JUSTICE INSTITUTE of BRITISH COLUMBIA

HEALTH SCIENCES DIVISION

Advanced Care Paramedic

Treatment Guidelines Resource Manual

December 2015

www.jibc.ca

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Tenth Edition December 2015

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Overview – ACP Adult Treatment Guidelines

The following treatment guidelines have been developed for the use of Advanced Care Paramedics (ACP) in the province of British Columbia. This set of assessment models and treatment guidelines reflect the accepted medical practice for ACP within British Columbia. Each treatment guideline follows the current direction of the medical community taking into consideration the limitations and special circumstances that may exist in the out-of-hospital care environments.

Besides these treatment guidelines, the ACP is expected to be knowledgeable for all the information of other levels of licensure. If there are differences between the ACP treatment guidelines and the same treatment guidelines for other levels, the ACP shall follow the ACP treatment guidelines.

Treatment guidelines are designed to be educational tools, summaries, or memory aids for those providing care. Adequate airway, ventilation, O_2, compressions, defibrillations take precedence over medication, I.V., etc.

For all treatment guidelines, consider:

- Treat the patient, not the monitor
- Use intervention when appropriate indications exist
- Remember classifications of drugs or interventions

AHA Classifications of Recommendations

Class	LEVEL OF EVIDENCE	COMMENTS ON INTERVENTIONS
Class I (Strong) Benefit >>>Risk	Excellent	Procedure/Treatment **SHOULD** be performed/administered
Class II a (Moderate) Benefit >>Risk	Good to very good	Additional studies with focussed objective. **IT IS REASONABLE** to perform procedure/treatment
Class II b (Weak) Benefit ≥Risk	Fair to good	Additional studies with broad objectives needed: Additional registry data would be helpful. Procedure/Treatment **MAY BE CONSIDERED**
Class III (Moderate) No Benefit	Unacceptable	**Procedure/Test:** not helpful. **Treatment:** no proven benefit. Procedure/Treatment is **NOT** useful/effective and **MAY BE HARMFUL**
Class III (Strong) Harm	Unacceptable	**Procedure/Test:** Excessive cost/harmful **Treatment:** Harmful to patients Procedure/Treatment is **NOT** be useful/effective and **MAY BE HARMFUL**

Adult cardiac arrest treatment guidelines principles:

- AHA Guidelines now use “C-A-B” in order to emphasize the importance of chest compressions and to begin them as soon as possible. The pulse check is now de-emphasized to identify cardiac arrest. Delays in chest compressions should be minimized and it should take no longer than 10 seconds to check for a pulse or to defibrillate the patient.
- The time on the chest makes a difference and the AHA Guidelines are meant to enable maximum time on the chest. Best survival occurs when high quality CPR is delivered 80% of the time during the arrest.
- It is not acceptable to stop chest compressions or delay defibrillations for procedures or drugs that have not been proven effective. This includes advanced airway management and anti-arrhythmic therapy
- Target compression rate is 100-120/min with 1 ventilation delivered every 6 seconds (10 breaths per minute) asynchronously with low volume (500-600 cc of an adult BVM) and low pressure **(AHA 2015)**
- Depths of compressions is at least 2 inches (5 cm) for an average adult, while avoiding excessive chest compression depths greater than 2.4 inches (6 cm) **(AHA 2015)**
- Every 2 minutes change “compressors”
- Avoid leaning on the chest between compressions, to allow full chest wall recoil for adults in cardiac arrest **(AHA 2015)**
- When switching defibrillators the important principle is to not interrupt the treatments. The appropriate time to switch would be during the 2 minute period of CPR.
- Limit interruptions of chest compressions to less than 10 seconds **(AHA 2015)**
- Medications given via ETT usually require a 2-2.5 x the IV dose, followed by 10-20 cc saline “flush” and rapid ventilations.

How to Use This Manual

This manual is organized as follows:

Section 1:	Cardiac Arrest/Cardiovascular Treatment Guidelines
Section 2:	Respiratory Treatment Guidelines
Section 3:	Trauma Treatment Guidelines
Section 4:	Medical Treatment Guidelines
Appendix A:	Drug Therapy
Appendix B:	Procedures

Each treatment guideline is followed by general principles, therapies and special considerations.

Treatment Guideline Pages

The treatment guideline pages include:

- "Throughout the Call" – actions to be maintained throughout the call
- Algorithm – a simplified linear representation of complex activities that represents the latest point at which the actions may be performed. The steps of the algorithm must be integrated with ongoing patient assessment and management.
- Footnotes – provided to allow for variations in applying the protocol

Guideline Pages

At best guidelines cannot address every situation a paramedic may encounter. The guideline pages provide further explanations of the various situations in which the treatment guideline may be used.

Section 1:
Cardiac Arrest / Cardiovascular Treatment Guidelines

Overview: Cardiac Arrest Emergencies

This section covers the treatment guidelines and procedures to be followed in a cardiac arrest. The treatment guidelines assume that you have made adequate provision for airway control, establishment of an intravenous line, and cardiac monitoring, where appropriate. They also assume that Basic Cardiac Life Support (BCLS) is ongoing at all times during an arrest, with minimal interruption of CPR (hands off the chest) for intubation, defibrillation, or diagnostic monitoring.

If an unusual cause of arrest is apparent, such as overdose, diabetic ketoacidosis, or renal failure, try to contact EPOS as soon as possible.

If you think hypoglycemia is a component of the cardiac arrest, confirm with a blood test and if blood glucose is < 4 mmol/L administer 25 grams of 50% dextrose IV/IO.

If an **opioid** drug overdose is suspected during an arrest, administer Naloxone 4 mg IV/IO or 8-10 mg ET.

Follow all drugs given by a peripheral IV/IO with a 10-20 mL fluid bolus to help push them into the central circulation system.

There is less emphasis on intubation early on in the arrest, providing that BVM is effective.

The following pages contain the **adult** cardiac arrest treatment guidelines. **Do not use them in patients less than 13 years of age or less than 35 kg in weight or those children who are clinically pre pubertal**. **Please refer to the separate pediatric treatment guidelines section.**

Causes of Cardiac Arrest

Some treatable causes of cardiac arrest	Suggested example field treatments	Rhythm
Drug Overdoses • Tricyclic antidepressant • Cocaine • Amphetamines • Class Ia antiarrhythmics such as procainamide, quinidine, and disopyramide • Calcium channel blocker, beta blockers	Naloxone for **opioids** Sodium bicarbonate for TCA OD to inhibit TCA's protein binding. $MgSO_4$ in Class 1a and sotolol hydrochloride OD $CaCl_2$ for calcium channel and beta blocker OD	**PEA** **Asystole**
Torsades de pointes The clinical situations often associated with torsades are: • Congenital prolonged QT • Severe starvation states • Nutritional deficiency • Anti-arrhythmic drug therapies with Class Ia agents or sotalol.	Effective treatment consists of $MgSO_4$, 4.0 grams as a bolus. Routine administration of $MgSO_4$ in cardiac arrests has not been of proven efficacy.	**Torsades de pointes**
Pacemaker Failure Pacemaker failure presenting as asystole is not a common event. For asystole to present as a manifestation of pacemaker failure, the entire power unit of the pacemaker would have to fail abruptly in a patient with no native underlying rhythm. Pacemaker leads may fracture, resulting in pacemaker spikes without capture.	Treat as profound bradycardia	**PEA** **Asystole**

Some treatable causes of cardiac arrest	Suggested example field treatments	Rhythm
Cardiac Tamponade **Hypothermia** **Pulmonary embolus** **Sepsis**	A field bolus may be beneficial in these cases, however, field treatment of these conditions is limited. Rapid transport is indicated. Contact EPOS as early as possible.	**PEA** **Asystole** **VF**
Tension pneumothorax	Needle thoracentesis is immediately indicated for cardiac arrest patients suspected of having a tension pneumothorax.	**PEA** **Asystole**
Hypovolemia	Treat with IV fluid bolus and rapid transport.	
Hypoxia	Ensure 100% oxygen optimal perfusion (CPR)	
Acidosis	Ensure adequate oxygenation and optimum perfusion. Give Sodium bicarbonate if acidosis is the cause of the arrest.	
Anaphylaxis	IV Epinephrine, fluid bolus	
Hyperkalemia (Renal failure patients)	Sodium bicarbonate $CaCl_2$	
Profound bradycardia	Epinephrine bolus	**PEA**
Extremely rapid tachycardia	Cardioversion	

Skills and Procedures Guideline – Resusciation Orders

	Intervention Notes	Action
Advance Care Directive	Establish that the patient's advanced care directive is clear and valid	Follow the patient's wishes as outlined in the directive
Expected Home Death DNR – Order with patient	Patient has a physician order or a signed "No CPR" form or a "No CPR" bracelet	Do not resuscitate Contact EPOS for orders if unsure of appropriateness of DNR
Unexpected Home Death in the presence of a terminal illness "No" DNR	Perform basic life support procedures until a determination of viability can be assessed	Start CPR and immediately determine the medical history. Consult with EPOS
Traumatic Arrest	Traumatic arrest in the absence of massive disruptive injuries. Time is critical to survival. Commence resuscitation with immediate transport. Consult EP en-route if travel time > 15 minutes	**Refer** to new Traumatic Cardio-pulmonary Arrest TG's. Start CPR immediately if the downtime < 15 minutes.
Cardiac Arrest < 15 minutes No unusual medical characteristics	Follow standard resuscitation guidelines. Characteristic of sudden cardiac death – **No** treatable cause identified	Attempt to contact EPOS following 15 minutes of high quality CPR. Option is to transport or provide a further 15 minutes of CPR on scene with discontinuation at 30 minutes if no ROSC at any time
Cardiac Arrest > 15 minutes No unusual characteristics	Commence resuscitation until the downtime can be accurately determined to be >15 minutes with no resuscitative efforts	Start CPR and immediately determine the medical history. Discontinue if timeframe is determined to be definitive

	Intervention Notes	Action
Environmental Death Hypothermia	These patients require a careful assessment and special care. Transport with CPR. Only an ACP may determine death in the field in consultation with the EPOS.	Follow guidelines for Hypothermic Cardiac Arrest. Early consultation with EPOS is required. If discontinue orders are received, cardiac monitoring and auscultation for a full 2 minutes are required before assuming death
Obvious Death – • Prolonged down time • Decapitation • Trans-section • Open skull fracture with brain tissue evident • Evidence of tissue decomposition, including rigor mortis and/or lividity	Permanent cessation of all vital functions The final and irreversible cessation of perceptible heart beat and respiration	Non viability is obvious. CPR is not initiated
CBRNE – Related Deaths	These situations are unique and require special training	Contact Technical Advisor (TA) through dispatch. These patients have to be managed as a contamination hazard until otherwise determined.

CPR Adult Cardiac Arrest – Unwitnessed by Paramedic

Attendant	Driver
10 second check If no response, no pulse and absent or abnormal breathing, **Say "Start Compression"**	Turn on AED or Monitor/Defibrillator Bare chest Initiate chest compressions (CC)
Apply pads ASAP	CC rate of 100-120/min until pads applied
Prepare BVM	Push analyse or interpret rhythm Check pulse
Ventilate with low volume and low pressure once every 10 chest compressions. Check for airway patency/foreign body without stopping chest compressions	Immediate CC while charging
"Clear"	Push to shock
Time for 2 minutes of CPR	Immediate CC for 2 minutes (200 CC or 20 cycles of 10)
Apply BVM	
Ventilate once 10 compressions	If timer available have them timing 2 minutes
Time to analyse after 2 minutes	
After passing off BVM check pulse during analysis	Push Analyze
If shock is indicated compress while charging, clear, the defibrillate	Move to maintain BVM and take over ventilations
Do next 2 minutes of CC	Time for 2 minutes of CPR Ventilate once every 10 CC (no more than 10/min)

Repeat last section until return of spontaneous circulation, arrival of ALS, arrival at hospital, or discontinue order after a minimum of 30 minutes of CPR

CPR Adult Cardiac Arrest – Witnessed by Paramedic

Attendant	Driver
10 second check – if no response, no pulse and absent or abnormal breathing, perform precordial thump and begin chest compressions. After pads applied, push analyse or, if ALS, interpret rhythm	Open and turn on AED or Monitor/Defibrillator Bare chest and apply pads ASAP
Prepare BVM	Immediate Chest Compressions (CC) while charging, rate 100/min
"Clear"	Push to shock

Assess for immediate return of signs of circulation or responsiveness

If no response

Time for 2 minutes of CPR Apply BVM Ventilate once every 10 compressions	Immediate CC for 2 minutes (200 CC or 20 cycles of 10) If timer available have them timing 2 minutes
Time to analyse after 2 minutes	
Say "Clear"	Push to shock
After passing off BVM check pulse during analysis. If shock is indicated compress while charging, clear, then defibrillate	Push Analyze Move to maintain BVM and take over ventilations
Do next 2 minutes of CC	Time for 2 minutes of CPR Ventilate once every 10 CC (no more than 10/min

Repeat last section until return of spontaneous circulation, arrival of ALS, arrival at hospital, or discontinue order after a minimum of 30 minutes of CPR

Ventricular Fibrillation or Pulseless Ventricular Tachycardia

THROUGHOUT THE CALL
Use "Paddles" mode to monitor patient

INDICATIONS

Patients in cardiac arrest who present with ventricular fibrillation or pulseless ventricular tachycardia rhythm.[1.]

Precordial thump in paramedic witnessed arrest

↓

Immediately start high quality CPR

↓

Defibrillate once every 2 min[2]
200 J, 300 J, 360 J, 360 J, etc.

↓

Consider treatable causes[3]

↓

Initiate IV/IO N/S and intubate

↓

Epinephrine 1.0 mg then q 3 min[4]
(Consider 4 grams $MgSO_4$ if indicated).

↓

Amiodarone 300 mg

↓

Amiodarone 150 mg 5 minutes after initial bolus

↓

Lidocaine 1.5 mg/kg [5]

↓

Lidocaine 1.5 mg/kg[5]

↓

Contact EPOS

- Rapid transport
- $MgSO_4$ if not already administered
- Consider discontinue orders

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[1] Confirm patient is clinically in cardiac arrest and rapid scene scan reveals no evidence that paramedics should not attempt CPR (No CPR Order).
[2] Minimize hands off time between analyses.
[3] Refer to the Causes of Cardiac Arrest Overview.
[4] Sodium bicarbonate and/or $MgSO_4$ should be administered following the recommendations in the Causes of Cardiac Arrest Overview. The dose for sodium bicarbonate is 1.0 mEq/kg, then 0.5 mEq/kg q 10 min.
[5] Lidocaine to be administered if patient is refractory to Amiodarone, patient has an allergy to it or if Amiodarone isn't available

Guidelines for Ventricular Fibrillation or Pulseless Ventricular Tachycardia Treatment Guideline

General Principles

- The treatment guidelines assume that you have made adequate provision for airway control, establishment of an intravenous line, and cardiac monitoring. They also assume that Basic Cardiac Life Support (BCLS) is going at all times during an arrest, with minimal interruption of CPR (hands off the chest) for intubation, defibrillation, or diagnostic monitoring.

- High quality continuous CPR coupled with ACLS procedures maintains a viable patient while you identify and treat the cause of the cardiac arrest.
- Early defibrillation is the key to the Ventricular Fibrillation or Pulseless Ventricular Tachycardia (VF/VT) treatment guidelines.
- Consider treatable causes of cardiac arrest, as indicated in the Causes of Cardiac Arrest Table in Section 1 Overview. Transport and consult with EPOS if a treatable cause such as electrolyte disturbance is suspected
- Observe the $ETCO_2$ value. A level of 10mmHg means very little blood flow. The $ETCO_2$ will rise to 15-20 mmHg if compressions are improved and relative hyperventilation is avoided. Levels above 20 mmHg or a sudden rise usually indicate underlying native circulation.

Therapies

- Sodium bicarbonate should be administered according to the *Causes of Cardiac Arrest Table in Section 1 Overview*., after intubation and adequate ventilation are complete.
- A pre-cordial thump will deliver 5 joules of energy to the heart, with possible conversion.

- If an automatic external defibrillator (AED) has been used prior to your arrival, assume that the initial arrhythmia was VF/VT. Confirm that the initial defibrillation was completed and start the arrest treatment guideline following that step.
- $MgSO_4$ may be administered without a physician's order when clinically indicated (Torsades de Pointes, suspected

  hypomagnesemia: alcoholic, on diuretics, nutritional deficiency such as anorexia, or antiarrhythmic medications, particularly sotalol)
- If you think hypoglycemia is a component of the cardiac arrest, confirm with a blood test and if blood glucose is < 4 mmol/L administer 25 grams of 50% dextrose IV/IO.
- If an opioid drug overdose is suspected during an arrest, administer Naloxone 4.0 mg IV/IO, or 8-10 mg ETT.
- Lidocaine is administered for a patient who is refractory to Amiodarone, has an allergy to it, or if Amiodarone is unavailable
- Ensure that epinephrine 1.0 mg IV/IO is administered every 3 minutes, throughout the cardiac arrest to maintain therapeutic levels.
- If ventricular fibrillation recurs during resuscitation, reinitiate defibrillation at the energy level that previously resulted in successful defibrillation.
- When you contact the EPOS, you may request orders to discontinue or consult on clinical findings. Transport or call earlier if a treatable cause is suspected, such as electrolyte disturbance.
- If the rhythm changes at any time, move to the appropriate Guideline (for example, asystole, V-Fib) and adjust the steps according to what the patient has already been given. Remember to consider proper drug dosages and electrical energy levels.

Special Considerations

- Minimizing hands-off time is perhaps the most important determinant of resuscitation success. Ensure good CPR is continuing during the cardiac arrest. In order to calculate the hands-off time during resuscitation, the impedance information must be captured through the “paddles” mode on the LP 12/15.
- It is not acceptable to delay CPR or defibrillations for procedures or drugs that have not been proven effective. This includes intubation, Epinephrine, and antiarrhythmics.

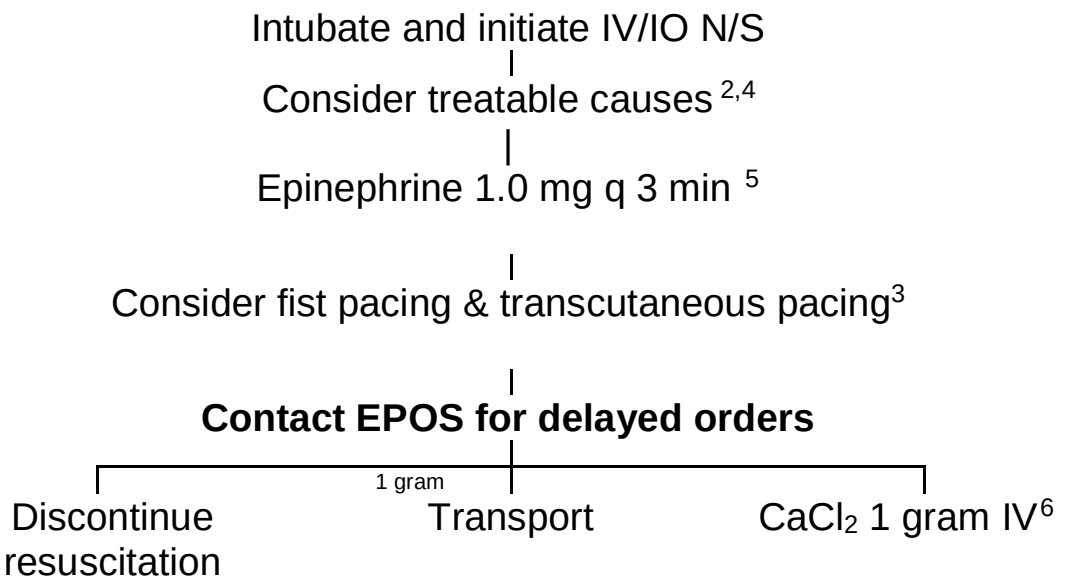
Asystole

THROUGHOUT THE CALL

Use “Paddles” mode to monitor patient

INDICATIONS

Patients in cardiac arrest who present with an asystolic rhythm.[1]



[1] Confirm patient is in cardiac arrest and evaluate for presence of DNR.
[2] Refer to Causes of Cardiac Arrest Overview
[3] Initiate fist pacing for witnessed asystole evolving from a previously perfusing ventricular or supraventricular rhythm
[4] If it is clinically possible that pacemaker failure was the primary cause of arrest, an early attempt at transcutaneous pacing may be justified. Transcutaneous pacing may also be indicated for patients responsive to fist pacing.
[5] Sodium bicarbonate should be administered following the recommendations in the Causes of Cardiac Arrest Table. If administered, the dose for sodium bicarbonate is 1.0 mEq/kg, then 0.5 mEq/kg q 10 min.
[6] $CaCl_2$ is administered per the Causes of Cardiac Arrest Overview

Guidelines for Asystole Treatment Guideline

General Principles

- The treatment guidelines assume that you have made adequate provision for airway control, establishment of an intravenous line, and cardiac monitoring, where appropriate. They also assume that Basic Cardiac Life Support (BCLS) is going at all times during an arrest, with minimal interruption of CPR (hands off the chest) for intubation, defibrillation, or diagnostic monitoring.

