or -
  - Start transcutaneous pacing (see box)
- Consider...**
  - Assessing and treating underlying etiology (see differential diagnosis box)
  - If hemodynamically unstable, minimizing volatile anesthetics
  - Calling cardiology consult
- If bradycardia progresses to asystole or PEA arrest**
  - go to CHKLST 04

### DRUG DOSES & treatments

**Atropine** 0.5 - 1 mg IV, may repeat up to 3 mg total

**EPINEPHrine** BOLUS: 10 - 100 MCG IV, repeat as needed

1 mg in 100 mL = 10 MCG/mL

INFUSION: 0.01 - 0.1 MCG/kg/min

- or -

**DOPamine** 2 - 20 MCG/kg/min IV infusion

### OVERDOSE treatment

*Beta-blocker*

**Glucagon** 5 - 10 mg IV push

*Calcium channel blocker*

**Calcium chloride** 1g IV

- or -

**Calcium gluconate** 3g IV

*Digoxin*

**Digoxin FAB**; consult pharmacy for patient-specific dosing

### DIFFERENTIAL diagnosis

Drug effect or overdose

Hyperkalemia

Tension pneumothorax

Hypothermia

Auto-PEEP

Hypovolemia

Surgical stimulation

Local anesthesia systemic toxicity (CHKLST 12)

High spinal

Malignant Hyperthermia (CHKLST 13)

Acidosis

Myocardial ischemia (CHKLST 14)

### TRANSCUTANEOUS PACING instructions

- Place pacing electrodes front and back
- Connect 3-lead ECG from pacing defibrillator
- Turn monitor/defibrillator to PACER mode
- Set PACER RATE (bpm) to 80/minute (adjust based on clinical response once pacing is established)
- Start at 60 mA of PACER OUTPUT and increase until electrical capture (pacer spikes aligned with QRS complex)
- Set final milliamperes 10 mA above initial capture level
- Confirm effective capture
  - Electrically: assess ECG tracing
  - Mechanically: palpate femoral pulse

**i** Please add details about how to call for extra help at your facility, such as overhead page or call a specific phone number.

**i** This is a drop down menu where you can select from methods of preparing dilute EPINEPHrine for bolus administration. You can delete the dilution instructions if desired.

**i** This is a drop down menu where you can select from dose ranges for MCG/min or MCG/kg/min.

**i** Please edit instructions for use to be specific to your institution's device(s).



**i** Please add details about how to call for extra help at your facility, such as overhead page or call a specific phone number.

# 04 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"
  - ▶ Crisis manager assigns roles - see ROLE assignments box
- 2 Put backboard under patient**
  - ▶ Turn supine as soon as possible, but do not delay the start of compressions
- 3 Turn FiO<sub>2</sub> to 100%, turn off volatile anesthetic**
- 4 Start CPR and assessment cycle**
  - ▶ Perform CPR
    - "Hard and fast" about 100-120 compressions/min to depth ≥2 inches
    - Ensure full chest recoil with minimal interruptions
    - 10 breaths/minute, do no over-ventilate
      - Bag-mask ventilation until able to place endotracheal tube
  - ▶ Give EPINEPHrine 1mg IV
    - Repeat EPINEPHrine every 3-5 minutes
  - ▶ Assess every 2 minutes (limit assessment to <10 seconds)
    - Change CPR compression provider
    - Check ETCO<sub>2</sub>
      - If: <10 mmHg, evaluate CPR technique
      - If: Sudden increase to >40 mmHg, may indicate return of spontaneous circulation
    - Check rhythm
      - If: Asystole/PEA continues:
        - Resume CPR and assessment cycle (restart Step 4)
        - Treat reversible causes, consider reading aloud differential diagnoses
      - If: VF / VT
        - Resume CPR
        - go to CHKLST 05

- 5 Consider ECMO if refractory cardiac arrest**

**i** Please add details about how to coordinate ECMO at your facility here, such as phone numbers or paging groups. If you do not have access to ECMO, delete this bullet point.

## DRUG DOSES & treatments

<b>EPINEPHrine</b>	1 mg IV, repeat every 3 - 5 minutes
<b>TOXIN treatment</b>	
Local anesthetic	go to CHKLST 12
Beta-blocker	<b>Glucagon</b> 5 - 10 mg IV push
Calcium Channel Blocker	<b>Calcium chloride</b> 1g IV - or - <b>Calcium gluconate</b> 3g IV
<b>HYPERKALEMIA treatment</b>	
Calcium chloride - or - Calcium gluconate	0.5 - 1 g IV 1 - 3 g IV
Sodium bicarbonate (if pH <7.2)	50 mEq IV
Insulin (Regular) - and - Dextrose	5 - 10 units IV 50 - 100 mL D50W IV - or - 250 - 500 mL D10W IV

## ROLE assignments

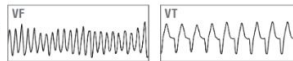
Chest compressions	Code cart
Airway	Time keeping
Vascular access	Checklist reader
Documentation	

## DIFFERENTIAL diagnosis

Hypovolemia	Myocardial ischemia (CHKLST 14)
Hyper- or hypokalemia	Acidosis
Tamponade	Hypoxia (CHKLST 11)
Tension pneumothorax	Hypoglycemia
Auto-PEEP	LAST (CHKLST 12)
Embolism	Surgical stimulation
High neuraxial	
Intra-abdominal hypertension	



# 05 Adult 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 the defibrillator arrives"
- ▶ Crisis manager assigns roles (see ROLE assignments box)

### 2 Put backboard under patient

- ▶ Turn supine as soon as possible, but do not delay the start of compressions

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

### 4 Start CPR - defibrillation - assessment cycle

- ▶ Perform high-quality CPR
  - "Hard and fast" about 100 – 120 compressions/min to depth ≥ 2 inches
  - Ensure full chest recoil with minimal interruptions
  - 10 breaths/minute; do not over-ventilate
    - Bag-mask ventilation until able to place endotracheal tube
- ▶ Defibrillate
  - Shock at highest setting
  - Resume CPR immediately after shock
- ▶ Give EPINEPHrine
  - Repeat EPINEPHrine every 3 – 5 minutes
- ▶ Give antiarrhythmics for refractory VF/VT after 2 shocks
- ▶ Assess every 2 minutes
  - Change CPR compression provider
  - Check ETCO<sub>2</sub>
    - If: <10 mm Hg, evaluate CPR technique
    - If: Sudden increase to >40 mm Hg, may indicate return of spontaneous circulation
  - Treat reversible causes, consider reading aloud differential diagnoses
  - Check rhythm; if rhythm organized, check pulse
    - If: VF/VT continues: Resume CPR cycles (restart Step 4)
    - If: Asystole/PEA: go to CHKLST 04

### 5 Consider ECMO

## DRUG DOSES & treatments

EPINEPHrine 1 mg IV, repeat every 3 – 5 minutes

### ANTIARRHYTHMICS

Amiodarone 1st dose: 300 mg IV  
2nd dose: 150 mg IV

Lidocaine 1st dose: 1 - 1.5 mg/kg  
2nd dose: 0.5 - 0.75 mg/kg

Magnesium 2 - 4 g IV for *Torsades de Pointes*

## DEFIBRILLATOR instructions

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

## ROLE assignments

Chest compressions	Code cart
Airway	Time keeping
Vascular access	Checklist reader
Documentation	

## DIFFERENTIAL diagnosis

Hypovolemia	Myocardial ischemia (CHKLST 14)
Hyper- or hypokalemia	Acidosis
Tamponade	Hypoxia (CHKLST 11)
Tension pneumothorax	Hypoglycemia
Auto-PEEP	LAST (CHKLST 12)
Embolism	
High neuraxial	
Intra-abdominal hypertension	

**i** Please add details about how to call for extra help at your facility, such as overhead page or call a specific phone number.

**i** Please edit instructions for use to be specific to your institution's device(s).

**i** Please add details about how to coordinate ECMO at your facility here, such as phone numbers or paging groups. If you do not have access to ECMO, delete this bullet point.



# 06 Delayed Emergence

*Prolonged unresponsiveness following general anesthesia or abnormal neurologic exam following general anesthesia*

## START

- 1 **Call for help**
  - ▶ Ask: "Who will be the crisis manager?"
  - ▶ Crisis manager designates checklist reader
- 2 **Ensure all anesthetic medications have been stopped**
- 3 **Check for and correct hypoxemia, hypercarbia, hypothermia, or hypotension**
  - ▶ Consider signs of increased intracranial pressure (widened pulse pressure, bradycardia, irregular respirations)
- 4 **Check for and treat residual drug effects**
  - ▶ Neuromuscular blockade (check TOF)
  - ▶ Opiates and hypnotics
- 5 **Send labs**
  - ▶ Arterial blood gas, electrolytes, glucose
- 6 **Correct electrolyte, glucose abnormalities**
- 7 **Perform neurologic examination**
  - ▶ If unresponsive: pupil changes, gag reflex, level of arousal
  - ▶ If responsive: stroke assessment
    - Facial droop - show teeth in smile
    - Pronator drift - eyes closed, extend arms with palms up for 10 seconds
    - Speech assessment - say "you can't teach old dogs new tricks"
    - Assess for severe sudden headache
  - ▶ Consider **STAT head CT** and **neurology consult** for abnormal exam

### DRUG DOSES & treatments

<b>Naloxone</b>	40 MCG IV (0.4 mg in 9 mL = 40 MCG/mL) Repeat q 2 minutes
	<i>If no response to 400 MCG, consider non-opiate causes</i>
<b>Flumazenil</b>	0.2 mg IV Repeat dose q 1 minute Max dose 1 mg
	<i>AVOID in chronic benzodiazepine use or seizure history</i>
<b>Sugammadex</b>	2 - 4 mg/kg IV

### DIFFERENTIAL diagnosis

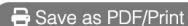
Serotonin syndrome  
 Myxedema coma or thyroid storm  
 Concomitant head injury  
 Hepatic or uremic encephalopathy  
 Neurosurgical complications

- Hemorrhage
- Vascular occlusion
- Elevated ICP

Postictal state following intraoperative seizure  
 Medication error  
 Local Anesthetic Systemic Toxicity (CHLST 12)  
 Central anticholinergic syndrome

**i** Please add details about how to call for extra help at your facility, such as overhead page or call a specific phone number.

**i** Please add details as appropriate for how to obtain a stat head CT or neurology consult at your institution.



# 07 Failed Airway

2 unsuccessful intubation attempts by an airway expert in a patient under general anesthesia

## START

- 1 Call for help and a code cart**
  - ▶ Ask: "Who will be the crisis manager?"
  - ▶ Crisis manager designates checklist reader
- 2 Get difficult airway cart**
- 3 Monitor elapsed TIME, intubation ATTEMPTS, and SpO<sub>2</sub>**
  - ▶ Limit attempts to 3 by initial provider plus 1 attempt by other airway expert ("3+1")
- 4 Bag-mask ventilation with 100% Oxygen**
  - ▶ Is ventilation adequate?
    - Maintaining adequate SpO<sub>2</sub>?
    - Capnographic evidence of adequate ventilation?