- High quality continuous CPR coupled with ACLS procedures maintains a viable patient while you search out and treat the cause of the cardiac arrest.
- If there is any possibility that the rhythm is ventricular fibrillation, administer defibrillations. Otherwise, defibrillations are not indicated in the Asystole Protocol.
- Consider treatable causes of cardiac arrest, as indicated in the Causes of Cardiac Arrest Overview.
- Observe the $ETCO_2$ value. A level of 10mmHg means very little blood flow. The $ETCO_2$ will rise to 15-20 mmHg if compressions are improved and relative hyperventilation is avoided. Levels above 20 mmHg or a sudden rise usually indicate underlying native circulation.

Therapies

- Sodium bicarbonate should be administered according to the *Causes of Cardiac Arrest Table in Section 1 Overview*., after intubation and adequate ventilation are complete.
- Fist pacing (1 per second) should be initiated in a monitored asystole that evolves from a previously perfusing rhythm. Assess for effectiveness (i.e., presence of a carotid pulse). If there is no pulse, start standard CPR.
- Consider initiating transcutaneous pacing for patients responding to fist pacing with witnessed pacemaker failure.

- If you think hypoglycemia is a component of the cardiac arrest, confirm with a blood test and if blood glucose is < 4 mmol/L administer 25 grams of 50% dextrose IV/IO.
- If an opiod drug overdose is suspected during an arrest, administer Naloxone 4.0 mg IV/IO or 8-10 mg ET.

Special Considerations

- Minimizing hands-off time is perhaps the most important determinant of resuscitation success. Ensure good CPR is continuing during the cardiac arrest. In order to calculate the hands-off time during resuscitation, the impedance information must be captured through the “paddles” mode on the LP 12/15.
- The “Leads” mode may be used briefly to check multiple leads when rhythm analysis is of critical importance and “Paddles” mode is inconclusive. It is quite rare to find VF or an organized rhythm that you did not suspect from the paddles tracing. Immediately return to “Paddles” mode when the rhythm is identified.
- Keep the lead switched to “Paddles” as much as possible. The information obtained will be invaluable to improve our resuscitation outcomes within BCEHS. If ventricular fibrillation is suspected, immediate defibrillation is appropriate.
- If rhythm changes occur, switch to the appropriate protocol. Adjust for medications already administered and energy levels already delivered.
- Pacemaker failure presenting as asystole is not a common event. The usual presentation of a failing pacemaker is failure in sensing and capture. For asystole to present as a manifestation of pacemaker failure, the entire power unit of the pacemaker would have to fail abruptly in a patient with no native underlying rhythm.

- Normally, when a pacemaker fails, the patient's native underlying rhythm, commonly a bradycardia, will emerge. Pacemaker leads may fracture, resulting in pacemaker spikes without capture. The most common arrest scenario in a patient with a pacemaker is capture without corresponding output (PEA) due to myocardial ischemia or infarction.
- Regardless of the cause, survival to discharge is less than 3%.

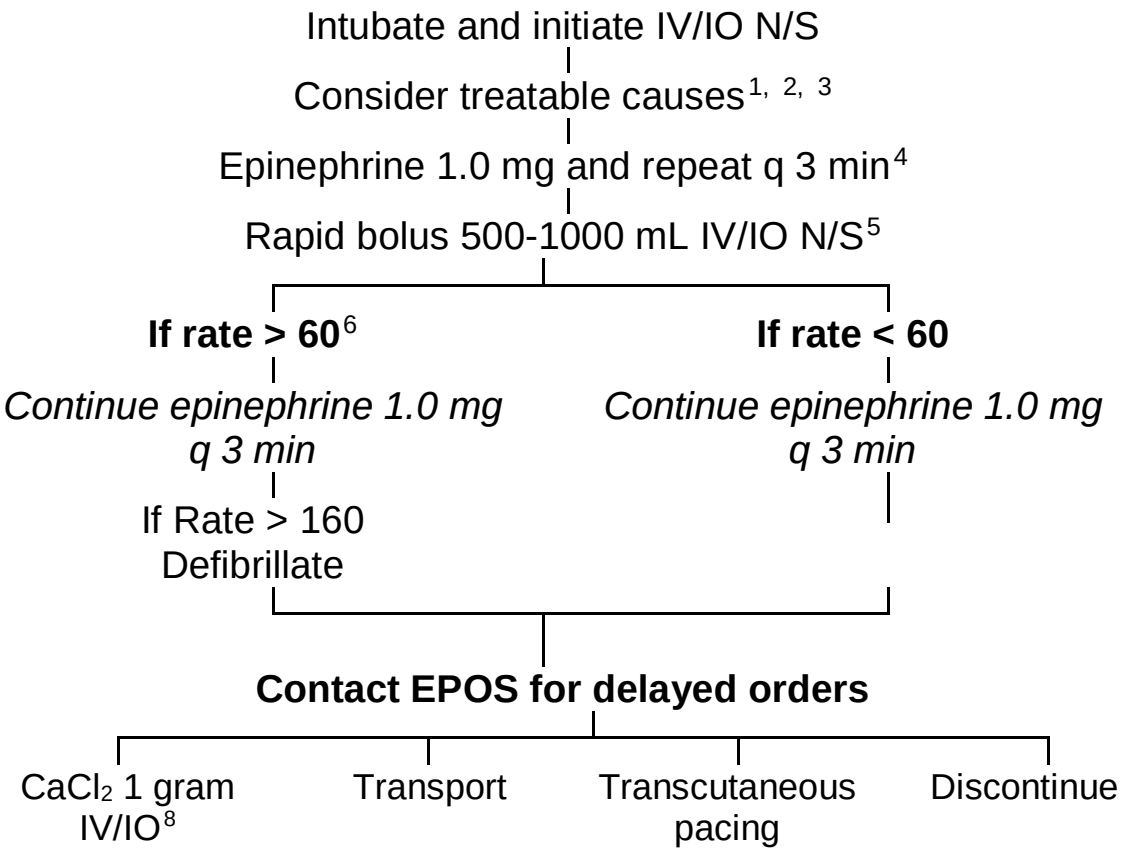
Pulseless Electrical Activity (PEA)

THROUGHOUT THE CALL

Use “Paddles” mode to monitor patient

INDICATIONS

Patients in cardiac arrest who present with pulseless electrical activity.



[1] In PEA, rapid transport may take precedence.
[2] Sodium bicarbonate should be administered following the recommendations in the Causes of Cardiac Arrest Overview. If administered, the dose is 1.0 mEq/kg, then 0.5 mEq/kg q 10 min.
[3] Refer to the Causes of Cardiac Arrest Overview.
[4] If it is clinically possible that pacemaker failure was the primary cause of arrest, an early attempt at transcutaneous pacing may be justified.
[5] Contraindicated in the presence of acute pulmonary edema.
[6] If the patient’s rate > 160, defibrillation is indicated as early as possible.
[8] CaCl2 may be appropriate in special circumstances (hypocalcemia, hyperkalemia, or Calcium channel blocker overdose). If these indications are clear, contact EPOS as early as possible.

Guidelines for PEA Treatment Guideline

General Principles

- The treatment guidelines assume that you have made adequate provision for airway control, establishment of an intravenous line, and cardiac monitoring, where appropriate. They also assume that Basic Cardiac Life Support (BCLS) is ongoing at all times during an arrest, with minimal interruption of CPR (hands off the chest) for intubation, defibrillation, or diagnostic monitoring.

- High quality continuous CPR coupled with ACLS procedures maintains a viable patient while you identify and treat the cause of the cardiac arrest.
- PEA has a poor outcome unless a reversible cause can be treated.
- Consider treatable causes of cardiac arrest, as indicated in the *Causes of Cardiac Arrest Table in Section 1 Overview*.
- Observe the $ETCO_2$ value. A level of 10mmHg means very little blood flow. The $ETCO_2$ will rise to 15-20 mmHg if compressions are improved and relative hyperventilation is avoided. Levels above 20 mmHg or a sudden rise usually indicate underlying native circulation.

Therapies

- Sodium bicarbonate should be administered according to the *Causes of Cardiac Arrest Table in Section 1 Overview*., after intubation and adequate ventilation are complete.
- If you think hypoglycemia is a component of the cardiac arrest, confirm with a blood test and if blood glucose is < 4 mmol/L administer 25 grams of 50% dextrose IV/IO.
- If an opioid drug overdose is suspected during an arrest, administer Naloxone 4.0 mg IV/IO, or 8-10 mg ETT.

- Defibrillation is indicated for narrow complex PEA > 160. Epinephrine is indicated and 500mL rapid N/S bolus may be considered. Monitor for signs of pulmonary edema.

Wide Complex Tachycardia (WCT)

THROUGHOUT THE CALL		
Primary survey	High-flow O_2	Monitor

INDICATIONS

Patients in a wide complex tachycardia with a pulse > 140 and a QRS > 0.12 seconds and who are compromised by one or more of the following which is believed to have been caused by the arrhythmia:[1,2]

- Hypotension (BP < 90 mm Hg systolic)/poor perfusion/shock, or
- Shortness of breath (acute heart failure), or
- Chest pain suggestive of coronary ischemia, or
- Diminished level of consciousness/syncope, or
- Recurrent unstable WCT

If asymptomatic – no treatment is required

↓

Contact **EPOS** if circumstances permit

↓

Unstable Presentation

↓

Sedation[3]

↓

Synchronized Cardioversion
starting at 100 joules

↓

Continue cardioversion at 200, 300 & 360 joules if no effect

↓

Reassess rhythm & airway after each shock

↓

Recurrent unstable WCT or Intermittent unstable VT
Amiodarone 150 mg IV over 10 minutes

↓

Torsades de Pointes[4]

↓

Hospital

[1] Patients who are pulseless, treat as cardiac arrest.

[2] Patients who have altered LOC due to dementia, or have non-ischemic chest pain, or have pre-existing pulmonary edema may not be candidates for cardioversion. If there is any clinical doubt with these conscious or semi-conscious patients, contact the EPOS for guidance.

[3] If sedation is required, administer midazolam, 2 mg to effect. Have airway equipment ready

[4] Consider Magnesium Sulfate 2 grams over 1-2 minutes for Torsades de pointes

Guidelines for Wide Complex Tachycardia (WCT)
Treatment Guideline
General Principles

- Check carefully for the regularity of the rhythm as it is one of the key attributes that help distinguish the type of WCT.

Irregular WCT may be caused by:

- Atrial fibrillation with aberrant conduction such as bundle branch block (BBB)
- Wolfe-Parkinson-White syndrome (WPW)
- Torsades de pointes (which is often intermittent and responds well to IV magnesium)
- 90% of wide complex tachycardia (WCT) has been found to be ventricular tachycardia. Therefore, if there is any doubt between narrow complex tachycardia (NCT) with aberrancy and WCT, treat as WCT. If the arrhythmia is known not to be ventricular tachycardia, use the Narrow Complex Tachycardia Treatment Guideline.
- In the patients with atrial fibrillation and pre-existing BBB/WPW or other pre-excitation syndrome, contact the EPOS.
- Often atrial fibrillation with WCT is not as unstable as other causes of WCT. Aggressive treatments are usually not indicated unless the patient is grossly unstable and requires electrical cardioversion. Discuss the case with the EPOS. Conversion of atrial fibrillation can result in stroke.

Immediately life threatening causes of WCT:

- Medication adverse effects (TCA, some antiarrhythmics)
- Cardiac electrical abnormalities (PSVT, or A. Fib with aberrant AV conduction)
- Electrolyte abnormalities (potassium, magnesium and pH changes)
- Hypovolemia/hypoperfusion states (sepsis, profound haemorrhage)
- Hypoxia from any cause (pneumonia, CHF, pulmonary embolism, COPD, asthma, airway obstruction)
- Myocardial ischemia or infarction

Synchronization versus non-synchronization

- In the unstable patient with severe compromise (e.g. unconscious, gross pulmonary edema, failing respirations, etc.) who usually manifests high rates of WCT, it may be difficult to distinguish the QRS and T waves. In these types of patients, immediate non-synchronized cardioversion is acceptable.

Intubation

- Intubation should be performed when it is determined that the patient requires airway control, but generally should not precede cardioversion.

Therapies

- For patients that present with persistent or recurrent WCT or intermittent unstable VT administer Amiodarone 150 mg over 10 minutes.
- For patients that present with Torsades de pointes (which is often intermittent), treatment is Magnesium Sulfate 2g IV over 1-2 minutes
- Defibrillation is indicated if the patient loses a pulse. Defibrillations should start at the last energy level that was used for cardioversion.

Special Considerations

Ventricular fibrillation → stabilized → unstable wide complex tachycardia

- Cardioversion starting at 100 joules is indicated if the patient:
  - has been previously converted from ventricular fibrillation
  - has received defibrillation during the resuscitation,
  - then has a period of stabilization (palpable pulse and blood pressure)
  - then presents with unstable wide complex tachycardia with a pulse

Wide complex tachycardia → ventricular fibrillation

- If the rhythm deteriorates from wide complex tachycardia to ventricular fibrillation at any time during the WCT Treatment Guideline, the patient should immediately receive defibrillations starting with the previous joules used for cardioversion (for example, if the last cardioversion was at 200 joules, start defibrillation at 200 joules).

- If the patient has already required high energy levels for cardioversion, further pharmacologic therapy should be based upon previous drug dosages given and expected blood levels.

Symptomatic Bradycardia

THROUGHOUT THE CALL		
Primary survey	High-flow O_2	Monitor
IV	Atropine	TCP

INDICATIONS

Bradycardia with a ventricular rate < 50[1], associated with one or more of the following:

- BP < 90 mmHg, or
- PVCs, or escape beats, or
- Chest pain suggestive of ischemia, or
- Pulmonary edema or
- Decreased LOC

INDICATION for Post Arrest Bradycardic Patients

- Pulse rate < 50 and BP < 90

IV NS

Vagolytic therapy:
Atropine 0.6 mg IV [5]
Repeat q3 min to effect (to maximum of 3 mg)

Sedation[2]

Consider transcutaneous pacing[3, 4]

Contact EPOS for delayed orders

Beta 1 adrenergic therapy:
Consider epinephrine infusion[4]
1 mcg/min infusion incrementally increased q 2-3 minutes to effect

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[1] Therapeutic aims: ventricular rate ≥ 50 and/or relief of signs or symptoms (e.g., if the patient was complaining of chest pain with a rate of < 50, and after treatment the patient still had a rate < 50 but the chest pain was relieved, no further treatment for symptomatic bradycardia would be needed). Titrate medications to maintain the heart rate close to ≥ 50.

[2] If sedation is required, administer midazolam, 2 mg to effect.

[3] TCP is an intervention in the treatment of bradycardia. Epinephrine is drug in the treatment of bradycardia, both are used after atropine has been used

[4] For symptomatic bradyarrhythmias that are refractory to atropine. Contact EP if PVCs develop or BP or pulse does not improve.

[5] Atropine is indicated in 2° and 3° degree blocks, however consider contacting EPOS early in these cases to discuss TCP or Epi infusion.

Guidelines for Symptomatic Bradycardia Treatment Guideline

General Principles

- Not all bradycardia requires immediate pharmacological intervention. Positing the patient supine and administering O_2 as needed may help relieve symptoms. If in doubt regarding pharmacological intervention, consult with the EPOS early.
- External cardiac pacing and Epinephrine infusion are interventions for symptomatic bradycardia after atropine has been used
- Symptomatic bradycardia patients may not have suffered a significant cardiac event; therapeutic aims are therefore slightly different from the post-arrest bradycardia protocol.
- Therapeutic aims: Pulse $\geq$ 50 and/or relief of the patient's symptom(s) triggering the use of this protocol.

Therapies

- In the post arrest patient the indications for using this treatment guideline are:
- Pulse rate < 50 and BP < 90

- **Therapeutic aims:**
  - Pulse rate > 50 and/or BP > 90
  - Therapies include: atropine, external cardiac pacing, and/or epinephrine infusion.
  - Atropine is the first-line drug for bradycardic patients.
  - Be prepared for an idiosyncratic slowing of pulse while administering Atropine. If this occurs administer another Atropine 0.6 mg immediately.
  - In some patients, use of atropine may increase susceptibility to ventricular fibrillation and increase MVO_2 demands, myocardial damage, and the patient's chest pain. Watch closely for this and be prepared to deal with the situation.

- Atropine should be repeated q3 minutes if required, up to a maximum of 3 mg. Simultaneous use of other treatment guidelines may be indicated.
- For patients with 2° atrioventricular (AV) block, 3° AV block, and idioventricular rhythms, atropine should still be considered. Theoretically, in type II 2° AV block, atropine may rarely accelerate the atrial rate and produce increased AV nodal block, which in turn may be accompanied by a paradoxical fall in the ventricular rate and blood pressure. Consider contacting the EPOS early in these situations to discuss TCP or Epi infusion.
- Pacing should be initiated at a rate of 70-80. Start with 5 mA and adjust amperage sufficiently to result in consistent capture. Output must be verified when pacing.
- Epinephrine infusion should be initiated at approximately 1 mcg/min and increased 1 μg/min q 2-3 minutes to effect. Continued monitoring is required to increase or decrease the rate to keep the patient close to the therapeutic aim.

Chest Pain (Suspected Acute Coronary Syndrome)

THROUGHOUT THE CALL		
High-flow O_2	Monitor	IV

INDICATIONS

Patients with suspected angina or acute myocardial infarction (MI).[1]

Initiate IV N/S

↓

ASA 160mg PO[2]

↓

Nitroglycerin spray 0.4 mg SL
(repeat as indicated)[3, 4, 5]

↓

Correct rhythm disturbances:
Symptomatic Bradycardia
Symptomatic Wide Complex Tachycardia
Symptomatic Narrow Complex Tachycardia

↓

12 Lead ECG[6]
(transmit if indicated)

↓

Contact EPOS
(for MS orders / 12 lead consult)

↓

Morphine 2.5 mg to effect for pain and anxiety

↓

Dimenhydrinate (Gravol) 25 mg IV

---

[1] **Rapid transport to hospital**: Expeditious treatment and transport of a patient to avoid delay in thrombolytic therapy. Notifying the hospital of a suspected MI in all cases will further eliminate hospital delays in thrombolytic therapy.

[2] Administer to patients with chest pain and previously diagnosed angina/MI or to patients who have a highly suggestive history without a previous diagnosis of angina/MI. If the patient has definitely taken a therapeutic dose of ASA in the previous 12 hours, the medication may be withheld, if the dose is less than 160 mg, the balance may be administered.

[3] Monitor BP between doses. Do not administer nitroglycerin if patient is hypotensive. After 3 doses, consider alternating morphine with further nitroglycerin.

[4] Nitroglycerin spray is an acceptable alternative to nitroglycerin tablet. 1 spray = approximately 0.3 mg tablet; 2 sprays = approximately 0.6 mg tablet.

[5] Nitroglycerin is contraindicated if patient has taken Viagra or Levitra within 24 hours or Cialis in the last 48 hours.

[6] Perform 12 lead ECG and transmit according to local protocol.

Guidelines for Chest Pain Treatment Guideline

General Principles

- Left arm is preferred for an IV start due to angiography in the right wrist
- Expedite treatment and transport to hospital to avoid delay of thrombolytic therapy or PCI. Transmit all “Acute MI Suspected” 12 leads to the hospital, with follow-up EPOS phone call to discuss
- Nitroglycerin will not relieve the pain of MI and may worsen outcomes if it causes hypotension. Nitroglycerin is cautioned in patients with inferior MI and contraindicated with right ventricular MI.

Therapies

- Monitor patient’s blood pressure between doses of nitroglycerin. Consider nitroglycerin prn after the initial 3 doses or if pain returns.
- Nitroglycerin is contraindicated if the patient has taken Viagra (Sildenafil Citrate) or Levitra (Vandenafil) within the last 24 hours or Cialis (Tadalafil) in the past 48 hours.
- Contact the EPOS for morphine orders. Administer 2.5 mg IV increments to effect for pain and anxiety. Use cautiously for patients with COPD. Consider alternating this with nitroglycerin.
- Correct rhythm disturbance: Symptomatic Bradycardia, Wide Complex Tachycardia or Narrow Complex Tachycardia.
- Administer dimenhydrinate for nausea/vomiting or history of nausea with Morphine administration.
- It is recommended that ASA be administered to patients with chest pain, suspicious for ischemia. The recommended dose is 160mg that must be chewed and swallowed. If there is any doubt as to whether the patient has taken ASA, it is better to stay on the side of caution and proceed with ASA.

Special Considerations

- Chest pain can occur due to life threatening diseases such as dissecting aneurysm, pulmonary embolus, pericarditis or ruptured esophagus when the ECG is negative.
- Beware of atypical ACS presentations, especially in the elderly, women and diabetics.
- Be aware of the patients that are hypo-perfusing or who develop congestive heart failure. Rapid transport is indicated.

Narrow Complex Tachycardia

THROUGHOUT THE CALL

Primary survey | High-flow O_2 | Monitor

INDICATIONS

Acute onset of unstable narrow complex tachycardia (NCT) with regular heart rate > 160.[1, 2, 3]

Valsalva maneuver

Mild to moderately unstable

Contact EPOS

Adenosine 6 mg[4]

Adenosine 12 mg

Transport

Critically Unstable:

- **With symptoms believed to have resulted from the arrhythmia**
- **Hypotension (BP < 90 mm Hg systolic), or**
- **Acute pulmonary edema, or**
- **Chest pain suggestive of coronary ischemia, or**
- **Decreased level of consciousness**

Contact EPOS

Adenosine 6 mg[4]

Adenosine 12 mg

Sedation

Cardioversion

Transport[6]

Sedation[5]

Cardioversion

Transport[6]

---

[1] If the patient has NCT with no pulse, treat as cardiac arrest.

[2] Narrow complex tachycardia (NCT) is usually a benign rhythm associated with a sensation of palpitations and chest discomfort in a patient with a previous history. Many patients suffering from NCT may not have had the rhythm diagnosed. Most have stable vital signs and require 12-lead ECG (or other studies) to properly ascertain the exact nature of the rhythm disturbance (PAT, WPW, etc.). Drug or electrical therapy to arrest the rhythms in stable patients is therefore *not* encouraged.

[3] In elderly patients with underlying atrial fibrillation, an NCT may be secondary to a variety of underlying disease processes such as sepsis/hypovolemia, drug toxicity, etc. Treatment is directed at the underlying cause, not at the rhythm.

[4] Administer adenosine rapidly over 1-3 sec followed each time by a 20 mL saline bolus.

[5] If sedation is required, administer midazolam, 2 mg to effect. Morphine can also be considered. Energy level to be establish with EPOS

[6] Download data with patient ID if treated as cardiac arrest.

Guidelines for Narrow Complex Tachycardia Treatment Guideline

General Principles

- NCT is not a disease but a description of a rhythm type. The key question is whether this is a new onset of PSVT, atrial fibrillation, atrial flutter or whether this is sinus tachycardia secondary to another problem. Long standing atrial fibrillation can also speed up in response to another illness.

Therapies

- The patient may be encouraged to perform a valsalva maneuver.
- If the patient has NCT with no pulse, start CPR
- In the stable patient, drug or electrical therapy to arrest their rhythms is not encouraged.
- Discuss with EPOS the use of adenosine for patients who are mild or moderately unstable but who do not require immediate cardioversion. These may include patients with PSVT (regular rhythm) who are relatively hypotensive, and/or with mild chest discomfort with a long transport time to hospital.
- 6 mg of adenosine should be administered rapidly over 1-3 seconds followed by a 20 mL saline bolus in the largest line closest to the heart. If no effect after one minute, administer a 12 mg dose of adenosine.
- Atrial fibrillation should only be converted in the field if the patient is peri-arrest.
- Try and obtain a 12 lead ECG prior to converting the patient unless immediate action is required for a rapidly deteriorating patient
- At higher rates atrial fibrillation may present as a regular rhythm. Make every effort to rule it out. Try to ascertain if it is regular. It may help to turn up the “QRS volume” on the monitor.
- PSVT is the only narrow complex tachycardia treated in the field unless the patient is grossly unstable. In those cases try and discuss the case with the EPOS prior to treating the patient.
- The physician may order higher energy doses for atrial fibrillation and lower energy doses for atrial flutter. Note: If the rhythm fails to convert or converts only transiently, repeated shocks may not

be indicated until other definitive drug therapy (at hospital) is given.

Special Considerations

- In some patients, if there is failure to convert or the conversion is transient, repeated shocks may not be indicated. These patients require definitive in-hospital treatment to diagnose the rhythm.
- Cardioversion is contraindicated in patients who have been in atrial fibrillation > 48 hours or who are not sure about the duration of the arrhythmia because the cardioversion may result in a stroke.
- Contact the EPOS where the decision to electrically cardiovert or chemically cardiovert is difficult.

Congestive Heart Failure with Pulmonary Edema

THROUGHOUT THE CALL		
Primary survey	High-flow O_2 Monitor	Consider IPPV

INDICATIONS

Patients who are short of breath with pulmonary edema secondary to congestive heart failure.[1]

IPPV/CPAP if indicated[2]

Correct rhythm disturbance:
Symptomatic Bradycardia
Symptomatic Wide Complex Tachycardia
Symptomatic Narrow Complex Tachycardia

IV NS

Preload Reduction:
Nitroglycerin 0.4 mg SL[3, 4] as required

Contact EPOS for delayed orders

Reduce pain and anxiety:
Morphine IV 2.5 mg to effect

Reduce airway pressure/bronchodilate:
Ventolin 5 mg via nebulizer
Atrovent 0.5 mg via nebulizer with Ventolin

[1] If bronchospasm is present and COPD or asthma is a contributing factor, use bronchodilators as per the Shortness of Breath Protocol.

[2] Intubate for respiratory failure: respirations < 10, profound central cyanosis, inability to maintain airway. If the patient is combative and/or unable to cooperate and sedation is required, administer midazolam, 2 mg to effect or morphine 2.5 mg to effect

[3] Nitroglycerin is contraindicated if the patient has taken Viagra/Levitra within 24 hours or Cialis in the past 48 hours.

[4] Monitor BP between doses. Do not administer nitroglycerin if patient is relatively hypotensive. After 3 doses, consider nitroglycerin prn.

Guidelines for Congestive Heart Failure with Pulmonary Edema Treatment Guideline

General Principles

- Provide high-flow oxygen.
- Most severely compromised patients may be managed with bag/valve/mask assistance or CPAP in conjunction with initial therapeutic maneuvers.
- Perform immediate intubation if indicated. Clinical signs of imminent arrest include:
  - respiratory rate < 10
  - profound central cyanosis
  - inability to manage airway secondary to frothy and/or bloody sputum

Therapies

- Position the patient to help facilitate decreased venous return.
- BVM assistance or CPAP (See Procedures section – Appendix B)
- For CHF patients with increased BP, it is preferable to administer further nitroglycerin
- Patients who have evidence of myocardial ischemia require early transport since the primary treatment is opening the obstructed coronary artery.
- Nitroglycerin is contraindicated if the patient has taken Viagra (Sildenafil Citrate)/Levitra (Vardenafil) within 24 hours or Cialis (Tadalafil) within 48 hours.
- Patients with acute pulmonary edema and hypotension are in cardiogenic shock and must be transported to hospital without delay for intervention.

Special Considerations

- Many patients with congestive heart failure may have hypotension for a variety of reasons, such as a severely depressed ejection fraction, AMI, cardiac valve problem, nitrate usage, volume depletion due to diuretic use, or use of ACE inhibitors. Remember that in the elderly, hypotension can be a relative finding. If a person is normally hypertensive, they may have manifestations of shock even though by strict definition they are still normotensive.
- Bronchodilators may help with cardiac asthma; however, it is important to remember that wheezes in these cases are associated with edematous airways and not bronchospasm. Risk versus benefit of relieving wheezes while introducing a sympathomimetic drug to these patients must be considered.
- Beware of moving the patient too quickly prior to treatments as they may suddenly deteriorate.
- Congestive heart failure is characterized by impaired pump function often as a result of a previous MI. Other common causes are: hypertension, cardiac valve disease, congenital heart disease and cardiomyopathy.
- Acute MI is a common precipitant of acute pulmonary edema. Other precipitating events include: hypertensive crisis, new cardiac depressant drugs (beta blockers, calcium channel blockers), increased sodium loads (dietary, medicinal), dysrhythmias, fever, infection, pregnancy, renal failure, valve problems, or failure to take necessary medications.

Section 2:
Respiratory Treatment Guidelines

Overview: Respiratory Emergencies

Condition	Management
Asthma/COPD/other causes of SOB with bronchospasm	• Salbutamol and Ipratropium bromide by nebulizer or MDI. • Contact EPOS • Epinephrine for Asthma only
Epiglottitis/croup	• Avoid stimulation • Sit in upright position • Oxygen • Have airway equipment ready • Transport rapidly • Contact hospital
Tension pneumothorax	• Position patient with affected side down • Oxygen • Contact EPOS • Needle thoracentesis
Smoke/gas inhalation	• Oxygen • Have intubation equipment ready • Monitor • IV therapy

Shortness of Breath

THROUGHOUT THE CALL

Primary survey	High-flow O_2	Monitor respiratory drive

INDICATIONS

Patients who are short of breath from bronchospasm for a variety of causes when clinically indicated.

Consider the causes of SOB
(epiglottitis, tension pneumothorax, smoke inhalation)

CPAP/BVM

Salbutamol 5.0 mg[1]

Ipratropium bromide 0.5 mg via nebulizer (if indicated)

Repeat salbutamol 5.0 mg en route (if indicated)[2]

Contact EPOS

Bronchospasm persists

Hx suggestive of **asthma** only:

Failing respirations.
Adequate signs of peripheral perfusion

Epinephrine 0.005 mg/kg 1:1,000
S/C (max. 0.3 mg single dose)
Repeat q 3 min to effect

Profound respiratory distress.
Obvious signs of hypo-perfusion

Epinephrine 50-100 μg
1:10,000 IV q 3 min to effect
(max dose 0.3 mg)

$MgSO_4$ Infusion
2 g/250 cc NS over 20 minutes

[1] Patients requiring salbutamol and ipratropium bromide by side port nebulizer: salbutamol 5.0 mg in 5.0 mL N/S, ipratropium bromide 0.5 mg.
[2] Patients may use their own salbutamol MDI.

Guidelines for Shortness of Breath
Treatment Guideline

General Principles

Identify the cause of the SOB and treat the patient accordingly.

Therapies

- Initiate and maintain basic life support (BLS) procedures.
- Airway management may include.

  1) Clearing of airway.

  2) CPAP (See Procedures section – Appendix B)

  3) Intubation.

  4) Contacting the EPOS for the use of needle cricothyrotomy or current accepted prepared kits such as Melker Cricothyrotomy Kits™ (Appropriate training must be completed prior to use of invasive airway device(s)).
- If a patient has bronchospasm contributing to the SOB, treat with salbutamol plus ipratropium bromide. Ipratropium bromide must never be administered alone. It may be added to the first dose of salbutamol if indicated. Repeat dosing with salbutamol is not indicated.
- The dose of MDI Salbutamol is eight puffs or 800μg per set then reassess the effects of treatment i.e. Two doses (sprays) should be administered at end expiration followed by appropriate tidal volume. Continue until a total of eight doses or 800μg is achieved, this should be four respiratory cycles. The total dose may be repeated in 2-3 minutes if there is no improvement in the ease of ventilation and bronchospasm. Monitor patient for salbutamol toxicity.
- As above eight puffs of ipratropium (Atrovent) may also be given initially but not repeated.
- Repeat doses of salbutamol 5.0 mg may be administered continuously. Monitor patient for salbutamol toxicity.

- Some patients in severe distress respond dramatically to salbutamol and ipratropium bromide, thereby avoiding intubation and/or respiratory arrest.

- CPAP
  - Salbutamol and ipratropium bromide may be administered via a side port nebulizer. Dose: salbutamol 5.0 mg and Ipratropium bromide 0.5 mg for all adult intubated patients.
  - Patients can achieve efficacy equal to nebulized salbutamol/ipratropium bromide using their own MDI (inhaler). It is important that they use proper technique when using their own medication.

- Smoke/gas inhalation: Provide 100% O_2. Consider the benefits of IPPV (via bag/valve/mask and/or early intubation) for these patients.
- Tension pneumothorax: Consult with the EPOS regarding needle thoracentesis. If the patient is in cardiac arrest and tension pneumothorax is a likely cause, immediate needle thoracentesis is indicated.
- Epiglottitis is best managed with non-invasive IPPV techniques.
- Epinephrine may be indicated in a younger otherwise healthy patient with failing respirations and decreased level of consciousness who is not improving with salbutamol. Epinephrine is **administered on EPOS orders.**
  - Epinephrine has serious side effects. It can cause an increase in blood pressure, precipitating a hypertensive emergency or intracerebral bleed. The increased contractility that it causes can increase myocardial oxygen consumption and precipitate myocardial ischemia (angina). It can also cause tachycardia and more serious dysrhythmias. Because of this, it must be used with extreme caution only after consultation with a physician.
  - Subcutaneous administration is a safer route and each dose is 0.005 mg/kg q 3 min to effect. Never exceed 0.3 mg per single dose.
  - If the patient is profoundly shut down, IV epinephrine 1:10,000 may be used with extreme caution. 50-100 μg may be administered q 3 min to effect until a total dose of 0.3 mg (300 μg). The rate of administration is 50-100 μg/min over 1 minute.

- Magnesium Sulfate may be a useful 3rd line medication for severe asthma unresponsive to beta agonist and ipratropium. It is not effective in other causes of respiratory distress. Since its action is slower in onset magnesium should be considered in severe cases unresponsive to standard therapy particularly where there are longer transports. It should be given enroute. It is given as an infusion. Contact EPOS for discussion

Special Considerations

- Droplets from nebulization can carry virus particles. For a patient with fever (subjective) and mild to moderate wheeze consider transport without administering Ventolin. Always wear personal protective equipment when treating a coughing patient. If nebulized treatment is necessary in a febrile patient place a surgical mask (not N95) over the nebulizer to limit spread of droplets. Discontinue the nebulizer prior to entering the facility and until triaged to an appropriate bed.
- Beware of using high-flow O_2 to drive the nebulizer in patients with severe COPD on home oxygen therapy. Monitor the patient for decreasing LOC secondary to CO_2 retention caused by high-flow O_2
- Intubation should only be required in the most exceptional circumstances. Intubating an asthmatic is a last resort since the introduction of the tube can dramatically increase bronchospasm in an already compromised patient. Asthma patients with a history of COPD do not do well when intubated and ventilated. Intubation can exacerbate the primary problem which is distal air trapping. It is often difficult to wean these patients off a ventilator.

- If you are going to intubate the patient it can be accomplished with topical Xylocaine (lidocaine) spray alone. There are considerable risks associated with the use of morphine and midazolam to sedate patients for endotracheal intubation.

- Although more common in the pediatric age group, epiglottitis is still seen in adults and may often prove fatal if not recognized and treated appropriately. This upper respiratory tract infection with airway obstruction is a life-threatening emergency. Field treatment is limited to:
  - Calming the patient (unnecessary stimulation can result in sudden complete airway obstruction)
  - Sitting the patient in the upright position (let the patient assume a comfortable position)
  - Administering oxygen if the patient permits
  - Readying airway equipment such as bag/valve/mask
  - Transporting rapidly
  - Notifying the hospital of the circumstances in all suspected cases

- Beware of the weary, exhausted or restless patient with decreased LOC and respiratory drive. Patients even with mild hypoxia and hypercarbia may be in imminent danger of respiratory failure or cardiac arrest
- Beware of the patient who is complaining of profound SOB yet has clear lung fields with excellent air entry to the bases. They may be mistaken for hyperventilation but may be experiencing any of a number of life threatening conditions such as pulmonary embolism.