Switch list if ventilation status changes

### Ventilation NOT ADEQUATE

- ▶ Consider/attempt supraglottic airway
  - Optimize patient position
- ▶ If unsuccessful, attempt alternative intubation approaches as you **prepare** for emergency invasive airway
  - Limit to "3+1"
- ▶ If you remain unable to intubate and unable to ventilate, **implement** emergency invasive airway

### Ventilation ADEQUATE

- ▶ Attempt alternative intubation techniques
  - Limit to "3+1"
- ▶ Consider doing the procedure with a supraglottic or mask airway
- ▶ Optimize ventilation/intubating conditions
- ▶ Consider invasive airway
- ▶ Consider awakening patient
- ▶ If awakening patient, consider:
  - Awake intubation
  - Complete procedure under local or regional
  - Cancel the procedure

### DRUG DOSES & treatments

<b>Sugammadex</b>	8 - 16 mg/kg IV
<b>Naloxone</b>	0.4 mg IV
<b>Flumazenil</b>	0.2 mg IV May repeat up to 1 mg

*AVOID in chronic benzodiazepine use or seizure history*

### Alternative INTUBATION TECHNIQUES

Video laryngoscope  
 Intubation via supraglottic device  
 Different blades  
 Intubating stylet  
 Gum elastic bougie  
 Flexible bronchoscope  
 Lightwand  
 Retrograde intubation  
 Blind oral or nasal intubation

**i** Please add details about how to call for extra help at your facility, such as overhead page or call a specific phone number.

**i** Specify location of airway cart.

**i** Please add a sub-bullet point to this list with details about how to obtain emergency invasive airway equipment and/or personnel.

**i** Please add or delete equipment to match what is available at your institution.

## 08 Fire

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

## START

- 1 **Call for help**
  - ▶ Ask: "Who will be the crisis manager?"
  - ▶ Crisis manager designates checklist reader
- 2 **Halt surgery, if possible**

## FIRE EXTINGUISHER use

- P - pull the pin  
 A - aim at the base of the fire  
 S - squeeze the handle  
 S - sweep side to side

## If AIRWAY FIRE

- 3 **Attempt to extinguish fire**
  - ▶ Shut off medical gases
  - ▶ Remove endotracheal tube
  - ▶ Remove flammable material from airway
  - ▶ Pour saline in airway
- 4 **After fire extinguished**
  - ▶ Re-establish ventilation using self-inflating bag with room air
    - If unable to re-establish ventilation, go to CHKLST 07
  - ▶ Avoid N<sub>2</sub>O and minimize FIO<sub>2</sub>
  - ▶ 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 examination**

## If NON-AIRWAY patient fire

- 3 **Obtain a fire extinguisher**
- 4 **Attempt to extinguish fire**

**FIRST ATTEMPT**

  - ▶ Discontinue N<sub>2</sub>O and minimize FIO<sub>2</sub>
  - ▶ Remove drapes / all flammable materials from patient
  - ▶ If patient or drapes are on fire: extinguish burning materials with saline or saline-soaked gauze

**If Fire PERSISTS**

  - ▶ Use fire extinguisher (Class A and BC are safe in wounds)
  - ▶ **Activate fire alarm**
- 5 **After fire extinguished**
  - ▶ 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
- 6 **Devise ongoing management plan**
- 7 **Save involved materials/devices for examination**

## If OR EQUIPMENT fire

- 3 **Obtain a fire extinguisher**
- 4 **Attempt to extinguish fire**
  - ▶ Use CO<sub>2</sub> (Class BC) fire extinguisher (avoid liquids)

**If Fire PERSISTS**

  - ▶ Evacuate patient
  - ▶ Close OR door
  - ▶ **Turn OFF gas supply to room**
  - ▶ **Activate fire alarm**
- 5 **After fire extinguished or patient evacuated**
  - ▶ 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
- 6 **Devise ongoing patient management plan**
- 7 **Save involved materials/devices for examination**

**i** Please add details about how to call for extra help at your facility, such as overhead page or call a specific phone number.

**i** If you choose to include "activate fire alarm" here as a sub bullet, you should delete it from step 4 under "NON-AIRWAY" and "OR EQUIPMENT" below.

**i** Please add details about how to activate the fire alarm and/or alert the fire department at your facility.



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# 09 Hemorrhage

Acute massive bleeding

## START

- 1 **Call for help**
  - ▶ Ask: "Who will be the crisis manager?"
  - ▶ Crisis manager designates checklist reader
- 2 **Crystalloid bolus until blood products available**
- 3 **Obtain large bore IV access, rapid infuser**
  - ▶ Obtain arterial access
- 4 **Turn FiO<sub>2</sub> to 100% and reduce volatile anesthetics**
- 5 **Call blood bank**
  - ▶ Activate massive transfusion protocol
    - Consider whole blood
    - Consider uncrossmatched Type O RBC and Type AB plasma
    - Consider autologous blood salvage
  - ▶ Assign 1 person as primary contact for blood bank
- 6 **Begin transfusion in 1 PRBC : 1 FFP : 1 Platelet**
  - ▶ Calcium repletion for massive transfusion
  - ▶ Fibrinogen replacement as indicated
- 7 **Consider TXA administration**
- 8 **Warm patient and fluids**

**i** Please add details about how to coordinate placing a REBOA at your facility here, such as phone numbers or paging groups. If you do not have access to the resources to place a REBOA, delete this bullet point.