Features of a severe and possibly fatal asthma attack

- **History**
  - Rapid and severe onset
  - Exposure to a known precipitant – allergens or other environmental
  - History of non-compliance with treatment
  - Previous life threatening asthma attacks. A patient who has a history of having been admitted to an ICU for asthma in the past is at risk for a fatal attack
  - Attendance to an emergency department with asthma in the last year
  - Multiple types of asthma drugs prescribed in last year (indicating that their asthma is unstable
  - Increasing frequency of beta-agaonist use – the patient who has used his or her puffer many times in the past day or two

- **Physical**
  - Upright or forward sitting (tripod) position
  - Difficulty speaking full sentences – the fewer words at a time, the worse the situation
  - Decreased oxygen saturation – asthmatics breathe quickly and the problem is ventilation, not oxygenation. Any decrease in oxygen saturation is an ominous sign
  - No wheeze – this may be a sign of no air entry at all (silent chest). If there is good air entry but no wheeze this could be a sign that the respiratory distress is due to another serious condition (pulmonary embolus). Never assume that patients in respiratory distress with good quality of air entry are not suffering from a serious condition

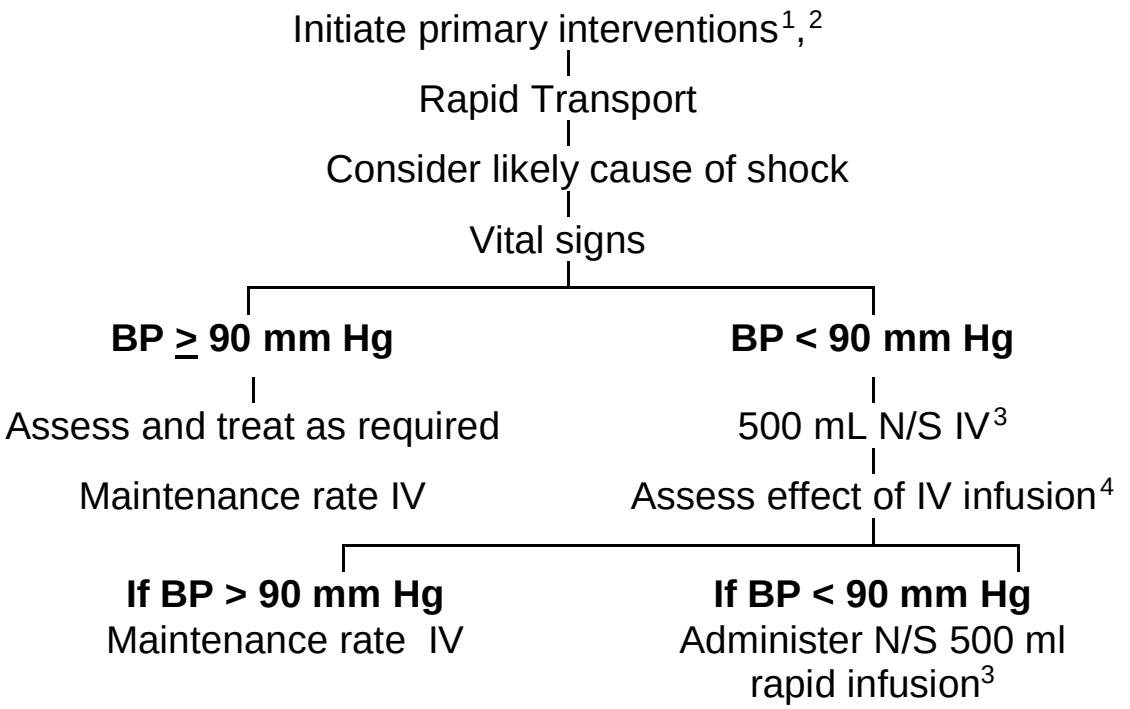
Section 3:
Trauma Treatment Guidelines

Shock

THROUGHOUT THE CALL		
Primary survey	High-flow O_2	IV enroute

INDICATIONS

Patients with hypo-perfusion associated with uncompensated shock.



[1] Consider possibility of anaphylaxis. Transport to closest appropriate hospital as soon as possible.

[2] IV initiated enroute, but may be required for primary intervention.

[3] After each 500 ml N/S, auscultate the lungs and reassess the BP. If the BP <90 mm Hg, continue the administration of IV in 500 ml boluses. Maximum 2000 ml without further orders. Contact EP if further orders are needed.

[4] A second IV may be considered.

Guidelines for Shock patients Treatment Guideline

General Principles

Shock may be due to hypovolemia, distributive, obstructive, or cardiogenic causes (poor cardiac output) or a combination thereof. The fundamental defect in shock is reduced perfusion of vital tissues due (usually) to hypotension, so that O_2 delivery or uptake is inadequate for aerobic metabolism. This results in a shift to anaerobic respiration with increased production and accumulation of lactic acid. When shock persists, impaired organ function is followed by irreversible cell damage and death. The degree of systemic hypotension necessary to cause shock varies and often is related to pre-existing vascular disease. Thus, a modest degree of hypotension that is tolerated well by a young, relatively healthy person might result in severe cerebral, cardiac, or renal dysfunction in a patient who has significant arteriosclerosis (e.g., elderly or already ill).

SHOCK: categorized into four types

Type	Cause	Examples
Hypovolemic shock	Critical decrease in intravascular volume	Hemorrhagic Vomiting/diarrhea Burns
Distributive shock	Inadequate intravascular volume due to vasodilation. Increased capacity for blood to pool in the vascular bed	Anaphylaxis, Sepsis, Neurogenic associated with brain or spinal cord injury.
Obstructive shock	Reduction in cardiac output usually associated with obstruction (mechanical or pressure) in the cardiopulmonary circuit.	Cardiac tamponade, tension pneumothorax, pulmonary embolus
Cardiogenic shock	Inability of the heart to pump efficiently	Acute MI, arrhythmia, valve failure, ruptured cardiac septum

Time is of the essence; patients should be managed and transported without delay. Fluid resuscitation is the pre-hospital treatment of choice during transport but some caution should be used in cardiogenic shock. Paramedics should discuss these difficult cases with the EPOS.

Trauma Management

THROUGHOUT THE CALL		
Primary survey	High-flow O_2	IV en route

INDICATIONS

Patients with major trauma.

Initiate primary interventions[1],[2]

Rapid Transport

Vital signs

Consider advanced airway management:

Lidocaine Spray
Midazolam 2 mg to effect
Morphine 2.5 mg to effect

Tranexamic acid (TXA) 1 gram/over 10 minutes enroute

BP ≥ 90 mm Hg

Assess and treat as required

Maintain patient IV

BP < 90 mm Hg

500 mL N/S IV[3]

Assess effect of IV infusion[4]

If BP > 90 mm Hg
Maintain IV

If BP < 90 mm Hg
Administer N/S 500 ml rapid infusion[3]

Further stabilization of injuries enroute
Pain Control
Entonox
Morphine 2.5 mg to effect (contact EPOS)

[1] Consider mechanism of injury. Transport to closest appropriate hospital as soon as possible.
[2] IV may be required for primary intervention or in case of extrication.
[3] After each 500 ml N/S, auscultate the lungs and reassess the BP. If the BP <90 mm Hg, continue the administration of IV in 500 ml boluses. Maximum 2000 ml without further orders. Contact EPOS if further orders are needed.
[4] A second IV may be considered.

Guiding Principles for Trauma Treatment Guideline

Trauma patients in general cannot be stabilized in the field. They will continue to deteriorate until they receive definitive surgical care.

To maximize survival, scene time must be kept to a minimum. The focus must be on basic care with oxygen, basic airway care, control of bleeding, prevention of further spinal injury and transport. IV's should not delay transport. Spinal stabilization should not delay basic airway care and rapid transport in unstable patients with a head injury or shock. Much can be accomplished by simply reducing any gross neck movement. Even endotracheal intubation should not delay transport as long as ventilations can be supported and the airway is patent.

Mechanism of Injury

In most cases of exsanguinations, the patient is bleeding internally. This can be controlled only with surgery. This point is a key to the decision-making process. Often you have only the mechanism of injury to go by. This alone should be sufficient to alert you to the potential for catastrophic injury and the need for rapid transport. Even if vital signs are in the normal range, the mechanism of injury alone warrants treating the patient as an unstable patient.

Major trauma criteria define patients who clearly have a high risk of death. These include but are not limited to:

- Altered level of consciousness with GCS ≤ 13
- Respiratory distress – rate less than 10 or greater than 30
- Signs of hypo-perfusion – BP less than 90
- Penetrating injury to head, neck, chest, abdomen, or proximal extremity
- Long bone fractures – 2 or more
- Flail chest
- Major amputation of extremity
- Airway compromised with significant 2° or 3° burns

Causes

Examples of incidents that involve a high risk of serious injury include:

- Severe deceleration incidents
- fall from a height > 20 feet
- high speed motor vehicle crashes
- roll-over motor vehicle incidents
- ejection from a moving vehicle
- pedestrian struck by a vehicle > 30 km/h
- bicycle or motorcycle incidents > 30 km/h

You also need to consider the patients at high risk of developing shock:

- elderly and pediatric patients, who are less able to tolerate the effects of haemorrhage
- patients with pre-existing cardiovascular disease
- pregnant women > 20 weeks
- patients with SIRS/Sepsis or malignancy

Vital Signs

A blood pressure that appears within the normal range is not sufficient to rule out unstable trauma. You must also consider the pulse (weak? rapid?) and other signs and symptoms of shock, along with the mechanism of injury. If a patient was struck by a car and thrown 10 m but has a blood pressure of 120/70 and a rapid pulse, all precautions must still be taken in case the patient deteriorates. Prepare the patient for immediate transport. Take the patient's vital signs every 5 minutes. For unstable patients and stable patients with high likelihood of deterioration, take vital signs as often as required to adequately monitor the patient for improvement or deterioration.

Paramedics must ensure that any delay in transport is warranted. The only interventions that should be carried out prior to transport are:

- Basic C-spine stabilization when required
- Airway management and ventilator support of patients with increasing airway obstruction or failing respirations
- Relief of tension pneumothorax
- Simple stabilization of long bone and pelvic fractures

Except for very long transports the value of an IV and fluids, even for a patient in moderate shock, is controversial and certainly does not warrant any delay.

Tranexamic acid (TXA) is an antifibrinolytic agent that inhibits clot breakdown, promoting hemostasis and reducing blood loss. It is a very safe drug, it does NOT promote new clot formation so it does not cause strokes or heart attacks. It must be given within three hours of the trauma. If given after 3 hours it may cause harm.

TXA is indicated with:

- Mechanism of injury suggestive of major trauma and suspicion of ongoing occult bleeding

OR:

- Injuries identified on primary survey AND HR> 110 OR SBP<90.

There is significant controversy in the literature regarding the best way to manage airways in trauma patients. It is clear that the old standard of hyperventilation negatively affects outcome. Even transient hypoxia or hyperventilation during airway management should be avoided. The principles of airway management taught in the AIME courses are sound current standards.

Thermal Burns

THROUGHOUT THE CALL		
Primary survey	High-flow O_2	Monitor

Consider smoke/gas inhalation.[1]
Look for traumatic injuries.
Cool burns 1-2 minutes followed by clean dry dressings during transport

INDICATIONS

Patients with significant burns > 20% of body surface area (TBSA).
Use "Lund and Browder Chart".[2]

Transport
|
Secondary survey, vital signs en route
|
Administer 500 ml bolus up to 2 litres to maintain BP at 120/80 mm/Hg depending on presence of associated trauma
|
Long Term Care Fluid Requirements: administer N/S according to the following formula:
(.25 x % of burn) x patients weight in kg = volume/hr
|
Entonox[3]
|
Contact EPOS for pain control
|
Morphine 2.5 mg to effect

[1] Assist ventilations and consider early intubation for acute respiratory failure.
[2] For burns, manage according to the guidelines for Thermal Burns
[3] Entonox is contraindicated for suspected inhalation injury because an O_2 concentration of 100% is desirable. Mask is contraindicated in major facial burns.

Guidelines for Thermal Burns Treatment Guideline

General Principles

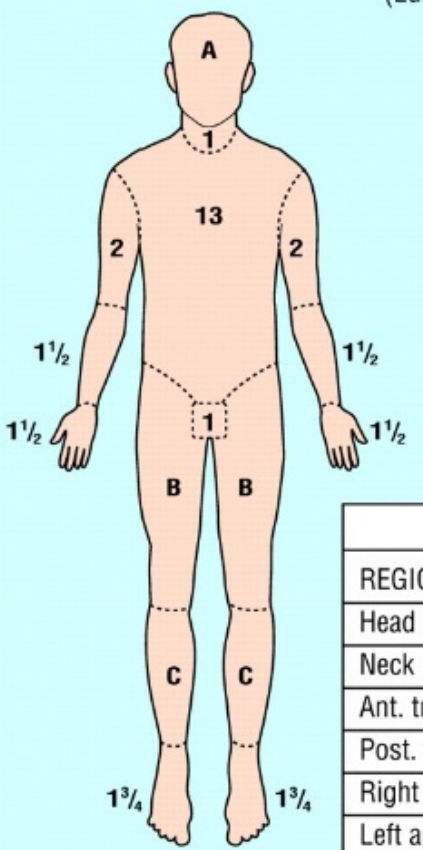
- If the patient has associated traumatic or respiratory injuries, immediate transport is a priority.
- Only immediate Primary Survey interventions should be done on scene. Goal is rapid transport to hospital.
- Burn patients lose fluids rapidly. In the immediate phase of care, patients should receive a NS 500mL bolus, up to 2L to maintain blood pressure targeted at 120/80.
- Burns are often associated with other types of trauma. Fluid therapy to manage shock due to blood loos must strike a balance the patient's fluid requirements resulting from the burn and the need to not promote further bleeding from the traumatic injury

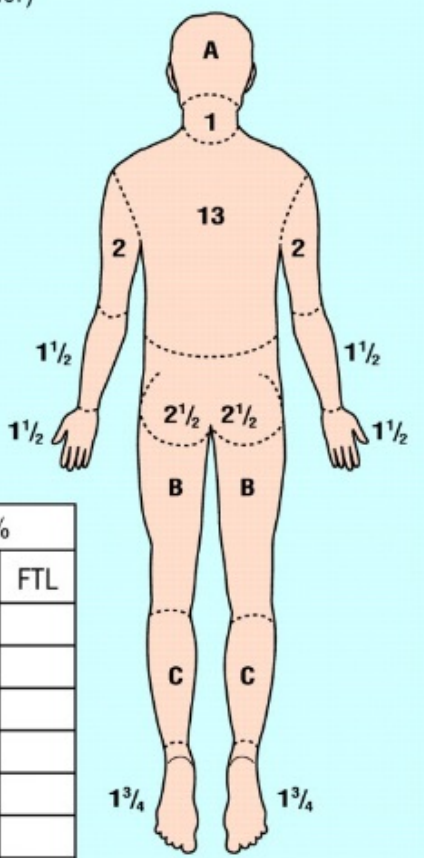
Calculating the Body Surface Area

Using the “Lund and Browder Chart” is the quickest way to calculate the extent of the burn. Only include partial and full thickness burns – not superficial ones.

% Total Body Surface Area Burn

Be clear and accurate, and do not include erythema
(Lund and Browder)





	%	
REGION	PTL	FTL
Head		
Neck		
Ant. trunk		
Post. trunk		
Right arm		
Left arm		
Buttocks		
Genitalia		
Right leg		
Left leg		
Total burn		

AREA	Age 0	1	5	10	15	Adult
A = ½ OF HEAD	9½	8½	6½	5½	4½	3½
B = ½ OF ONE THIGH	2¾	3¼	4	4½	4½	4¾
C = ½ OF ONE LOWER LEG	2½	2½	2¾	3	3¼	3½

Guidelines for Thermal Burns Treatment Guideline

Watch for inhalation injury.

Primary Survey

Cooling

- For burns greater than 20% BSA, limit cool soaks to 1-2 minutes followed by clean dry dressings during transport. Exercise caution to avoid hypothermia.

Oxygen

- Assist ventilation or intubate for acute respiratory failure.
- Apply O_2 with non-rebreather or BVM for suspected inhalation injury.

Analgesics

- Entonox - **Note**: Entonox is contraindicated for suspected inhalation injury because an O_2 concentration of 100% is desirable.
- Morphine 2.5 mg to effect: Contact EPOS for delayed orders.

Carbon Monoxide (CO) Poisoning

- CO is a by-product of combustion and is one of the many chemical products in smoke.
- CO is colourless, odourless, and tasteless and is virtually impossible to detect without special instruments.
- CO binds to the haemoglobin molecule and prevents oxygenation of the cells in the body, while possibly indicating false high SpO_2 readings.
- Suspect carbon monoxide poisoning with home space heaters, auto exhaust fumes of any material burn.
- Vague symptoms – headache, sob, nausea & vomiting, altered mental status

0-5 %	Normal in Non-Smokers	Symptomatic – give oxygen, assess environment, screen others
5-10 %	Normal in Smokers, Abnormal in Non-Smokers	Symptomatic – give oxygen, assess environment, screen others
10-15 %	Abnormal in anyone	If symptomatic and remains elevated > 10 % in any patient = transport
>15 %	Significantly abnormal	If this elevated – transport whether symptomatic or not, especially if pregnant
>30 %	May need Hyperbaric Chamber	If this elevated – transport whether symptomatic or not, especially if pregnant

American Burn Association Burn Classifications

Superficial burns	Involve only the epidermal layer of the skin and are painful. Dry, red skin.
Superficial Partial-thickness burns	Involve the epidermis and superficial portions of the dermis and are painful, red and weeping, usually from blisters, and blanch with pressure
Deep Partial-thickness burns	Extend into deeper dermis, damaging hair follicles and glandular tissue – painful to pressure only. Almost always blister, are wet or waxy dry and have variable colour from patchy white to red.
Full thickness burns	Extend through and destroy the dermis – usually painless. Skin appearance can vary from waxy white to leathery grey to charred and black.
Fourth Degree burns	Extend through the skin to underlying tissues of the fascia or muscle.

Guidelines for Chemical Burns Treatment Guideline

Protect yourself from contamination. Wear appropriate gloves and clothing.

To manage a chemical burn, follow these steps:

1. Manage the chemical. Patients with association traumatic or respiratory injuries require immediate transport. Most chemical burns can be managed with copious flushing with water for 20 minutes or more. Chemicals not soluble with water may need to be covered with a solute (e.g. mineral oil) before you begin to irrigate with water. Dry powder should be brushed off before flushing. NOTE: Sodium metals produce considerable heat when mixed with water and may explode. To prevent exposure to air and stop the burning, cover these types of burns with mineral oil if available.
   - Remove all clothing and any solid chemical that might be a source of continuing contamination.
   - Check eyes, particularly for exposure. Flush/irrigate for 20 minutes.
2. Follow the Burn Protocol for O_2, IV and analgesic therapy.
3. Because of systemic absorption from chemical burns, check the patient frequently for systemic signs.

Section 4:
Medical Treatment Guidelines

Anaphylaxis – Minor Symptoms

THROUGHOUT THE CALL		
Primary survey	High-flow O_2	Monitor

INDICATIONS

Patients who have come into contact with a known allergen and who are beginning to display minor symptoms

Provide symptom relief/prevent progression

- Diphenhydramine hydrochloride 25-50 mg PO/IM/IV

Anaphylaxis – Progressing Symptoms

THROUGHOUT THE CALL		
Primary survey	High-flow O_2	Monitor

INDICATIONS

Patients who have come into contact with a known allergen and have airway swelling, initial signs of hypo-perfusion or shortness of breath

- **Position supine or position of comfort**
- **Remove patient from vicinity of allergen**
- **Scrape off any stingers**

Reduce capillary leakage (swelling)
Increase afterload (BP) and bronchodilate

- Epinephrine IM (SC if unable to administer IM) 0.3 mg 1:1000 IM/SC to effect q5 mins

Prevent progression

- Diphenhydramine 50 mg IV

Correct hypo-perfusion-hypotension BP < 90

- Normal saline up to 2 litres – reassess BP and lungs every 500 cc's – target BP is 90 systolic

If patient is still short of breath and has wheezes, reduce airway edema and bronchoconstriction

- Nebulized Epinephrine 0.5 ml/kg 1:1000, max 5 mg

Anaphylaxis – Life Threatening Symptoms

THROUGHOUT THE CALL		
Primary survey	High-flow O_2	Monitor

INDICATIONS

Patients who have come into contact with a known allergen and are airway compromised, hypo-perfusing hypotensive, decreasing level of consciousness

Position supine or position of comfort
Remove patient from vicinity of allergen
Scrape off any stingers

Reduce capillary leakage (swelling)
Increase afterload (BP) and bronchodilate

- Epinephrine IM (SC if unable to administer IM) 0.3 mg 1:1000 IM/SC to effect, q5 mins

Prevent progression

- Diphenhydramine 50 mg IV

Correct hypo-perfusion-hypotension BP < 90

- Normal Saline up to 2 litres – reassess BP and lungs every 500 cc's – target BP is 90 systolic
-

No improvement in patient condition – obvious signs of hypoperfusion

- Epinephrine IV/IO 50-100 mcg 1:10000 IV increments to effect (give IM or IO epinephrine if IV unattainable) Maximum dose 0.3 mg

If patient is still short of breath and has wheezes, reduce airway edema and bronchoconstriction

- Nebulized Epinephrine 0.5 ml/kg 1:1000 max 5 mg

Guidelines for Anaphylaxis Treatment Guideline

General Principles

- Anaphylaxis is an acute but rare medical emergency requiring early recognition, rapid assessment, and aggressive treatment.
- Anaphylaxis usually produces signs and symptoms within minutes of the contact or ingestion. Rarely, reactions may develop later (30 minutes after exposure). Late phase or biphasic reactions occasionally occur 8-12 hours after the initial attack, especially with oral ingestions.
- Patients with symptoms of airway compromise from edema (difficulty swallowing, swollen tongue, hoarse voice), bronchospasm and/or hypotension are a significant risk of death and require immediate treatment in the field.
- Epinephrine is the primary treatment and is usually effective. Benadryl prevents progression, but is not effective in life threatening anaphylaxis. Nebulized Epinephrine may also be required, if stridor exists and/or angioedema is present.
- IV epinephrine may be indicated in failing respirations or profound shock and decreased level of consciousness. The risk is that if given IV it is extremely arrhythmogenic and can cause coronary vaso-constriction. Maximum IV dose is 0.3 mg
- Patients who are hypoxic and are not responding to epinephrine may require assisted ventilations or intubation.
- If assisted ventilation is required, you should use low pressure, extended ventilations with long pauses for exhalation as in the asthmatic patient. Normal ventilation rates and volume can cause serious complications including gastric distension/vomiting, pneumothorax and worsening hypotension may result from high pulmonary pressures.