- 9 **Discuss management plan** with surgical, anesthesiology, and nursing teams
  - ▶ Call for additional surgery consultation as indicated
  - ▶ Consider damage control surgery (pack, close, resuscitate)
  - ▶ Consider resuscitative endovascular balloon occlusion of the aorta (REBOA) for hemorrhage below the diaphragm
  - ▶ Consider ECMO or cardiac bypass to facilitate surgical repair
- 10 **Send labs**
  - ▶ CBC, PT / PTT / INR, fibrinogen, lactate, arterial blood gas, potassium, and ionized calcium
  - ▶ Viscoelastography
- 11 **Consider re-dosing antibiotics** if EBL > 1500 mL

## DRUG DOSES &amp; treatments

## ANTIFIBRINOLYTIC treatment

**Tranexamic Acid (TXA)** BOLUS: 1 g/kg Over 10 min  
 INFUSION: 1 g/500 mL over 8 hours

## HYPOCALCEMIA treatment

**Calcium Gluconate** 1 g per 3 units product  
**Calcium Chloride** 1 g per 5 units product  
 Adjust to measured ionized calcium

## HYPERKALEMIA treatment

**Insulin (Regular)** 5 - 10 units IV  
 - and -  
**Dextrose** 50 - 100 mL D50W IV  
 - or -  
 250 - 500 mL D10W IV  
**Sodium bicarbonate** 50 mEq IV  
 (if pH < 7.2)

**i** Please add details about how to coordinate ECMO or cardiopulmonary bypass at your facility here, such as phone numbers or paging groups. If you do not have access to ECMO and cardiopulmonary bypass, delete this bullet point.

**i** Delete this bullet if viscoelastic testing is not available at your facility. If you do have viscoelastography available, you may edit to add your brand - "viscoelastography (TEG)".

**i** If autologous blood salvage is not in use at your facility, consider deleting.

**i** Please edit the ratio to match your local practice if it differs from 1:1:1.

**i** Please add details about how to call for extra help at your facility, such as overhead page or call a specific phone number.

**i** Please edit this line with the details about your institution's rapid infuser device(s), e.g. "obtain large bore IV access and the Belmont."

**i** Please add details about how to communicate with the Blood Bank at your institution.

**i** Please add details about how to activate the massive transfusion protocol at your facility. If your facility does not have a massive transfusion protocol, delete this bullet point.

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## 10 Hypotension

Unexplained drop in blood pressure refractory to initial treatment

START

- Call for help**
  - Ask: "Who will be the crisis manager?"
  - Crisis manager designates checklist reader
- Check...**
  - Measurement artifact
  - ETCO<sub>2</sub> - adequacy of perfusion
  - Heart rate
    - If BRADYCARDIA, go to CHKLST 03
    - If TACHYCARDIA, go to CHKLST 16
  - Rhythm
    - If PEA, go to CHKLST 04
    - If VF / VT, go to CHKLST 05
- Inspect surgical field for bleeding**
  - If BLEEDING, go to CHKLST 09
- Run IV fluids wide open**
- Give vasopressors** and titrate to response
  - MILD hypotension:
    - Give ePHEDrine or phenylephrine
  - SIGNIFICANT / REFRACTORY hypotension:
    - Administer norepinephrine; consider escalating to add vasopressin or EPINEPHRINE
- Turn FIO<sub>2</sub> to 100% and minimize volatile anesthetics**

- Consider...**
  - Trendelenburg position
  - Additional IV access
  - Arterial line
  - Point of care ultrasound or echocardiography for diagnosis
  - Mechanical circulatory support
- PERIPHERAL diagnosis**
- Volume / Vasoconstriction**
  - Occult bleed
  - Anaphylaxis
  - Drug overdose
  - Sepsis
  - Hypoxia, go to CHKLST 01
  - Adrenal insufficiency, go to CHKLST 02
  - Obesity / patient positioning, go to CHKLST 06
  - Reperfusion injury, go to CHKLST 07
- Obstructed / Occluded**
  - Mechanical obstruction, go to CHKLST 08
  - Insufflation during laparoscopy, go to CHKLST 10
  - Vascular compression, go to CHKLST 11
  - Tamponade, go to CHKLST 12
  - Increased PEEP, go to CHKLST 13
  - Pneumothorax, go to CHKLST 14
- Cardiac Function**
  - Myocardial ischemia, go to CHKLST 15
  - Heart failure, go to CHKLST 17
  - Emboli (pulmonary fat, amniotic, CO<sub>2</sub>, air, gas), go to CHKLST 18
  - Bone cement embolism, go to CHKLST 19
  - Malignant arrhythmias, go to CHKLST 20

DRUG	DOSES & treatments
ePHEDrine	5 - 25 mg IV - or - 50 mg IM x 1
Phenylephrine:	BOLUS: 50 - 200 MCG IV 1 mL of 10 mg/mL in 100 mL = 100 MCG/mL INFUSION: 0.5 - 1 MCG/kg/min
Norepinephrine:	BOLUS: 5 - 20 MCG IV 1 mL of 1mg/mL in 100 mL = 10 MCG/mL INFUSION: 0.05 - 0.5 MCG/kg/min
Vasopressin:	BOLUS: 1 - 2 units IV 1 mL of 20 units/mL in 19 mL = 1 unit/mL INFUSION: 0.01 - 0.1 units/min
EPINEPHRINE:	BOLUS: 4 - 10 MCG IV 1 mg in 100 mL = 10 MCG/mL INFUSION: 0.01 - 0.1 MCG/kg/min
REFRACTORY VASOPLÉGIA treatment	
Methylene Blue	1 - 2 mg/kg in 100mL NS over 20 - 30 minutes consider pharmacy consultation
Hydrocortisone	100 mg IV
HYPOCALCEMIA treatment	
Calcium Gluconate	1 - 3 g IV
or -	
Calcium Chloride	0.5 - 1 g IV

**i** Please add details about how to call for extra help at your facility, such as overhead page or call a specific phone number.

**i** You may add details about how to obtain a TEE, TTE, or POCUS at your facility here, such as phone numbers or paging groups. If you do not have access to TEE, TTE, or POCUS, delete this bullet point.

**i** You may add details about how to coordinate mechanical circulatory support (ECMO, bypass, VAD, IABP) at your facility here, such as phone numbers or paging groups. If you do not have access to mechanical circulatory support, delete this bullet point.

**i** This is a drop down menu where you can select from methods of preparing dilute Phenylephrine for bolus administration. You can delete the dilution instructions if desired.

**i** This is a drop down menu where you can select from dose ranges for MCG/min or MCG/kg/min.

**i** This is a drop down menu where you can select from methods of preparing dilute Norepinephrine for bolus administration. You can delete the dilution instructions if desired.

**i** This is a drop down menu where you can select from dose ranges for MCG/min or MCG/kg/min.

**i** You can delete this dilution instruction if desired.

**i** This is a drop down menu where you can select from dose ranges for MCG/min or MCG/kg/min.

**i** This is a drop down menu where you can select from methods of preparing dilute EPINEPHRINE for bolus administration. You can delete the dilution instructions if desired.



**i** Please add details about how to call for extra help at your facility, such as overhead page or call a specific phone number.

# 11 Hypoxia

Unexplained oxygen desaturation

## START

- 1 **Call for help**
  - ▶ Ask: "Who will be the crisis manager?"
  - ▶ Crisis manager designates checklist reader
- 2 **Turn FiO<sub>2</sub> to 100%** at high gas flows
  - ▶ Confirm inspired FiO<sub>2</sub> = 100% on gas analyzer
  - ▶ Confirm presence of end-tidal CO<sub>2</sub>
- 3 **Hand-ventilate** to assess compliance
- 4 **Listen** to breath sounds
- 5 **Check...**
  - ▶ Blood pressure, pulse, airway pressures
  - ▶ Capnogram waveform
  - ▶ Endotracheal tube/supraglottic device position
  - ▶ Pulse oximeter placement and limb perfusion
  - ▶ Circuit integrity: disconnection, kinks, holes
- 6 **Consider initial stabilization actions**
  - ▶ Suction secretions
  - ▶ Remove circuit and use self-inflating bag
  - ▶ Alveolar recruitment maneuver and PEEP titration

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**i** Please add details about how to coordinate ECMO at your facility here, such as phone numbers or paging groups. If you do not have access to ECMO, delete this bullet point.

- 7 **Consider causes - see DIFFERENTIAL Diagnosis**
- 8 **If hypoxia persists, consider ECMO**

**i** This is a drop down menu where you can select from methods of preparing dilute EPINEPHrine for bolus administration. You can delete the dilution instructions if desired.

### DRUG DOSES & treatments

Albuterol 3 MDI puffs per ETT  
2.5 mg via nebulizer

EPINEPHrine 10 - 20 MCG IV, repeat PRN  
1 mg in 100 mL = 10 MCG/mL

### Additional DIAGNOSTIC TESTS

Fiberoptic bronchoscopy  
Chest x-ray  
Electrocardiogram  
Transesophageal echocardiogram  
Arterial or venous blood gas  
Lung ultrasound

### DIFFERENTIAL diagnosis

#### Airway / Breathing

- Right mainstem intubation
- Aspiration
- Atelectasis
- Bronchospasm
- Anaphylaxis (CHKLST 02)
- Hypoventilation
- Laryngospasm
- Obesity / positioning
- Pneumothorax
- Pulmonary edema
- Auto-PEEP

#### Circulation

- Embolism (CHKLST 01)
- Heart disease
- Tamponade
- Septic shock
- Severe hypotension (CHKLST 10)

#### Artifacts

- Dyes (e.g. methylene blue)
- Hemoglobinopathies (e.g. methemoglobinemia)

**i** Please add details about how to call for extra help at your facility, such as overhead page or call a specific phone number.

# 12 Local Anesthetic Systemic Toxicity (LAST)

Neurologic or Cardiovascular Signs/Symptoms following use of local anesthetic

## START

- 1 **Call for help**
  - ▶ Ask: "Who will be the crisis manager?"
  - ▶ Crisis manager designates checklist reader
- 2 **Get LAST rescue kit or lipid emulsion and consider early call for ECMO**
- 3 **STOP local anesthetic infusion, if running**
- 4 **START administering lipid emulsion**
  - ▶ Do not delay airway protection or hemodynamic management while waiting for lipid emulsion
- 5 **If seizing:**
  - ▶ Ensure adequate airway patency and ventilation
  - ▶ Administer benzodiazepine
  - ▶ If only propofol is available, administer low dose, e.g. 20 mg increments
- 6 **If hemodynamically unstable, give low-dose EPINEPHrine**
  - ▶ Doses of EPINEPHrine are LOWER than ACLS recommendations
  - ▶ AVOID: beta blockers, calcium channel blockers, local anesthetics, and vasopressin
  - ▶ Ensure adequate airway patency and ventilation
- 7 **If cardiovascular collapse is unresponsive to EPINEPHrine and lipid emulsion, initiate ECMO or cardiac bypass**
- 8 **Continue lipid emulsion for at least 15 minutes after achieving hemodynamic stability**

**i** Add location of LAST rescue kit. If your facility does not have ECMO, You may delete the second half of this line. Information about how to call ECMO can be added in editing step 7.