Therapies

- In anaphylaxis where the patient has life threatening symptoms IM epinephrine should be administered as soon as possible.
- If there is no improvement after epinephrine IM then IV epinephrine 1:10,000 50-100 μg to effect may be used. IV epinephrine should be done with extreme caution at a rate of 50-100 μg/min, q3 mins
- If the patient is still SOB and has wheezes administer nebulized epinephrine 1:1000 0.5 ml/kg to a maximum dose of 5 mg.

Special Considerations

- Epinephrine has serious side effects. It can cause an increase in blood pressure, precipitating a hypertensive emergency or intracerebral bleed. The increased contractility that it causes can increase myocardial oxygen consumption and precipitate myocardial ischemia (angina). It can also cause tachycardia and more serious dysrhythmias. Use with caution in patients with a history of hypertension or cardiac/stroke risk.

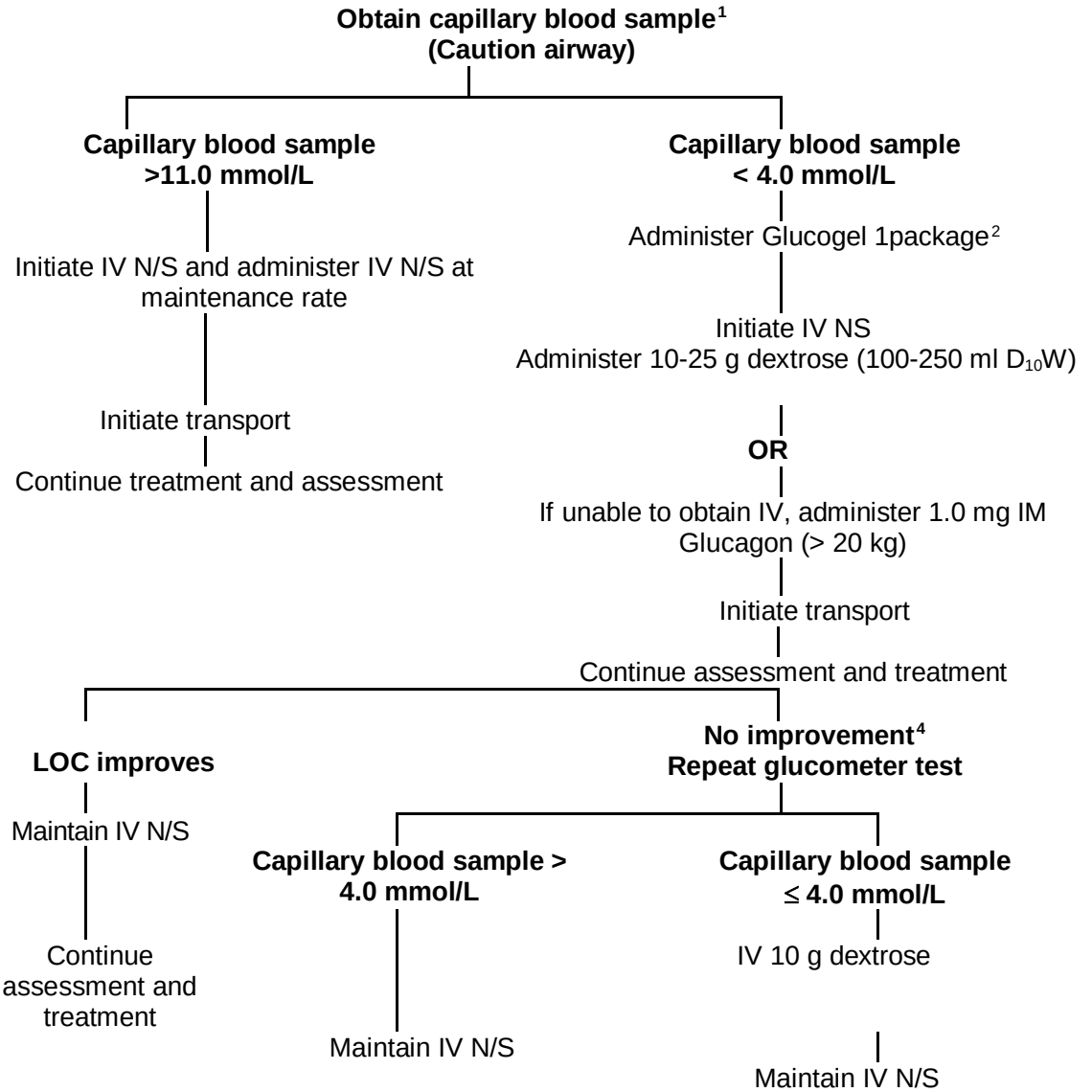
Altered Mental Status - Hypo/Hyperglycaemia

THROUGHOUT THE CALL

Primary survey | High-flow O_2 | Vital Signs and Monitor

INDICATIONS

Patients with decreased LOC whose history suggests hypoglycaemia



[1] If the patient is hypotensive, follow the Shock Treatment Guideline.

[2] Apply the Glucogel against mucous membrane of mouth (rub against gum and cheek). Glucogel provides immediate treatment for the patient. If the patient is not responding satisfactorily to the Glucogel, at least he/she has received some glucose while the IV or Glucagon is being prepared and initiated.

[4] Wait 5 minutes with IV glucose – Wait 15 minutes with glucagon.

Altered Mental Status-Hypo/Hyperglycaemia Treatment Guideline

General Principles

This guideline should be employed for patients with a decreased LOC whose history suggests hypoglycaemia or hyperglycaemia.

Hypoglycaemia is a blood glucose level <4mmol/L.

Hyperglycaemia is a blood glucose level >11mmol/L.

Therapies

- For the patient that is hypoglycaemic the goal of care is to restore normal glucose levels in the field.
- For the patient that is hyperglycaemic the goal of care is to restore normal glucose levels in the hospital.
- For patients who can still comply with directions, administration of oral glucose may be enough to increase their level of consciousness and avoid unnecessary IV initiation.
- After obtaining the capillary blood sample, administer liquid glucose gel to the buccal mucosa or sublingually. This oral glucose provides some immediate treatment for the patient. If the patient responds to the oral glucose (several administrations may be necessary), an IV may not be indicated. If the patient does not respond adequately to the oral glucose, at least he/she has received some glucose while the IV is being prepared and initiated.
- If the patient is hypotensive, follow the Shock Treatment Guideline and transport.
- Hyperglycemia is a condition often associated with dehydration and volume depletion. For this reason normal saline is the initial IV of choice. These patients may have diabetes with DKA or undiagnosed diabetes and have developed hyperglycaemic non-ketotic coma. These patients are at risk of death and require careful management in the ER.

- If after 25 g dextrose the patient has not improved or has partially improved, obtain a repeat capillary blood sample reading and follow the appropriate treatment regime. This capillary blood sample reading is obtained to avoid unnecessary administration of glucose and to diagnose the non-responsive patient earlier to a normalized blood sugar.

Altered Mental Status – Agitated Patients

THROUGHOUT THE CALL		
Monitor ABCs	High-flow O_2	Monitor - IV

INDICATIONS
Patients in agitated states

ACTIONS:
- Await police restraint if indicated
- Position the patient supine
- Monitor vital signs

Correct Hypoglycemia:

Glucogel
- Administer 1 package to oral mucosa

Glucagon
- 1 mg IM (if IV unattainable)

Dextrose
- 10 - 25 grams (100 – 250 cc) D10W

Excited delirium states:
Midazolam
- 5 – 10 mg IM to effect
- 2 – 5 mg IV to effect

General Guidelines for Altered Mental Status – Agitated Patients Treatment Guideline

Acute confusion or delirium is defined as acute cognitive dysfunction secondary to a medical condition. It is characterized by disturbances of consciousness, cognition, and perception. The incidence of delirium at time of hospital admission has been reported to be as high as 20%. It is highly prevalent in the elderly population.

It is common to encounter agitated, aggressive patients. Many of these are patients who are angry, frightened or reacting to stress. Others, however, are acutely delirious or have an altered mental status. It is of primary importance to recognize this and to look for reversible causes as well as provide safe transport.

Life Threatening Conditions:

1. Hypoglycemia
2. Hypoxia
3. Psychosis
4. Drug interactions
5. Head injury
6. Infections (pneumonia, sepsis)
7. Biochemical abnormalities

Other common Causes:

1. Alcohol or recreational drug intoxication
2. Endocrine

Patients who are extremely agitated with an alteration of cognitive function and excluding those with hypoglycemia are at risk of irreversible cardiopulmonary arrest.

A broad spectrum of patients can present in acutely agitated states. Apart from hypoglycaemia, few causes are reversible in the pre-hospital setting.

Sedation may permit a safer transport and provide an earlier opportunity for hospital staff to evaluate the patient. As Advanced Care Paramedics you may be requested to assist in the safe transport of these patients.

Be aware that sedation comes with the potential for respiratory compromise which may compound an underlying drug or disease effect. There is no evidence that sedation will prevent nor cause sudden death in the extremely agitated patient.

Sudden death in excited delirium usually occurs in patients restrained face down with or without impairment of chest movement. If it is necessary to place the patient prone initially to gain control, monitor the airway and vital signs closely and always move to a supine or ¾ prone position as soon as possible.

Altered Mental Status - CNS Depressant Poisoning/Overdose

THROUGHOUT THE CALL		
Primary survey	High-flow O_2	Monitor – I.V.

INDICATIONS

Patients suffering from an apparent central nervous system depressant poisoning or overdose. Altered LOC is a continuum ranging from mild confusion to deep unconsciousness with no responses and may progress to cardiovascular collapse and death.

Correct Hypoglycemia:

Glucogel:

1 package applied or oral mucosa

Glucagon:

1 mg IM (if IV unattainable)

Dextrose:

10-25 grams (100-250 cc) D10W IV

Correct Narcotic Overdose

Narcan:

0.8 mg SC q5 min

0.4 mg IV q5 min

Tricyclic Antidepressant Overdose

Contact EPOS:

Sodium bicarbonate 1 mEq/kg IV

Guidelines for Altered Mental Status - CNS Depressant Poisoning/Overdose Treatment Guideline

General Principles

- Primary airway management, adequate oxygenation and support of ventilation are required in the majority of cases
- Always consider other potential causes of altered level of consciousness. Patients with medicinal or recreational drug overdoses may have trauma, CNS infection or other serious illness in addition to the poisoning
- Consider causes of altered level of consciousness early in the call.
- This protocol should be employed when there is not an obvious reason for altered LOC.

Therapies

- TCA overdoses are time critical. Deterioration can be rapid and unexpected.
- For tachycardia with widening QRS complex (>100 ms), contact EPOS to consider treatment with sodium bicarbonate 1mEq/kg. The mechanism is unclear but may be related to effects on the sodium channels.
- Seizures should be treated promptly with Midazolam. Sodium bicarbonate 1 mEq/kg may also be indicated and should be discussed with the EP
- Opioid overdoses require optimal ventilation and oxygenation prior to consideration of naloxone
- Naloxone is often not required and should only be given if the respiratory rate is < 10 and there is altered LOC not responding to stimulation.
- S/C naloxone is absorbed more slowly than I.V. thus providing a smoother emergence. It is faster and safer to administer compared to initiating an IV.

- If narcotic overdose is suspected and BP < 90 mm Hg, administer naloxone 0.4 mg IV. Repeat dose is 0.4 mg IV q5 mins.
- If BP > 90 mm Hg, or unable to get an IV, administer naloxone 0.8 mg SC/IM. Repeat dose is 0.4 mg IV or 0.8 mg SC/IM
- If capillary blood sample is ≤ 4 mmol/L follow the Hypo/Hyperglycaemic Treatment Guideline.
- Beware of complications of Naloxone administration including:
    - Combativeness and violence especially if other drugs are on board
    - Acute withdrawal sometimes accompanied by a seizure
    - Acute respiratory distress (rare)
    - Deterioration after 20-30 minutes as the effect of naloxone diminishes and the opiate re-establishes its effect

Special Considerations

- **GHB** overdose can cause rapidly fluctuating states from combative to unresponsive with respiratory deterioration. Management consists of safe and expeditious transport

Hypothermia – Non Cardiac Arrest

THROUGHOUT THE CALL		
Primary survey	High-flow O_2	Monitor

INDICATIONS

A decrease in the core body temperature below 35°C. The goal of care is to stabilize the patient, treat associated medical conditions, minimize further heat loss and provide rapid transport - consider a facility with ECMO. Hypothermia is seen in a variety of different circumstances. It is classified into:

- Mild (32-35°C)
- Moderate 28-32°C)
- Severe (< 28°C)

Remove the patient from the environment

Thoroughly assess pulse/respirations for 30 seconds

Capillary blood glucose if altered LOC

- **Treat as required**

Assess for associated injuries or medical conditions

Immediate transport

Obtain core temperature where feasible

Prevent further cooling

Passive rewarming for severe cases should be limited to removal of wet clothing and use of blankets to limit further cooling

Guidelines for Hypothermia Non Cardiac Arrest Treatment Guideline

General Principles

- **Mild hypothermia** (32-35°C) is manifested by peripheral vasoconstriction, shivering, hypertension and tachycardia
- **Moderate hypothermia** (28-32°C) is manifested by the patient becoming confused and ataxic and the shivering may stop
- **Severe hypothermia** (<28°C) – patient will have significantly lower level of consciousness with no response to pain, display an absence of reflexes and have severely diminished cardiac output. Ventricular fibrillation risk increases as the temperature drops and becomes most significant below 28 degrees C.
- Consider possible causes of hypothermia such as near drowning, cold exposure or collapse for an extended period.
- In the case of collapse, consider hypothermia in the following clinical settings:
    - CVA
    - Drug overdose
    - Alcohol intoxication
    - Dehydration
    - Diabetes
    - Unheated rooms of seniors

Therapies

- Remove the patient from the environment
- Remove wet garments
- Blankets and insulation to prevent heat loss and protect against wind chill
- Avoid rough handling, but don't delay patient care. There is no convincing evidence to substantiate the issue of induction of ventricular fibrillation with moving or caring for the hypothermic patient. Use a backboard and/or clamshell to minimize patient movement if it doesn't delay patient care.

- Monitor temperature and cardiac rhythm
- Use BVM if no spontaneous respirations. Intubate when necessary for airway protection.
- Ventilate 8-10 breaths/min.
- Caution: Watch for arrhythmias
- Ventilate with 100% O_2.
- Establish IV N/S.
- Follow Hypo/Hyperglycaemic Treatment Guideline if the patient has an altered LOC.
- If the patient is in cardiac arrest, follow the Hypothermia and Cardiac Arrest Treatment Guideline.
- Warm heat packs have limited utility in severe hypothermia. Care must be taken to not cause thermal injury to the skin.

Seizures

THROUGHOUT THE CALL		
Primary survey	High-flow O_2	Monitor - IV

INDICATIONS

For patients having seizures. Most seizures are self-limiting.[1, 2]

Establish IV NS

↓

Capillary blood glucose

↓

If CBG <4.0mmol/L, treat as per Hypoglycemia Guideline

↓

Midazolam 2-5 mg IV to effect or 5-10 mg IM

[1] **Status epilepticus** is defined as:

- Recurrent seizures without full neurological recovery in between
- Prolonged seizure activity for longer than 5 minutes

[2] If seizures are associated with tricyclic overdose or other drug overdose, contact EP for further orders.

Guidelines for Seizures Treatment Guideline

General Principles

- Seizures may manifest in many unusual ways including
- Loss of awareness
- Twitching or shaking of the body, associated with uncontrolled muscular contractions
- Obtain as much history as possible from bystanders, family, or friends, and document this information fully. History should include:
  - Description of seizure, e.g., generalized versus focal
  - Duration of seizure
  - Previous seizure disorder
  - Increased frequency of seizures recently
  - Medications; time of last dose
  - Precipitating factors: fever, alcohol or other drugs, hypoglycemia, non-compliance with medications, or recent trauma
- **Status epilepticus** is defined as:
  - Recurrent seizures without full neurological recovery between
  - Prolonged seizure activity for more than 5 minutes

Therapies

- Secure airway, administer O_2 at 8-10 L, and protect patient from further injury. Beware that sudden loss of consciousness and intense rapid muscle contractions can cause injuries.
- Take vital signs and monitor cardiac status.
- Start IV normal saline.
- Obtain capillary blood sample. If blood sample $\leq$ 4 mmol/L, administer 10-25 g D10W. $D_{50}W$ may be used if the IV could be displaced by a continuing seizure.
- Beware of respiratory depression when administering midazolam.

- Ensure that the airway equipment is prepared when administering midazolam.

Special Considerations

If the cause of the seizure is a tricyclic overdose or other drug overdose, contact the EPOS early.

Typical Causes of Seizures:

- Hypoxia
- Hypoglycemia
- Withdrawal of alcohol or benzodiazepines
- Acute head injury
- Exposure to toxic drugs
- Structural damage to the brain
- Hyponatremia
- Meningitis or encephalitis
- Fluid accumulation in the brain
- Epilepsy
- Febrile seizures

Stroke

THROUGHOUT THE CALL		
Primary survey	High-flow O_2	Monitor - IV

Defined as a sudden, non-traumatic vascular insult to the brain. May be ischemic (embolic) or hemorrhagic (spontaneous bleeding). Identify reversible conditions, facilitate timely scene management and transport to an appropriate facility.