DRUG DOSES & treatments	
<b>Lipid Emulsion 20%</b>	
<b>Weight ≥ 70 kg</b>	<b>Weight &lt; 70 kg</b>
BOLUS: 100mL IV over 2-3 min	1.5 mL/kg IV over 2-3 min
INFUSION: 250mL IV over 15-20 min	0.25 mL/kg/min IV
Repeat bolus and double infusion if patient remains unstable Max lipid dose 12 mL/kg for initial dosing	
<b>Midazolam</b> 0.05 mg/kg, max 2 mg per dose, repeat as needed	
- or -	
<b>LORazepam</b> 0.1 mg/kg, max 4 mg per dose, repeat as needed	
<b>EPINEPHrine</b>	
10 - 20 MCG IV bolus, increase as needed to max 1 MCG/kg	
1 mg in 100 ml = 10 MCG/ml	

SIGNS and SYMPTOMS
<b>Timing:</b> onset from 60 seconds to 60 minutes following injection of local anesthetic
<b>Neurologic Symptoms:</b> neurologic excitement (agitation, metallic taste, auditory changes) -> seizures (generalized or focal) and neurologic depression
<b>Cardiac Symptoms:</b> decreased cardiac output, conduction
<b>Critical CHANGES</b>
If PEA develops, initiate resuscitation
If VF/VT develops, initiate resuscitation

**i** This is a drop down menu where you can select from methods of preparing dilute EPINEPHrine for bolus administration. You can delete the dilution instructions if desired.

**i** You may add details about how to coordinate ECMO at your facility here, such as phone numbers or paging groups. If you do not have access to ECMO, delete that part of the sentence. If you do not have access to ECMO or cardiopulmonary bypass, delete the whole bullet point.

**i** Please add details about how to call for extra help at your facility, such as overhead page or call a specific phone number.

**i** Add location of malignant hyperthermia kit.

**i** This is a drop down menu where you can select MH Hotline number. For US select- 800-644-9737. For outside North America select 001-209-417-3722. If not applicable, delete this bullet.

# 13 Malignant Hyperthermia

*In presence of trigger agent: unexpected, unexplained increase in end-tidal CO<sub>2</sub>, unexplained tachycardia / tachypnea, 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?"
  - ▶ Crisis manager designates checklist reader
- 2 **Get Malignant Hyperthermia Kit**
- 3 **Call MH Hotline 1.800.644.9737**
- 4 **Assign dedicated person to mix dantrolene**
- 5 **Open IV fluids and consider furosemide**
  - ▶ Goal urine output 1 - 2 mL/kg/hr
- 6 **Turn off volatile anesthetics and transition to non-triggering anesthetics**
  - ▶ **DO NOT** delay treatment to change circuit or CO<sub>2</sub> absorber
  - ▶ Insert charcoal filters on inspiratory and expiratory limbs, if available
- 7 **Turn FiO<sub>2</sub> to 100%**
- 8 **Hyperventilate patient at flows of 10 L / min or more**
- 9 **Terminate procedure**, if possible
- 10 **Give dantrolene**
- 11 **Give bicarbonate** if metabolic acidosis suspected (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 creatinine kinase (CK)
  - ▶ Serum / urine myoglobin
  - ▶ Coagulation profile
- 15 **Initiate supportive care**
  - ▶ Cool patient if >39 C:
    - Lavage open body cavities
    - Gastric lavage with cold water
    - Apply ice externally
    - Infuse cold saline IV
    - STOP cooling when < 38 C
  - ▶ Place Foley catheter, monitor urine output
  - ▶ Plan ICU monitoring for 24 hrs

## DRUG DOSES & treatments

<b>Dantrolene</b>	2.5 mg/kg, repeat up to 10 mg/kg until symptoms subside Rarely, may require up to 30 mg/kg
<b>Ryanodex</b>	Reconstitute 250mg vialS with 5 mL sterile water each (shake until orange) 2.5 mg/kg = 0.05 mL/kg 70kg patient dose = 3.5 mL (~1 vial)
- or - <b>Dantrium or Revonto</b>	Reconstitute 20 mg vials with 60 mL sterile water 2.5 mg/kg = 7.5 mL/kg 70kg patient dose = 525 mL (~9 vials)
<b>Bicarbonate</b>	1 - 2 mEq/kg slow IV push
<b>Furosemide</b>	40 mg IV

## HYPERKALEMIA treatment

<b>Calcium gluconate</b>	1-3g IV
- or -	
<b>Calcium chloride</b>	0.5-1g IV
<b>Insulin</b>	5 - 10 units regular IV
- and -	
<b>Dextrose</b>	50 - 100 mL D50W IV - or - 250 - 500 mL D10W IV

## DIFFERENTIAL diagnosis (consider when using high doses of dantrolene without resolution of symptoms)

### Cardiorespiratory

- Hypoventilation
- Sepsis

### Endocrine

- Thyrotoxicosis
- Pheochromocytoma

### Iatrogenic

- Exogenous CO<sub>2</sub> source (e.g. laparoscopy)
- Overwarming
- Neuroleptic Malignant Syndrome

### Neurologic

- Meningitis
- Intracranial bleed
- Hypoxic encephalopathy
- Traumatic brain injury

### Toxicology

- Radiologic contrast neurotoxicity
- Anticholinergic syndrome
- Cocaine, amphetamine, salicylate toxicity
- Alcohol withdrawal

**i** Delete if not available at your facility.

**i** Please delete the below Dantrolene preparations if they are not available at your facility

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**i** Please add details about how to call for extra help at your facility, such as overhead page or call a specific phone number.

**i** You may add details as appropriate for how to obtain a cardiology consult or cath lab activation at your institution.

**i** You may add details about how to obtain a TEE or TTE at your facility here, such as phone numbers or paging groups. If you do not have access to TEE or TTE, delete this bullet point.

## 14 Myocardial Ischemia

*Chest Pain, Shortness of Breath, ST Elevation or Depression, Ventricular Arrhythmias*

### START

- Call for help**
  - Ask: "Who will be the crisis manager?"
  - Crisis manager designates checklist reader
- Increase oxygen delivery and decrease oxygen demand**
  - Increase Supply:
    - 100% FIO<sub>2</sub>
    - Correct anemia (goal hgb 7-9 g/dL)
    - Correct hypotension (see CHKLST 10)
  - Decrease Demand:
    - Correct tachycardia - caution in RCA ischemia (II, III, aVF)
    - Correct hypertension
    - Restore sinus rhythm (see CHKLST 16)
- Obtain 12-lead EKG and send troponin levels**
- Consult cardiology**
  - Consideration of anticoagulation and/or antiplatelet therapy
  - Consideration of thrombolysis or cardiac catheterization
- Discuss clinical condition with surgical team**
  - Safe to abort surgery?
  - Safe to consider anticoagulation and/or antiplatelet therapy?
- Consider hemodynamic monitoring**
  - If ongoing hemodynamic instability, arterial line
  - If persistent vasopressor requirement, central line
  - If evidence of cardiogenic shock, non-invasive cardiac output monitor or PA catheter
- Consider TEE or TTE if ongoing hemodynamic instability**
- Consider ICU admission**

**i** This is a drop down menu where you can select from methods of preparing dilute Norepinephrine for bolus administration. You can delete the dilution instructions if desired.

**i** This is a drop down menu where you can select from dose ranges for MCG/min or MCG/kg/min.

DRUG DOSES & treatments	
Nitroglycerin	0.5 - 5 MCG/kg/min
Aspirin	325 mg PO/PR x1 dose
Heparin	4000 - 5000 units IV push
Norepinephrine	BOLUS: 5 - 20 MCG IV 1 mL of 1mg/mL in 100 mL = 10 MCG/mL INFUSION: 0.05 - 0.5 MCG/kg/min
EPINEPHrine	BOLUS: 4 - 10 MCG IV 1 mL in 100 mL = 10 MCG/mL INFUSION: 0.05 - 0.5 MCG/kg/min
Esmolol	50 - 300 MCG/kg/min
Metoprolol	5 - 20 mg IV

**i** This is a drop down menu where you can select from methods of preparing dilute EPINEPHrine for bolus administration. You can delete the dilution instructions if desired.

DIFFERENTIAL diagnosis	
Coronary artery disease with acute thrombus	
Coronary artery disease with demand ischemia	
Coronary artery embolism	
Local Anesthetic Systemic Toxicity (CHKLST 12)	
Severe hypoxia (CHKLST 11)	

Critical CHANGES	
If PEA develops, go to CHKLST 04	
If VF/VT develops, go to CHKLST 05	

**i** This is a drop down menu where you can select from dose ranges for MCG/min or MCG/kg/min.

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**i** Please add details about how to call for extra help at your facility, such as overhead page or call a specific phone number.

## 15 OB Hemorrhage

Cumulative Blood Loss (intrapartum and postpartum) > 1000 mL  
of hypovolemia within 24 hours after delivery

### START

#### 1 Call for help

- Ask: "Who will be the crisis manager?"
- Crisis manager designates checklist reader
- Crisis manager designates a person to monitor estimated blood loss

#### 2 Announce vital signs and cumulative blood loss every 10 minutes

#### 3 Open IV fluids and establish adequate IV access

- Warm patient and fluids
- Insert bladder catheter
- Consider arterial access

#### 4 Turn FiO<sub>2</sub> to 100% or start supplemental oxygen

- Minimize volatile anesthetics

#### 5 Prepare for transfusion

- Assign 1 person as primary contact with Blood Bank
- Activate massive transfusion protocol
- Request rapid transfuser device

#### 6 Send STAT labs

- CBC, BMP, Type and Screen, fibrinogen, PT, aPTT, lactate
- Viscoelastography

**i** Please add details about how to activate the massive transfusion protocol at your facility and adjust terminology if needed. If your facility does not have a massive transfusion protocol, delete this bullet point.

**i** Consider changing the frequency to q10-15 depending on the severity of the hemorrhage.

**i** There is relatively little data to guide a fixed ratio of blood product transfusion in obstetric patients. Please edit the ratio to match your local practice.

**i** If one of these products is not available at your facility, or if you prefer use of one product over the other, delete the relevant bullet point.

#### 7 Give uterotonic agents and tranexamic acid

#### 8 Begin transfusion

- Transfuse with products in ratio of 4 PRBCS : 4 FFP : 1 Platelet
- target fibrinogen > 200 mg/dL
  - 10 units cryoprecipitate, expected rise 100 mg/dL
  - Fibrinogen concentrate 4g, expected rise 100 mg/dL

#### 9 Surgical team: perform exam and uterine massage

- Consider the differential diagnosis (see box)
- Consider D+C, laceration repair, uterine tamponade
- If bleeding unresponsive, consider uterine artery ligation or hysterectomy, or Interventional Radiology for embolization

**i** Delete this bullet if viscoelastic testing is not available at your facility.

DRUG DOSES & Comments
<b>Oxytocin (Pitocin)</b> 3 units IM BOLUS or 5-10 units IM BOLUS Followed by — 10 - 40 units in 500 - 1000 mL IV INFUSION <i>Caution in hypotension</i>
<b>Methylergonovine maleate (Methergine)</b> 0.2 mg IM q 2 - 4 hours DO NOT administer IV <i>Caution in hypertension, cardiac disease</i>
<b>Carboprost tromethamine (Hemabate)</b> 250 MCG q 15 - 90 min IM x8 max DO NOT administer IV <i>Caution in asthma, HTN</i>
<b>miSOPROStol (Cytotec)</b> 800 - 1000 MCG PR/buccal/SL x1 dose
<b>Tranexamic Acid (TXA)</b> 1000mg IV over 10 min, repeat x1 after 30 min
<b>Calcium Chloride</b> 1g per 5 units product
<b>Calcium Gluconate</b> 1g per 3 units product
DIFFERENTIAL diagnosis
<ul style="list-style-type: none"> <li>Tone (uterine atony)</li> <li>Trauma (lacerations or uterine rupture)</li> <li>Tissue (retained placenta)</li> <li>Thrombin (clotting factor deficiency)</li> </ul>

**i** Please edit this to match your institutional high-dose oxytocin protocols if different.

**i** You may edit this box to include institution-specific phone numbers or protocols for activating OR or IR resources in obstetric emergencies.