Assess stroke symptoms
(Cincinnati Stroke tool)

Assess onset or last time seen “normal”

Minimize scene time

Capillary blood glucose
If CBG <4.0mmol/L, treat as per Hypoglycemia Guideline

Correct rhythm disturbance:
Symptomatic Bradycardia
Symptomatic Narrow Complex Tachycardia
Symptomatic Wide Complex Tachycardia

Guidelines for Stroke Treatment Guideline

General Principles

- EMS plays an important role in the care of patients with an acute stroke. Accurate recognition, timely scene management, transport and notification are key principles. Fibrinolytic drugs for acute stroke must be administered less than 4.5 hours from onset of symptoms. It takes approximately 1 hour in the ER for assessment and treatment so that leaves 3.5 hours for recognition by the patient, activating 911, EMS response time, scene time and transport time. Use your time efficiently.
- TIA is a warning sign that the patient is at risk for a stroke within days. Think of it as being the neurological equivalent to unstable angina in the cardiovascular system.
- Watch for and treat hypoglycaemia as its signs and symptoms can mimic a stroke.
- Anything that decreases blood flow can create stroke-like symptoms:
  - Symptomatic arrhythmias
  - Hypotension from GI bleeding or trauma
- Patients with a seizure disorder can present with stroke like symptoms as part of the postictal phase.
- Use the Cincinnati Stroke Tool for identification of the possibility of a stroke.
- It is vital to determine the time of onset of symptoms. If that can't be done try to determine when the patient was last seen normal.
- Notify the hospital

Cincinnati Stroke Scale - FAST

Interpretation: if any of these 3 signs is abnormal, the probability of a stroke is 72%

Arm Drift

The patient closes eyes and extends both arms straight out, with palms up for 10 seconds

- Normal – both arms move the same or both arms do not move at all (other findings, such as pronator drift, may be helpful)
- **Abnormal – one arm does not move or one arm drifts downward**

Facial Droop

The patient shows teeth or smile

- Normal – both sides of the face move equally
- **Abnormal – one side of the face does not move as well as the other side**

Abnormal Speech

The patient repeats "you can't teach an old dog new tricks"

- Normal – patient uses correct words with no slurring
- **Abnormal – patient slurs words, uses the wrong words, or is unable to speak**

Hot Stroke Definition:

- The patient has a significant deficit: speech problems, weakness, neglect of one side, loss of vision, etc.
- Time since onset is less than 3.5 hours

Record findings and time of onset on patient care report.

Syncope

THROUGHOUT THE CALL		
Primary survey	High-flow O_2	Treat reversible causes

Defined as a loss of consciousness resulting from a brief and reversible loss of normal neurological function due to poor perfusion, a metabolic event or a neurological event

Assess for etiology of syncope

↓

Capillary blood glucose
If <4.0mmol/L, treat as per Hypoglycemia Guideline

↓

IV during transport

BP < 90:
Fluid challenge 500ml NS (Reassessing lungs and BP every 200 mls. Target BP: 90 mm/Hg)

↓

Correct rhythm disturbance:
Symptomatic Bradycardia
Symptomatic Narrow Complex Tachycardia
Symptomatic Wide Complex Tachycardia

Guidelines for Syncope Treatment Guideline

General Principles

- Syncope is a common pre-hospital presentation. It is a symptom that results from a number of causes. It is a brief and reversible loss of normal neurological function due to poor perfusion of the brain (decreased BP), a metabolic event (hypoglycaemia, hyperventilation) or a neurological event (seizure, subarachnoid haemorrhage).
- Syncope is different from other unconscious collapses as it is often of limited duration and the patients return to a normal level of consciousness quickly.
- Syncope can be a sign of a potentially serious and life threatening condition. In the absence of an easily attributable cause for a vasovagal episode or if the patient isn't recovering, beware of the presence of specific conditions such as:
    - Unresolved hypotension
    - Hypoglycaemia
    - Seizure
    - CVA
- Maintain a high index of suspicion in patients who experience a sudden syncopal episode that occurs without warning and then returns to normal mental status. This is due to cardiac arrhythmia until proven otherwise, even if vital signs are normal.
- Vital signs and rhythm strips or 12 lead ECG's may be the best opportunity to diagnose the cause.
- Make every effort to convince the patient that they should be transported to the hospital as they may refuse service.
- Pre-syncope is the feeling of fainting without loss of consciousness. It may also result from any of the serious causes listed on the next page. It should be treated in the same fashion.

Immediate life threatening causes:

- Cardiac arrhythmias with or without ischemia
- Other heart diseases (valvular, hypertrophic cardiomyopathy)
- Hypovolemia (GI bleed, occult haemorrhage (ectopic pregnancy, AAA)
- Pulmonary embolus (obstructive shock)
- Hypoglycaemia
- Heat exhaustion/stroke
- Subarachnoid haemorrhage
- CVA/TIA
- Seizure
- Drugs: Beta blockers/Ca channel blockers/benzodiazepines/narcotics
- Hyperventilation/anxiety

Pain Management

THROUGHOUT THE CALL		
Primary survey	O_2	Monitor - IV

Pain from a traumatic injury or severe pain associated with other medical causes

Keep patient at rest/position of comfort
Splint/support any injured extremity

↓

Entonox

↓

Contact EPOS
Morphine 2.5 mg to effect

↓

Nausea associated with opioid:
Dimenhydrinate 12.5-25 mg IV

Guidelines for Pain Management
Treatment Guideline

General Principles

- Addressing the pain can calm the patient and may help with the assessment and management of the patient
- Pain can be managed in many ways. All are important:
    - Gentle handling
    - Reassurance
    - Appropriate splinting/support
    - Analgesic
    - Paramedic demeanour/language
- Contraindications for Entonox:
    - Inability to ventilate in an enclosed treatment area
    - Nitroglycerin used within the last 5 minutes
    - Inability to comply with instructions
    - Suspected air embolism or pneumothorax
    - Decompression sickness
- Provide the patient with high flow oxygen after Entonox use.

Nausea and Vomiting

THROUGHOUT THE CALL		
Primary survey	O_2	Monitor - IV

The list of potential etiologies for nausea is extensive. There are two main principles to managing nausea:

- Identify the underlying cause to provide specific therapies if appropriate
- Treat symptoms empirically for comfort

It is also important to allow the patient to maintain some degree of dignity. Take a proactive approach to ensure emesis is contained and the patient is kept clean and assisted

Keep the patient at rest
Position of comfort
|
Capillary blood glucose
If <4.0mmol/L, treat as per Hypoglycemia Guideline
|
Dimenhydrinate 25-50 mg IM/IV or
Dimenhydrinate 12.5 mg IM/IV for frail older adults
|
IV fluids for dehydration as appropriate

Nausea and Vomiting Treatment Guideline

General Principles

The common presentations of nausea are infectious, medication-related in nature or vertigo. However, nausea can also be a symptom of potentially life-threatening conditions such as stroke, meningitis, GI bleeding, ischemic bowel, DKA, myocardial infarction and sepsis. Other emergent diagnoses include electrolyte disturbance, overdose and drug toxicity, carbon monoxide poisoning, pregnancy, intra-abdominal infection, biliary disease and bowel obstruction.

The cause of most acute presentations can be determined by detailed history and physical examination. Specifically, the onset, pattern and duration of nausea with associated vomiting or other symptoms should be noted. A complete physical examination with particular attention to abdominal distension, peritonitis and neurological status are extremely important. A blood glucose level must be checked to identify potential hypoglycemia.

Dimenhydrinate (Gravol) is a medication that may be administered empirically for symptom relief. Use only if symptoms are present and not for prophylaxis.

Use Caution in Patients with:

- Increased intraocular pressure / glaucoma
- Prostatic hyperplasia and urinary obstruction
- Cardiovascular disease (ischemic heart disease and hypertension)
- Asthma

Traumatic Cardio-Pulmonary Arrest (TCPA)

THROUGHOUT THE CALL		
Primary survey	Consider Reversible Causes	Rapid Transport

Cardiac arrest associated with trauma

Low energy mechanism blunt trauma:

- CPR according to medical guidelines

High energy mechanism blunt trauma:

- **Contact EPOS** to discuss discontinuation orders

Penetrating trauma

- CPR and immediately prepare for rapid transport if <15 minutes to ED arrival

|

TRANSPORT

|

Oxygen en-route

|

Control life threatening bleeding while facilitating transport:

- Direct pressure to sites of obvious blood loss
- Rapid application of tight tourniquet for catastrophic extremity injury with ongoing high volume blood loss

|

IV during transport
BP < 90:
Fluid challenge up to 2L N/S

|

Assess for pneumothorax:
Decompress the chest

|

Consider advanced airway management enroute:

Guidelines for Traumatic Cardio-Pulmonary Arrest (TCPA) Treatment Guideline

General Principles

Recognize which patients should not have resuscitation started in the field.

Recognize when ongoing resuscitation is futile and should be terminated in the field.

Recognize special circumstances:

- Medical cardiac arrest patients who then sustained some trauma
- Electrocution
- Hypothermia
- Minor direct blow trauma to the chest-induced cardiac arrest (commodio cordis)

Conditions where resuscitation is clearly unwarranted:

- Decapitation
- Trans-section of the body
- Inability to treat a pulseless patient during prolonged extrication
- Cardiac arrest with an open skull fracture and brain tissue extrusion

Immediate recognition and correction of reversible causes of traumatic arrest and rapid transport to hospital.

Penetrating Trauma TCPA

- Penetrating trauma is a special situation where there may be a surgically correctable bleeding site if direct control is quickly possible. If you are <15 minutes anticipated time from loss of pulse/respiration to the Emergency Department then rapid transport and notification is indicated. If time delay is > 15 minutes contact the EPOS for likely discontinue orders.

Blunt Trauma TCPA

- Patients with blunt trauma are difficult to assess. It is sometimes difficult to determine if a medical event preceded the trauma or severe trauma resulted in the arrest. With signs of major trauma and absence/loss of pulse and respirations (either after your initial assessment and Rapid trauma survey or during transport) you are likely dealing with a non-survivable situation and should contact the EPOS for likely discontinue orders.

- Emphasis should be placed on the mechanism on injury and history of the event. In cases of relatively low forces of injury, a cardiac event should be considered. If you are not certain that blunt force caused the traumatic arrest, early in the course of preparing for transport, rule out a shockable rhythm with the cardiac monitor.

- Commodio Cordis is cardiac arrest from an isolated blow to the chest. The scene should be managed in the same way as a non-traumatic cardiac arrest with CPR and cardiac monitor.

Though a difficult decision, in both cases if you are unable to reach the EPOS and you are greater than 15 minutes to the Emergency Department you should consider discontinue resuscitation.

Traumatic Brain Injury

THROUGHOUT THE CALL		
Primary survey	Supplemental O2 Monitor - IV	Rapid Transport

Brian injuries resulting from a blunt blow to the head, rapid deceleration, or penetration by a missile or sharp object

Spinal motion restriction
|
TRANSPORT
Elevate the head of the stretcher 30°
|
BP < 90mmHg:
2 large bore IV's during transport
|
Fluid challenge up to 2L NS
Reassess every 500 ml
Target BP 110-120mmHg
|
Consider advanced airway management (risk vs. benefit)
|
If intubation is indicated
High Flow Nasal Cannula (NO DESAT)
Lidocaine spray 10mg/spray to effect (max 20 sprays)
Consider midazolam 2 mg to effect
Consider morphine 2.5 mg to effect

Guidelines for Traumatic Brain Injury Treatment Guideline

General Principles

All patients with trauma and any altered LOC should be suspected of having a traumatic brain injury and be transported without delay. Assume a spinal injury and stabilize the spine prior to transport, minimizing time of scene as much as possible.

The most important goals in pre-hospital treatment of head injury are rapid transport while minimizing secondary injury. This can be very challenging. The preferred destination will be a facility with neurosurgical capability. Follow trauma destination decision rules in your area.

Other internal injuries are common with brain injury and will be less apparent.

Preventing secondary injury is accomplished by:

- Ensuring adequate oxygenation
- Supporting ventilation if it is inadequate to maintain a partial pressure of CO_2 in the normal range
- Maintaining a blood pressure adequate to perfuse cerebral circulation

When assessing and managing an adult with a severe head injury, remember the Brain Trauma Foundation's "90-90-9 rule":

- A single drop in the patient's oxygen saturation (SaO2) to less than 90% doubles his or her chance of death.
- A single drop in the patient's systolic BP to less than 90 mm Hg doubles his or her chance of death.
- A single drop in the patient's GCS score to less than 9 doubles his or her chance of death. A drop in the GCS score of two or more points, at any time, also doubles mortality

Supplemental O_2 and a patent airway are essential. Often it is best to ensure a patent airway and oxygenation and let the patient determine the respiratory volume and rate.

Assisted ventilations are only required if you cannot maintain oxygenation or the patient clearly exhibits an inadequate volume or rate. A target O_2 saturation of 95% or greater is reasonable.

Endotracheal intubation may be necessary to maintain airway patency or ventilation. The decision to intubate must be carefully considered.

A low GCS is not a reason to intubate.

Risks associated with intubation include:

- Delay in surgical intervention
- Hypoxia during the attempt
- Hypercapnia during the attempt
- Hypocapnia after successful intubation
- Hypertension secondary to the airway reflex
- Induction agent induced hypotension and loss of sympathetic drive

Each of these is possible even in a seemingly uneventful insertion of the ET tube and likely worsens neurologic outcome. Monitor O_2 saturation before, during and after intubation and $ETCO_2$ as soon as possible. (Follow AIME principles)

The newer concept of permissive hypotension in trauma does not apply in head injuries with reduced level of consciousness. Hypotension should be treated with a normal saline fluid challenge during transport. A systolic pressure of 110-120mmHg is appropriate to ensure adequate cerebral perfusion. Once that level is reached fluids can be slowed to keep the vein open. Fluid overload results in secondary increased intracranial pressure which increases secondary injury.

Potential Spinal Trauma

THROUGHOUT THE CALL		
Primary survey	Supplemental O2	Spinal immobilization

Potential injury to spinal column as a result of any force applied to the head, neck or spine.

Provide manual stabilization

↓

Avoid any unnecessary movement

↓

Immobilize patient following principles of spinal immobilization

↓

Distributive Shock Treatment Guideline
BP < 90mmHg
IV during transport

↓

Fluid challenge up to 2L N/S
Reassess BP and lungs every 500 ml
Target BP 90mmHg

↓

Dimenhydrinate 12.5-25 mg IV/SC/IM

Guidelines for Potential Spinal Trauma Treatment Guideline

General Principles

Safe management of potential spinal trauma is a basic expectation of pre-hospital care. The fragility of patients with spinal injury and the risk of worsening the injury are legitimate concerns. Spinal trauma accompanies approximately 12% of serious trauma and may be present in lesser degrees with even minor trauma. The cervical spine is the most often injured segment or the spinal column.

Canadian C-spine rules are appropriate to follow when assessing a patient for potential C-spine injury.

If at all in doubt, err on the side of caution and immobilize the patient.

- In addition to obvious mechanism the following patients are at a higher risk for spinal injury:
  - Elderly patients
  - Falls with axial loads
  - Penetrating trauma, particularly gun shots
  - Altered level of consciousness/intoxication
  - History of spinal mobility issues, ankylosing spondylitis or rheumatoid arthritis
  - Patients with painful distracting injuries

- **Basic principles of spinal motion restriction:**
  - Follow fundamental trauma principles including minimizing scene times in trauma
  - Immobilization may range from simple stabilization in the multiple trauma patient requiring immediate rapid transport to efficient full immobilization of the patient with an isolated potential spinal cord injury
  - Appropriate gentle handling of patients with spinal trauma
  - Awareness of risks of spinal immobilization including airway compromise, respiratory restriction and effects of immobilization including pressure related injury.

    - Attempt to achieve and maintain spinal immobilization on uncooperative patients. However they may need individualized immobilization. This should be well documented
    - Document details of the injury and examination focusing on motor and sensory changes (including light and sharp touch sensations) along with signs of spinal tenderness/pain, or conditions that would preclude a physical examination

- Spinal shock may be present – hypotension and bradycardia may be part of the pattern. Treat with the treatment guideline on shock. Severe bradycardia with hypotension should be treated in consultation with EPOS
- Beware of sports, recreation or work based injuries that are isolated to the spinal cord even though it isn't a major multi-system trauma:
    - High cervical lesions will impair respirations
    - Extra time should be spent in careful patient immobilization to prevent further damage or conversion of a recoverable injury to a permanent one.
    - Signs of other injuries and internal bleeding may be masked, thus scene times must be as short as possible.

Electrical Injuries

THROUGHOUT THE CALL		
Ensure safety	Primary survey Monitor - IV	Cool burns

INDICATIONS

Injuries resulting from contact with high voltage electrical current.

Ensure scene safe from live electrical power

|

Cool burns – ensure entry and exit points identified

|

Dress injuries

|

Identify type of current and duration of contact

|

Rapid Transport

|

Entonox

|

BP < 90mmHg:
IV during transport

|

Fluid challenge of 500 ml, then TKVO
Target BP 120/80mmHg depending on presence of associated trauma
Maintain at IIV 100 ml/hr if no sign of shock

|

Monitor for and correct rhythm disturbances

|

Morphine 2.5 mg IV to effect

Guidelines for Electrical Injuries Treatment Guideline

General Principles

- Scene safety is paramount for everyone
- Electrical injuries can be divided into low voltage electrical injuries (< 500 volts) and high voltage electrical injuries (> 500 volts)
- Electrical energy trauma may result in the following injuries:
    - Direct tissue trauma due to the passage of the current. This includes damage to the bone, muscle, nerve and soft tissues and is seen in mainly high voltage current
    - Effect on the brain leading to loss of consciousness and respiratory arrest
    - Effect of current on the heart leading to ventricular fibrillation and arrhythmias
    - Trauma secondary to being thrown or falls post electric injury
- ABC's as always are the priority. Initiate CPR as required
- Assess for presence of injuries, either burns associated with entrance or exit point or secondary injury associated with falls of being thrown
- Gather information on the type/duration of current
- Patient comfort and protection of any injured limb
- IV fluids for high voltage injury, 500 cc bolus NS then 100 cc/hr for those with no sign of shock
- Follow the Thermal Burn treatment guideline for those patients who are hypotensive with signs of hypoperfusion
- Place patients on a cardiac monitor

Hypothermia – Cardiac Arrest

THROUGHOUT THE CALL		
Remove patient from the environment	Prevent further cooling	Initiate warming where feasible

Vital signs absent in the presence of primary hypothermia

Thoroughly assess pulse/respirations – 30 seconds

↓

Monitor
if organized electrical activity is noted review for presence of vital signs

↓

Ventricular Fibrillation:
CPR
Defib 200J x 1 only
Epinephrine 1 mg x 1 only

↓

PEA/Asystole
CPR
Epinephrine 1 mg x 1 only

↓

Consider early transport

Guidelines for Hypothermia – Cardiac Arrest Treatment Guideline

General Principles

- Consider hypothermia as a potential cause of cardiac arrest in any environment or circumstance where there is apparent exposure to cooling mechanisms. This doesn't always occur in the outdoors, as patients may be hypothermic from lying on the floor for an extended period of time inside the home.

- The hypothermic patient has reduced metabolic demands and may have significant bradycardia and decreased respiratory rate. Take 30 seconds to accurately detect the presence of a pulse and respirations.

- Cardiac electrical activity should be assessed as soon as possible. If the monitor shows an organized rhythm then carefully reassess the pulse.

- Limit defibrillations to 1 attempt and 1 dose of epinephrine 1 mg. If unsuccessful, continue CPR and transport, concentrating on reducing further heat loss and passive re-warming

- Decisions about prolonged resuscitation depend on the history.

- Consult with EPOS. If there is a possibility that the patient was cold prior to arresting then they should be warmed in the hospital prior to discontinuation.