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# 16 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?"
  - ▶ Crisis manager designates checklist reader
- 2 **Turn FiO<sub>2</sub> to 100% and turn down volatile anesthetic**
- 3 **Analyze rhythm**
  - ▶ If **wide complex, irregular**: treat as VF, go to CHKLST 05
  - ▶ If **narrow complex, regular**: consider adenosine while awaiting cardioversion
- 4 **Prepare for immediate synchronized cardioversion**
  - ▶ Sedate conscious patients unless deteriorating rapidly
- 5 **Cardiovert per instructions in gray box**
  - ▶ If **cardioversion needed and unable to synchronize**, use high-energy unsynchronized shocks (biphasic - select highest setting, monophasic - 360 J)
- 6 **If resistant to electrical conversion, consider amiodarone**
- 7 **Consider cardiology consultation**

## DRUG DOSES & treatments

<b>Adenosine</b>	6 mg rapid IV push If persistent, 12 mg rapid IV push <i>Caution in severe asthma</i>
<b>Amiodarone</b>	150 mg IV over 10 minutes May repeat x1

## SYNCHRONIZED CARDIOVERSION Instructions

1. Turn monitor/defibrillator ON, set to defibrillator mode
2. Place electrodes on chest
3. Engage synchronization mode
4. Adjust EKG if necessary until SYNC markers seen with each R-wave
5. Select energy level
6. Press charge button
7. Press and hold shock button
8. Check monitor, if tachycardia persists, increase energy level
9. Engage synchronization mode after delivery of each shock

## ENERGY Level

CONDITION	ENERGY LEVEL
Narrow complex, regular	50 J - 100 J
Narrow complex, irregular	120 J - 200 J biphasic; 200 J monophasic
Wide complex, regular	100 J
Wide complex, irregular	Treat as VF, go to CHKLST 05

## Critical CHANGES

- If **Cardiac Arrest** develops:
- Asystole/PEA, go to CHKLST 04
  - VF/VT, go to CHKLST 05

**i** Please add details about how to call for extra help at your facility, such as overhead page or call a specific phone number.

**i** Please edit instructions for use to be specific to your institution's device(s). Please limit content to 10 lines.

# 17 Transfusion Reaction

**Hemolytic Reaction:** Cardiac instability, bronchospasm, bleeding, dark urine

**Non-hemolytic Reaction:** fever, rash, pulmonary edema

**Anaphylactic Reaction:** hypotension, urticaria, bronchospasm

## START

- 1 **Call for help**
  - ▶ Ask: "Who will be the crisis manager?"
  - ▶ Crisis manager designates checklist reader
- 2 **Disconnect any blood products infusing**
  - ▶ Check blood product labels for correct patient name and ABO compatibility
  - ▶ Send the blood product(s) back to the blood bank for evaluation
- 3 **Support hemodynamics with EPINEPHrine**
  - ▶ Repeat bolus with increasing dose as needed
  - ▶ Consider EPINEPHrine infusion
- 4 **Manage bronchospasm**
  - ▶ FIO<sub>2</sub> 100%
  - ▶ Albuterol or EPINEPHrine
- 5 **Maintain urine output if hemolysis noted**
  - ▶ Volume load 20 mL/kg crystalloid. *Caution if signs of volume overload.*
  - ▶ Consider furosemide or mannitol to goal UOP 1-2 mL/kg/hr
- 6 **Monitor labs**
  - ▶ Arterial or venous blood gas, electrolytes
  - ▶ PT, aPTT, fibrinogen, viscoelastography
  - ▶ Direct antiglobulin (Coomb's) test, haptoglobin, LDH, free hemoglobin, tryptase
- 7 **Consider invasive lines**
  - ▶ Arterial line for ongoing hemodynamic instability
  - ▶ Central venous catheter for vasopressors
- 8 **Further treatment**
  - ▶ Consider hematology consult and ICU admission

DRUG DOSES & treatments	
EPINEPHrine	BOLUS: 10 -20 MCG IV 1 mg in 100 mL = 10 MCG/mL NFUSION: 0.01 - 0.1 MCG/kg/min
Furosemide	BOLUS 40 mg IV
Albuterol	2-3 puffs MDI via ETT 2.5 mg via nebulizer

DIFFERENTIAL diagnosis	
Anaphylaxis from other causes (CHKLST 02)	
Hypotension (CHKLST 10)	
Transfusion Related Acute Lung Injury (TRALI)	
Transfusion-Associated Circulatory Overload (TACO)	
Septic Shock	
Other hemolytic anemias (idiopathic, HUS, HELLP)	

**i** Please add details about how to call for extra help at your facility, such as overhead page or call a specific phone number.

**i** Delete "viscoelastography" if viscoelastic testing is not available at your facility.

**i** Edit the names of these tests to match the names in the orders available at your facility.

**i** This is a drop down menu where you can select from methods of preparing dilute EPINEPHrine for bolus administration. You can delete the dilution instructions if desired.

**i** This is a drop down menu where you can select from dose ranges for MCG/min or MCG/kg/min.