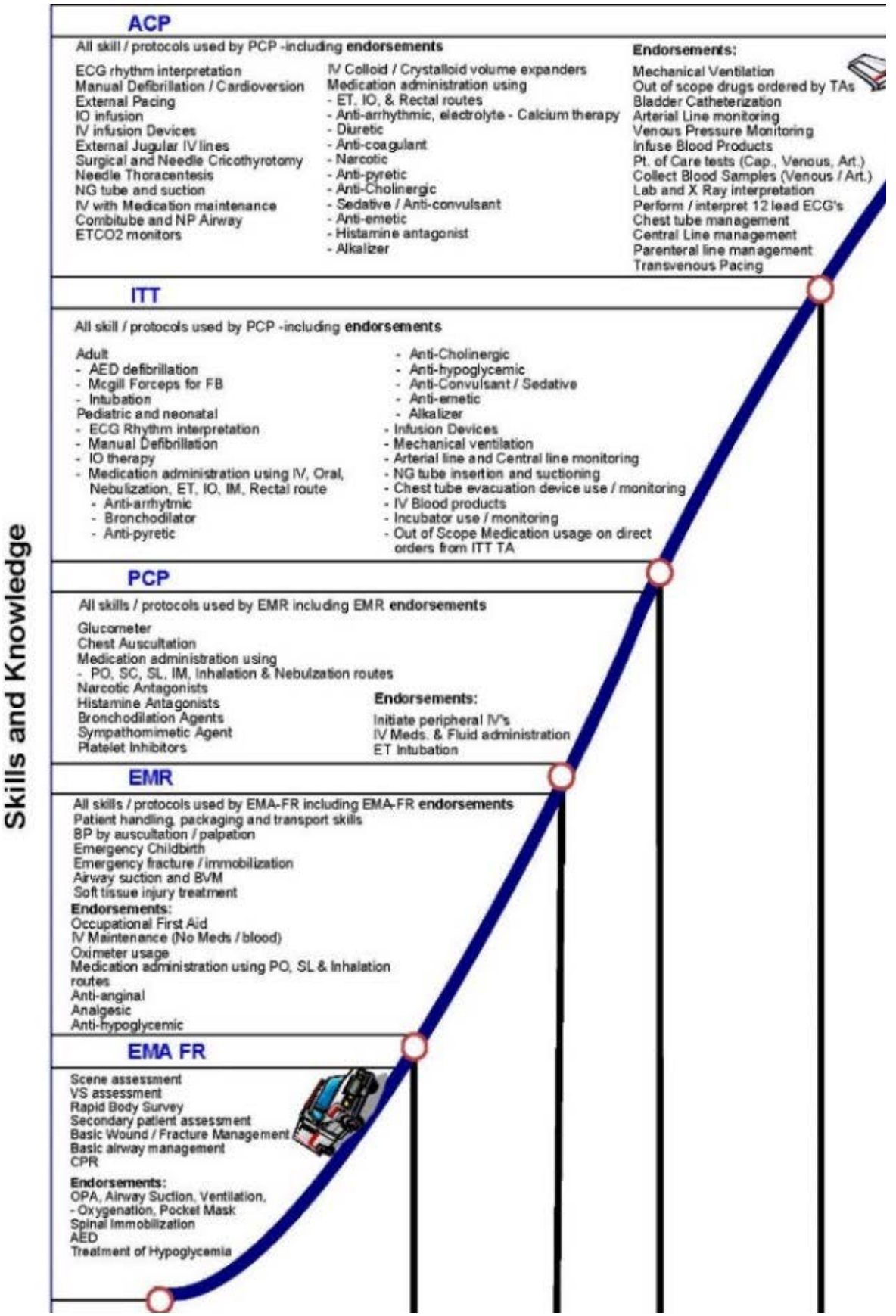
- There isn't any clear evidence for a time frame for resuscitation but 60 minutes is a good guide

- Other agencies may use an immersion time of 90 minutes (Coast Guard). When working together contact the ER Physician and Rescue Specialist for guidance.

Appendix A:
Drug Therapy

Medication Guide to BC Paramedic Qualifications

Medications	EMA FR	EMR	PCP	ITT	ACP
Adenosine					X
Acetaminophen				X	X
Amiodarone					X
ASA			X	X	X
Atropine				X	X
Atrovent					X
Benadryl			X	X	X
Bicarbonate				X	
Calcium					X
Dextrose 50%					X
Dimenhydrinate (Gravol, Dramamine)			X		X
Epinephrine			X	X	X
Glucagon			X	X	X
Glucose IV			X	X	X
Glucose Oral	X	X	X	X	X
Lidocaine					X
Magnesium				X	X
Midazolam				X	X
Morphine					X
Narcan			X	X	X
Nitroglycerin		X	X	X	X
Nitrous Oxide		X	X	X	X
Oxygen	X	X	X	X	X
Saline IV			X	X	X
Sodium Bicarbonate					X
Tranexamic Acid (TXA)			X	X	X
Ventolin			X	X	X


Skills and Knowledge
ACP
All skill / protocols used by PCP -including endorsements
ECG rhythm interpretation
Manual Defibrillation / Cardioversion
External Pacing
IO infusion
IV infusion Devices
External Jugular IV lines
Surgical and Needle Cricothyrotomy
Needle Thoracentesis
NG tube and suction
IV with Medication maintenance
Combitube and NP Airway
ETCO2 monitors
IV Colloid / Crystalloid volume expanders
Medication administration using
- ET, IO, & Rectal routes
- Anti-arrhythmic, electrolyte - Calcium therapy
- Diuretic
- Anti-coagulant
- Narcotic
- Anti-pyretic
- Anti-Cholinergic
- Sedative / Anti-convulsant
- Anti-emetic
- Histamine antagonist
- Alkalizer
Endorsements:
Mechanical Ventilation
Out of scope drugs ordered by TAs
Bladder Catheterization
Arterial Line monitoring
Venous Pressure Monitoring
Infuse Blood Products
Pt. of Care tests (Cap., Venous, Art.)
Collect Blood Samples (Venous / Art.)
Lab and X Ray interpretation
Perform / interpret 12 lead ECG's
Chest tube management
Central Line management
Parenteral line management
Transvenous Pacing
ITT
All skill / protocols used by PCP -including endorsements
Adult
- AED defibrillation
- Mcgill Forceps for FB
- Intubation
Pediatric and neonatal
- ECG Rhythm interpretation
- Manual Defibrillation
- IO therapy
- Medication administration using IV, Oral, Nebulization, ET, IO, IM, Rectal route
- Anti-arrhytmic
- Bronchodilator
- Anti-pyretic
- Anti-Cholinergic
- Anti-hypoglycemic
- Anti-Convulsant / Sedative
- Anti-emetic
- Alkalizer
- Infusion Devices
- Mechanical ventilation
- Arterial line and Central line monitoring
- NG tube insertion and suctioning
- Chest tube evacuation device use / monitoring
- IV Blood products
- Incubator use / monitoring
- Out of Scope Medication usage on direct orders from ITT TA
PCP
All skills / protocols used by EMR including EMR endorsements
Glucometer
Chest Auscultation
Medication administration using
- PO, SC, SL, IM, Inhalation & Nebulzation routes
Narcotic Antagonists
Histamine Antagonists
Bronchodilation Agents
Sympathomimetic Agent
Platelet Inhibitors
Endorsements:
Initiate peripheral IV's
IV Meds. & Fluid administration
ET Intubation
EMR
All skills / protocols used by EMA-FR including EMA-FR endorsements
Patient handling, packaging and transport skills
BP by auscultation / palpation
Emergency Childbirth
Emergency fracture / immobilization
Airway suction and BVM
Soft tissue injury treatment
Endorsements:
Occupational First Aid
IV Maintenance (No Meds / blood)
Oximeter usage
Medication administration using PO, SL & Inhalation routes
Anti-anginal
Analgesic
Anti-hypoglycemic
EMA FR
Scene assessment
VS assessment
Rapid Body Survey
Secondary patient assessment
Basic Wound / Fracture Management
Basic airway management
CPR
Endorsements:
OPA, Airway Suction, Ventilation, - Oxygenation, Pocket Mask
Spinal Immobilization
AED
Treatment of Hypoglycemia

Calcium Chloride ($CaCl_2$)

All studies show no benefit from the use of calcium during a cardiac arrest. In fact, high levels of calcium may be detrimental. The exception would be in cases where hypocalcemia or hyperkalemia is playing a crucial role in cardiac arrest. Examples of such cases include patients with renal failure, malnutrition, calcium channel blocker overdose, or wide QRS complex PEAs.

Magnesium Suphate ($MgSO_4$)

Torsades de pointes is a relatively rare clinical entity that is characterized by wide complex tachyarrythmias with gradually alternating axes. Often patients will remain conscious during the arrhythmia. The clinical situations often associated with torsades de pointes are severe starvation states, nutritional deficiency, and antiarrhythmic drug therapies with Class Ia agents or sotalol. Effective treatment consists of $MgSO_4$ 4.0 g as a bolus. Routine administration of $MgSO_4$ in cardiac arrests has not been of proven efficacy.

Drug Infusions

Epinephrine Infusion

Epinephrine Infusion

- Add 1 mg epinephrine to 250 mL N/S bag (use minidrip set).
- Solution will yield 4 µg/mL.
- Normal dose range is 1-10 µg/min or 15-150 mini gtt/min.

Amiodarone Infusion

Amiodarone Infusion

- Add 150 mg Amiodarone 50 mL N/S bag (use a standard drip set).
- Solution will yield 3 mg/mL.
- Infuse over 10 minutes at 50 gtts/min

Amiodarone Maintenance

- Add 150 mg Amiodarone 50 mL N/S bag (use a standard drip set).
- Solution will yield 3 mg/mL.
- For transport times longer than 30 minutes administer at 1 mg/min for the 1st 6 hours at 3.33 gtts/min

Magnesium Infusion

Magnesium Infusion

- Add 2 grams Magnesium to 250 mL N/S bag (use a standard drip set).
- Solution will yield 8 mg/mL.
- Infuse over 20 mins at 125 gtts/min (~ 2 drops/sec)

TXA Administration

TXA Administration

- Withdraw 1 gram and place in a 10 cc syringe
- Administer 1 gram over 10 minutes at 100 mg/min

OR:

- Add 1 gram (10 mls) TXA to 50 ml N/S bag (use a standard drip set).
- Volume in N/S bag = 60 mL
- Solution will yield 16.7 mg/mL.
- Infuse over 10 mins at 60 gtts/min (1 drops/sec)

Appendix B:
Procedures

Sedation

It may be necessary to sedate conscious, intubated, or post-arrest agitation patients. This decision should be made in consultation with the EPOS. In instances of airway compromise, phone-in orders are not required. The preferred drug for sedation is Midazolam, 2 mg to effect and if necessary, Morphine 2.5 mg to effect. Ensure that the airway equipment is prepared prior to sedation.

Pre-Intubation Lidocaine Spray

Pre-intubation lidocaine spray is recommended in situations where the patient has a perfusing rhythm. It is another tool to help facilitate intubation, including in an awake patient, by providing surface anaesthesia of the mucous membranes.

Each spray delivers 10 mg of Lidocaine (systemically) and is delivered in a “spray as you go” technique.

Maximum dose is 20 sprays.

Rhythm Changes

Whenever ventricular fibrillation reoccurs, defibrillation should be re-initiated at the energy level that previously resulted in successful defibrillation. Single shocks should be starting at the previously successful energy level, stepping up to 360 joules and continuing with 360 joules as long as the patient stays in ventricular fibrillation.

If a patient's rhythm changes from the initial rhythm causing cardiac arrest to another pulseless rhythm, you should assess the drugs previously given and the energies delivered and enter the new rhythm protocol at the most therapeutically appropriate level. For example, if the patient has already received a full atropinizing dose of 3.0 mg, do not give more atropine.

Pre-cordial Thump

Conversion of an abnormal rhythm following a pre-cordial thump or a cough is known to occur in patients with complete A-V block, WCT, or ventricular fibrillation. If a defibrillator is not immediately available, a solitary pre-cordial thump is recommended as an initial therapy in all witnessed cardiac arrests.

A pre-cordial thump should not be used in patients with stable ventricular tachycardia with a pulse unless a monitor/defibrillator is available, as a thump can induce ventricular fibrillation.

Intubation

Procedure

1. Assemble necessary equipment:
    - Check light
    - Select appropriately sized tube
    - Check cuff inflation
    - Insert stylette guide if required
    - Lubricate distal end of tube
2. Maintain sterility of tube throughout procedure.
3. Pre-oxygenate patient.
    - Monitor patient's O_2 levels throughout if equipment available
4. Position the patient's head appropriately.
5. Insert laryngoscope into mouth and expose vocal chords.
    - Using left hand, insert into the right side of the mouth
    - Push tongue to the left
    - Position blade correctly (according to type)
6. Suction as required (may do this step earlier).
7. Insert endotracheal tube into trachea.
    - Using right hand, insert the tube into right side of mouth
    - Visualize cuff passing vocal chords
    - Check tube distance against teeth
8. Inflate cuff to sufficient volume.
9. Ventilate patient with bag-valve-mask device, and confirm tube placement.
10. Secure endotracheal tube.
11. Resume ventilation of patient. (At no time is patient at risk of hypoxia due to prolonged procedure.)
12. Add PEEP

External Cardiac Pacing (Transcutaneous Pacing)

Indications

- Post arrest bradycardia with a heart rate < 50 and a BP <90.
- Initiate when there is no response to Atropine
- Start early for Asystole or PEA believed to be resulting from pacemaker failure and for Asystole that responds to fist pacing.

Procedure

- Apply the pacing electrodes and connect the cable to the pacer.
- Anterior-Posterior placement is preferred as there is lower impedance and higher current flow than with Anterior-Lateral placement.
- Turn the pacer on.
    - Machine should flag each intrinsic beat.
    - If the pacer does not flag each QRS, try turning up the gain, or using a different lead (vector) to monitor.
- Set the pacing rate (60-70).
- Activate the pacemaker
- Set the pacing current. (mAmp)
    - Adjust upwards slowly until electrical capture is present.
- Assess electrical capture.
    - Electrical capture is present when each pacing spike is followed by a ventricular depolarization with a visible QRS complex and repolarization with a T wave.
    - Each pacer spike that captures the ventricle will produce a wide QRS complex, a consistent ST segment, and a broad, slurred T wave that is opposite in polarity from the QRS complex.
- Do not mistake the wide, slurred after-potential following an external pacing spike for evidence of ventricular depolarization associated with electrical capture.
- Assess ventricular function and cardiac output (mechanical capture) during pacing.
- Increase mAmp by 10% once electrical and mechanical capture has been achieved
- Assess pulse and blood pressure.

- Attempt to palpate the patient's right carotid or right femoral artery to avoid confusing a pulse with the muscle contractions caused by the pacemaker.
- SpO2 and PetCO2 readings may be useful indicators of cardiac output.
- Consider sedation or analgesia (discuss with EP).

Notes

1. Watch for underlying, treatable VF. The pacing artifact may obscure recognition of the development of VF.
2. Once electrical capture is achieved, if there is no mechanical capture, there is no benefit to increasing the pacer output (mAmp) in an attempt to achieve mechanical output.
3. Several minutes of simultaneous pacing and chest compressions have been reported to re-establish electromechanical association' in some patients.
4. Loss of monitoring capability (leads off), automatically defaults the pacer to standby. The Lifepak 12/15 will NOT pace unless you are currently monitoring the ECG (demand mode).

Nasopharyngeal Airway

Indications

- The patient requires an airway adjunct to prevent mechanical upper airway obstruction from a flaccid tongue and relaxed hypopharyngeal structures secondary to the obtunded/unconscious state.
- The patient cannot tolerate insertion of an oropharyngeal airway.
- An oropharyngeal airway cannot be inserted because of biting, trismus, massive perioral trauma, or mandibular wiring.

Contraindications

- Basilar skull fracture
- Previous maxillofacial surgery

Sizing

- The millimeter size of the airway indicates internal diameter (i.d.); the larger the i.d., the longer the tube.
- The proper tube length is estimated from the tip of the nose to the tragus of the ear. Recommendations are:
    - Large Adult – 32-36 French
    - Medium Adult – 28-32 French
    - Small Adult – 24-28 French

Procedure

- Lubricate the appropriate size airway with water-soluble lubricant or anesthetic jelly (Xylocaine).
- Gently insert the airway close to the midline, along the floor of the nostril, into the posterior pharynx behind the tongue.
- If resistance is encountered, slightly rotate the tube to facilitate insertion at the angle of the nasal passage and nasopharynx.
- Maintain manual control of the airway (head tilt, jaw thrust or chin lift).

Notes

1. When a nasophyngeal airway is too long, insertion may injure the epiglottis and vocal cords, or may cause bradycardia through vagal stimulation. It may also facilitate air entry to the esophagus during Positive Pressure Ventilations.
2. In the patient with an intact gag reflex, insertion may provoke laryngospasm and vomiting.
3. Insertion may injure the nasal mucosa, causing bleeding.
4. Insertion stimulates excessive secretions that may require suctioning.

Skills and Procedures Guideline – Gastric Tube Insertion

Indications

- Cardiac Arrest
- Gastric distension interfering with ventilation

Contraindications

- Nasal gastric tube placement is contraindicated with a Basal skull fracture
- Extreme caution if history of caustic substance ingestion, esophageal varices

Principles

- Reduction of gastric distention will prevent ventilatory compromise during CPR.

Key Points

- Use aseptic technique and universal precautions throughout procedure
- Assembles and prepares equipment
- Gastric tube (14 or 16f), Water-soluble lubricating jelly, Laryngoscope, 30-50ml syringe, Stethoscope, Tape, Gloves
- Estimates insertion length
    - Distance from stomach to nose extending down to earlobe

- Lubricates tube
- Lubricates 7.5-10 cm of tube with water soluble lubricant
- Visualizes the esophagus (Orogastric)
- Inserts tube, advances tube to desired distance
- Checks tube placement
- Connects syringe to tube
- Places stethoscope over upper left quadrant of patient's abdomen just below costal margin
- Injects 10-20ml of air while auscultating – whooshing sound to confirm tube placement
- If tube is not in stomach, advances another 2.5-5 cm and rechecks position
- Anchors tube with tape

Skills and Procedures Guideline – Melker Device

These recommendations are designed to serve only as a general guideline. They are not intended to supersede institutional protocols or professional clinical judgement concerning patient care.

DEVICE DESCRIPTION

The Melker Universal Cricothyrotomy Catheter Set consists of components used for both Seldinger and surgical placement of a cricothyrotomy tube including:

- #15 and #11 scalpels
- 12 cc syringe
- 18 gage introducer needle
- 18 gage TFE catheter introducer needle
- Amplatz Extra Stiff Wire Guide .038 inch
- Curved Seldinger dilator
- Curved blunt dilator
- Airway catheter
- Tracheal hook
- Trousseau dilator
- Cloth tracheostomy tape
- Set also includes a drape and gauze pads

INTENDED USE

The Melker Universal Cricothyrotomy Catheter Set has been designed to establish emergency airway access when endotracheal intubation cannot be performed. Airway access is achieved utilizing either percutaneous entry (Seldinger) technique or surgical technique via the cricothyroid membrane. The product is intended for use by physicians trained and experienced in proper emergency airway techniques. Standard emergency techniques for the placement of a Seldinger or surgical cricothyrotomy should be employed.

CONTRAINDICATIONS

No absolute contraindications known.

WARNINGS

The Melker Universal Cricothyrotomy Catheter Set is not specifically designed for pediatric applications. Use with pediatric patients should be determined by attending physician. Use in children below the age of 12 is not recommended. Consideration should be given to the following medical and anatomic conditions:

- Distorted anatomy
- •Subcutaneous abscess
- Hematoma
- Post-operative scarring/radiation
- Coagulopathies or systemic thrombolytic therapy

SELDINGER TECHNIQUE

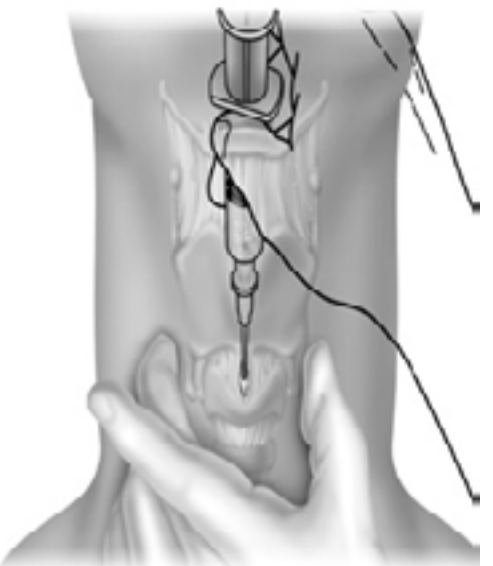
1. Identify the cricothyroid membrane between the cricoid and thyroid cartilages.
2. Carefully palpate the cricothyroid membrane and while stabilizing the cartilage, make a vertical incision in the midline using the #15 short handle scalpel blade. A sufficient incision to allow the passage of the dilator and cuffed airway is recommended. (Figure 1)

Figure 1

3. With the supplied syringe attached to the 18 gage TFE catheter introducer needle or the 18 gage thin wall introducer needle, advance it through the incision into the airway at a 45° angle to the frontal plane in the midline in a caudad direction.

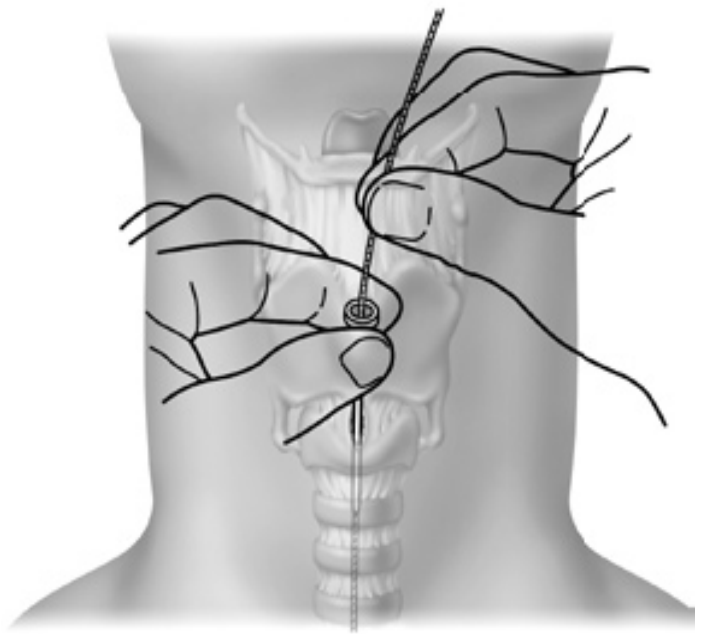
   When advancing the needle forward, verification of entrance into the airway can be confirmed by aspiration on the syringe resulting in free air return. (Figure 2)

Figure 2



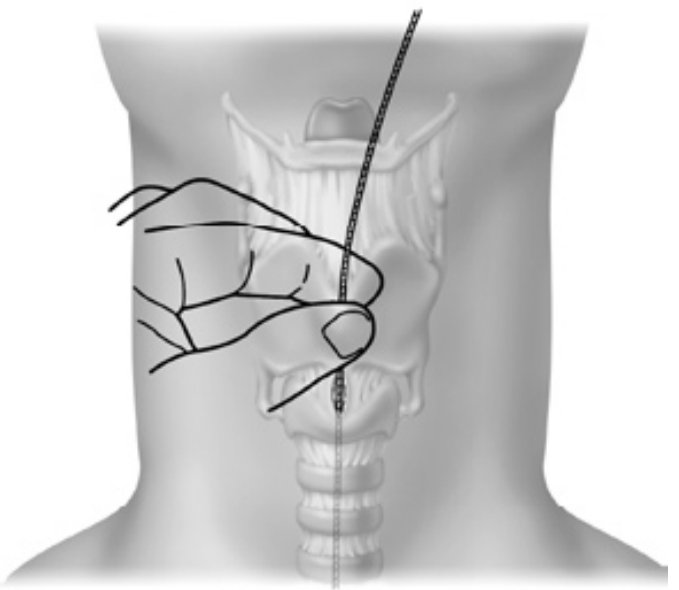
4. Remove the syringe and needle, leaving the TFE catheter in place. If using the 18 gage thin wall introducer needle, remove only the syringe leaving the needle in place. Advance the soft, flexible end of the wire guide through the TFE catheter and into the airway several centimeters. (Figure 3)

Figure 3



5. Remove the TFE catheter or the needle, leaving wire guide in place. (Figure 4)

Figure 4



6. Advance the handled dilator, tapered end first, into the connector end of the airway catheter until the handle stops against the connector.

NOTE: This step may be performed prior to beginning procedure. Use of lubrication on the surface of the dilator may enhance fit and placement of the cuffed emergency airway catheter. (Figure 5)

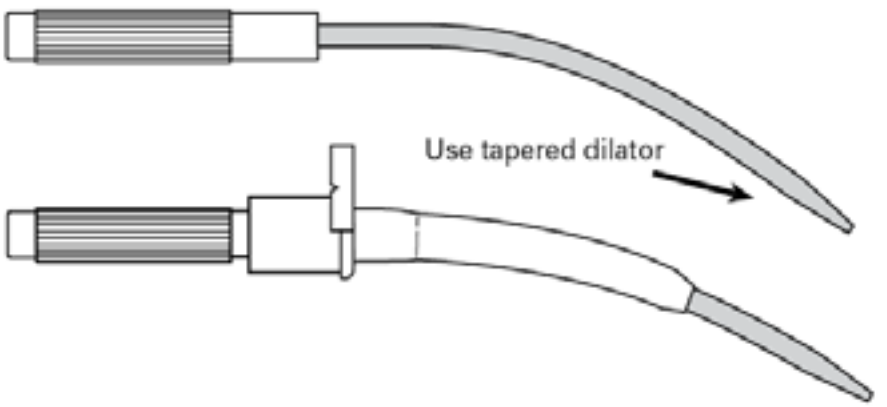
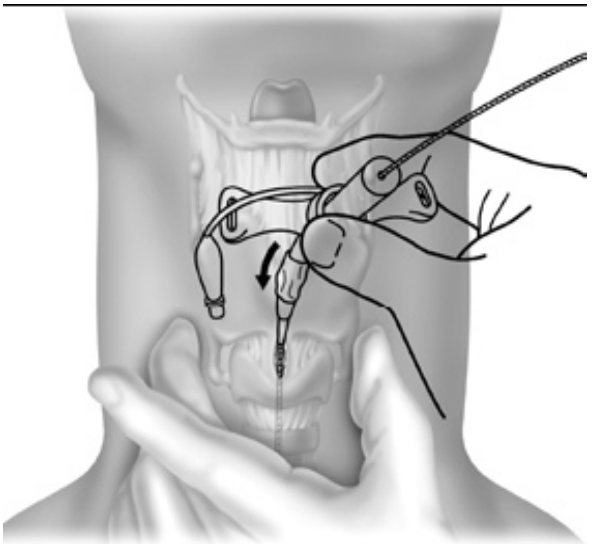


Figure 5

7. Advance the cuffed emergency airway access assembly over the wire guide until the proximal stiff end of the wire guide is completely through and visible at the handle end of the dilator. **It is important to always visualize the proximal end of the wire guide during the airway insertion procedure to prevent its inadvertent loss into the trachea.**

   Maintaining the wire guide position, advance the cuffed emergency airway access assembly over the wire guide with a reciprocating motion, and completely into the trachea. **Care should be taken not to advance the tip of the dilator beyond the tip of the wire guide within the trachea.** (Figure 6)

Figure 6

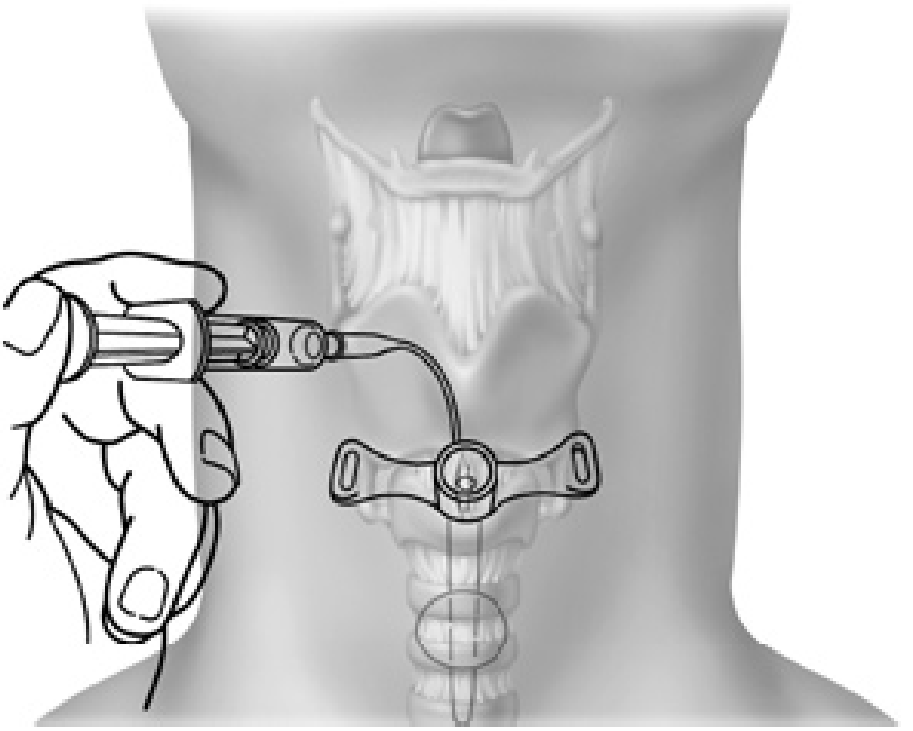


8. Remove the wire guide and dilator simultaneously.

9. Inflate the cuff using a syringe; 8-10 cc volume in the cuff will yield a cuff diameter of 22-29 mm. The inflation and deflation procedure is at the discretion of the physician. (Figure 7)

   Warning: Inflation of the cuff with more than 20 cc is not recommended.

Figure 7



10. Fix the emergency airway catheter in place with the cloth tracheostomy tape strip in a standard fashion.

11. Connect the emergency airway catheter, using its standard 15 mm adapter to an appropriate ventilatory device.

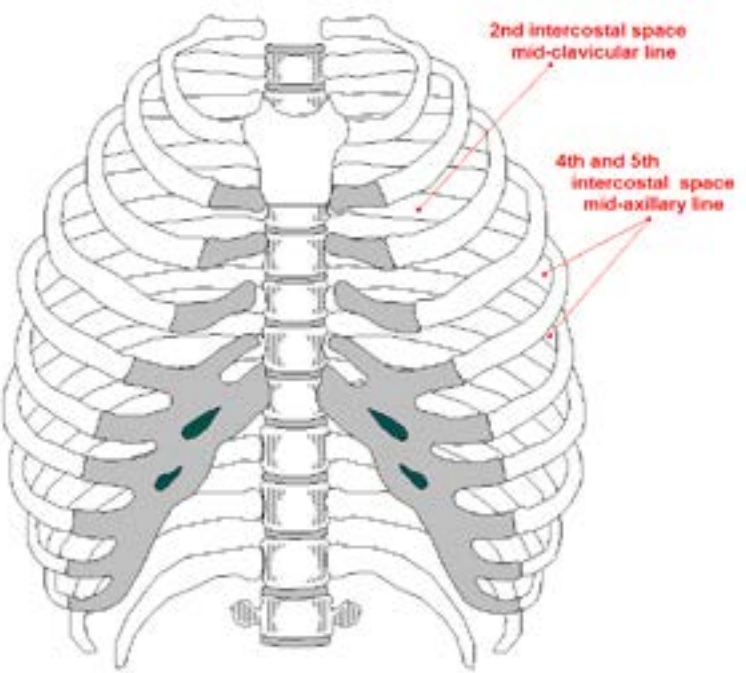
Skills and Procedures Guidelines - Needle Thoracentesis

Indications

- Tension pneumothorax with deteriorating vital signs, markedly decreased cardiac output, profound shock or cardiac arrest.
- Discussion should occur with the EPOS prior to performing needle thoracentesis, unless the patient is in cardiac arrest.

Procedure

- Identify insertion point, preferably the 2nd intercostal space in the mid-clavicular line. The 2nd intercostal space is adjacent to the Angle of Louis, the junction between the manubrium and the main sternal bone. The mid-clavicular line is approximately 6 -7 cm from the mid sternal line or the length of the pneumothorax needle. An alternative site is the 4th or 5th intercostal space in the mid-axillary line.



- Prepare the skin using the skin prep included in the pneumothorax kit. If it is not available, Povidone-iodine is the second choice and if all else fails, cleanse the area with an alcohol swab.

- Using a Cook Pneumothorax Decompression Needle/ Catheter connected to the syringe, enter the skin, directing the needle to pass above the rib thus avoiding the intercostal vessels and nerves that traverse along the inferior border of the ribs. The needle should be inserted perpendicular to the skin. If for some reason the Cook Kit is not available a 14 g angiocatheter is an option but will be ineffective up to 50 % of the time.

- Maintain negative pressure on the syringe. When you enter the pleural cavity, the pressure of the tension pneumothorax may force the plunger out of the syringe although this would be rare.

- Successful decompression of a clinically significant tension pneumothorax usually is apparent by reduction of negative pressure in the syringe barrel followed by a reduction in respiratory distress (or easier positive pressure ventilation) and an increase in blood pressure.

- Advance the catheter into the pleural space, and remove the syringe and needle.

- Apply an Asherman Chest Seal dressing.

- Place the Asherman Chest Seal over the catheter, and secure it in place. On expiration, air will escape from the pleural cavity via the catheter and flutter valve. On inspiration, the flutter valve is closed to prevent air from entering the pleural cavity. If the catheter appears to be placed appropriately in the pleural space but ceases to be effective in relieving the pneumothorax or is not functioning properly leave the catheter in place to alert the emergency department staff of its location.

- Upon entering the pleural cavity, you may not aspirate anything. This effectively rules out the diagnosis of tension pneumothorax. Remove the syringe but leave the catheter in place to alert the emergency department staff of its location.

- You may aspirate blood; this likely is a result of arterial puncture or may represent a large hemothorax. Although you may attempt to aspirate as much blood as possible from a hemothorax, it is probably not worth doing so in the field. Remove the syringe. If the patient is actively bleeding through the end of the device remove the catheter, control the bleeding and ensure you report the location of the puncture to the emergency department staff. If the patient is not actively bleeding through the end of the device leave the catheter in place.

Other Potential Complications

- Pneumothorax
- Hemothorax
- Pulmonary contusion or laceration
- Cardiac injury
- Hepatic, gastric, or splenic injury from improper positioning

CPAP

Purpose and Description

CPAP is a non-invasive means of providing respiratory support for patients who are in enough distress that they require more than supplemental oxygen, but are not at the point of invasive airway management. The application of an airtight face mask with a continuous pressure to the lungs has been shown in many research studies to reduce both intubation requirements and mortality.

CPAP devices deliver a controlled amount of positive pressure during both the inspiratory and expiratory phases of the breathing cycle which supports alveolar recruitment and maintenance in effort to improve pulmonary gas exchange.

Indications

Adult patients with Acute Respiratory Insufficiency defined as moderate to severe respiratory distress concurrent with:

- signs and symptoms of hypoxia (Spo2< 90, Skin mottling, cyanosis, pallor) and/or
- Accessory muscle use

Recommended Uses:

Consider in adult patients (>13 yrs old and/or >35 kgs) with Acute Respiratory Insufficiency secondary to:

- Acute Respiratory Failure
- CHF
- Acute Pulmonary Edema (cardiogenic and non cardiogenic)
- Asthma/Reactive airway disease
- Near Drowning
- COPD
- Pneumonia

Contraindications

- Patients less than <35kgs
- Respiratory arrest/ agonal respirations/ hypoventilation
- Loss of protective airway reflexes
- Severe decreased level of consciousness
- Traumatic etiology of respiratory distress
- Facial trauma / deformity / burns inhibiting proper mask fit
- High risk of aspiration / active vomiting
- Tracheostomy
- Pneumothorax
- SBP<90mmHg

Special Considerations

- CPAP requires an air-tight seal of facemask for optimal performance
- CPAP should be discontinued in the case of patient non-tolerance or progression to
- respiratory failure
- CPAP should not delay the administration of medications (i.e. Nitro)
- Observe patient for signs / symptoms of hypotension or respiratory failure
- DNR is **not** considered a contraindication to CPAP use

Advantages

- Provides positive pressure ventilation without the need for intubation
- Permits adequate oxygenation with lower FiO_2
- Avoidance of risk and complications of ETI
- Decreases the risk of nosocomial infections
- Preservation of normal airway defense mechanisms (gag reflex)
- Reduces length of stay in hospital and mortality compare to ETI

Complications

- Heightened sense of claustrophobia or smothering leading to non-tolerance.
- Patient discomfort.
- High external pressures may increase intrathoracic pressures thus decreasing venous return and decreasing cardiac output (rare).
- Potential for barotraumas - pneumothorax or pneumomediastinum (rare).
- Increased challenge in clearing secretions and suctioning.
- Difficult to assess airway patency.

Precautions

- Mechanical ventilation and intubation remain the mainstay of treatment for patient with persistent hypoxia or respiratory muscle fatigue. CPAP is not appropriate.
- Intubation equipment should be available for patients who do not respond to CPAP

Procedure for Rescuer CPAP Application

- Demonstrate appropriate body substance isolation procedures
- Assemble and prepare the equipment
- Explain the CPAP procedure to the patient
- Obtain verbal consent for treatment
- Prepare CPAP equipment and oxygen supply
- Place the patient in upright sitting position
- ECG SPO_2 monitors are on
- Initiate CPAP at 5 liters per minute with PEEP valve set to 0
- Have patient hold CPAP mask in proper position with proper force and coach the patient in order to gain acceptance of the mask. A calm directive approach is key.
- Place the head cap/ straps if patient will tolerate
- Adjust PEEP valve to 5 cm H_2O to deliver CPAP of 5 cm H_2O
- Monitor the face mask placement for proper fit and address any leaks
- Monitor the patient's respiratory response to the CPAP

- If SpO_2 remains < 92 % follow manufactures flow rate/CPAP chart and increase flow rate to 8L followed by increasing the PEEP valve to 10 cm H_2O to deliver a CPAP of 10 cm H_2O
- Monitor the patient's tolerance
- Typically CPAP 10 cm H_2O for acute pulmonary edema and 5 cm H20 for other etiologies
- Dependent on patient's tolerance and need for increased CPAP: titrate oxygen flow up to 10 L/min and increase PEEP valve to 15 cm H_2O to give a max CPAP of 15 cm H_2O if SpO2 remains below 92%
- Monitor and record complete vital signs every 5 minutes
- Continuous reassessment for need to positive pressure ventilate
- Titrate the oxygen flow (lpm) down if BP drops < 90 Systolic
- Continue with medications as appropriate (nitro, ventolin)

Discontinue CPAP if any of the following occur:

- The patient's mental status deteriorates and they cannot follow commands
- The patient's respiratory status declines or they cannot maintain airway
- The patient develops active vomiting or active upper gastrointestinal bleeding
- The patient is unable to tolerate the mask
- The patient's blood pressure drops below 90 systolic
- Equipment failure or concerns

Post CPAP removal

- Prepare for bag mask ventilation assistance
- Prepare for possible endotracheal intubation

Special Notes

- In-line nebulization may be utilized with CPAP in place or MDI may be used.
- Most patients will show signs of improvement in 5- 10 min. if no improvements assess for other causes. Re-evaluate for intermittent positive pressure ventilation or intubation

Practitioner Notes

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