EMERGENCY
MEDICINE KENYA FOUNDATION

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Adult Triage Criteria

Developed by World Health Organization, The International Committee of the Red Cross, Médecins Sans Frontières

1 CHECK FOR RED CRITERIA

- Unresponsive

AIRWAY & BREATHING
- Stridor
- Respiratory distress* or central cyanosis

CIRCULATION
- Capillary refill >3 sec
- Weak and fast pulse
- Heavy bleeding
- HR <50 or >150

DISABILITY
- Active convulsions
- Any two of:
  - Altered mental status
  - Stiff neck
  - Hypothermia or fever
  - Headache
- Hypoglycaemia

OTHER
- High-risk trauma*
- Poisoning/ingestion or dangerous chemical exposure*
- Threatened limb*
- Snake bite
- Acute chest or abdominal pain (>50 years old)
- ECG with acute ischaemia (if done)
- Violent or aggressive

PREGNANT WITH ANY OF:
- Heavy bleeding
- Severe abdominal pain
- Seizures or altered mental status
- Severe headache
- Visual changes
- SBP ≥160 or DBP ≥110
- Active labour
- Trauma

YES

MOVE TO HIGH ACUITY RESUSCITATION AREA IMMEDIATELY

NO

2 CHECK FOR YELLOW CRITERIA

AIRWAY & BREATHING
- Any swelling/mass of mouth, throat or neck
- Wheezing (no red criteria)

CIRCULATION
- Vomits everything or ongoing diarrhoea
- Unable to feed or drink
- Severe pallor (no red criteria)
- Ongoing bleeding (no red criteria)
- Recent fainting

DISABILITY
- Altered mental status or agitation (no red criteria)
- Acute general weakness
- Acute focal neurologic complaint
- Acute visual disturbance
- Severe pain (no red criteria)

OTHER
- New rash worsening over hours or peeling (no red criteria)
- Visible acute limb deformity
- Open fracture
- Suspected dislocation
- Other trauma/burns (no red criteria)
- Known diagnosis requiring urgent surgical intervention
- Sexual assault
- Acute testicular/scrotal pain or priapism
- Unable to pass urine
- Exposure requiring time-sensitive prophylaxis (eg. animal bite, needlestick)
- Pregnancy, referred for complications

YES

MOVE TO CLINICAL TREATMENT AREA

NO

Patients with high-risk vital signs or clinical concern need up-triage or immediate review by supervising clinician

YES

3 CHECK FOR HIGH-RISK VITAL SIGNS

- HR <60 or >130
- RR <10 or >30
- Temp <36° or >39°
- SpO2 <92%
- AVPU other than A

NO

MOVE TO LOW ACUITY OR WAITING AREA

High-Risk Trauma Criteria

General Trauma	Road Traffic
Fall from twice person's height	High speed motor vehicle crash
Penetrating trauma excluding distal to knee/ elbow with bleeding controlled	Pedestrian or cyclist hit by vehicle
Crush injury	Other person in same vehicle died at scene
Polytrauma (injuries in multiple body areas)	Motor vehicle crash without a seatbelt
Patient with bleeding disorder or on anticoagulation	Trapped or thrown from vehicle (including motorcycle)
Pregnant	

Major Burns

(the below criteria refer to partial or full thickness burns) Greater than 15% body surface area	Inhalation injury
Circumferential or involving face or neck	Any burn in age < 2 or age > 70

Threatened Limb

A patient presenting with a limb that is:
- Pulseless OR
- Painful and one of the following: pale, weak, numb, or with massive swelling after trauma.

Other High-Risk Criteria

Signs of Respiratory Distress

Adult	Child
Very fast or very slow breathing	Very fast breathing
Inability to talk or walk unaided	Inability to talk, eat or breastfeed
Confused, sleepy or agitated	Nasal flaring, grunting
Accessory muscle use (neck, intercostal, abdominal)	Accessory muscle use (e.g., head nodding, chest indrawing)

Ingestion/exposure

Use of clinical signs alone may not identify all those who need time-dependent intervention. Patients with high risk ingestion or exposure should initially be up-triaged to Red for early clinical assessment.

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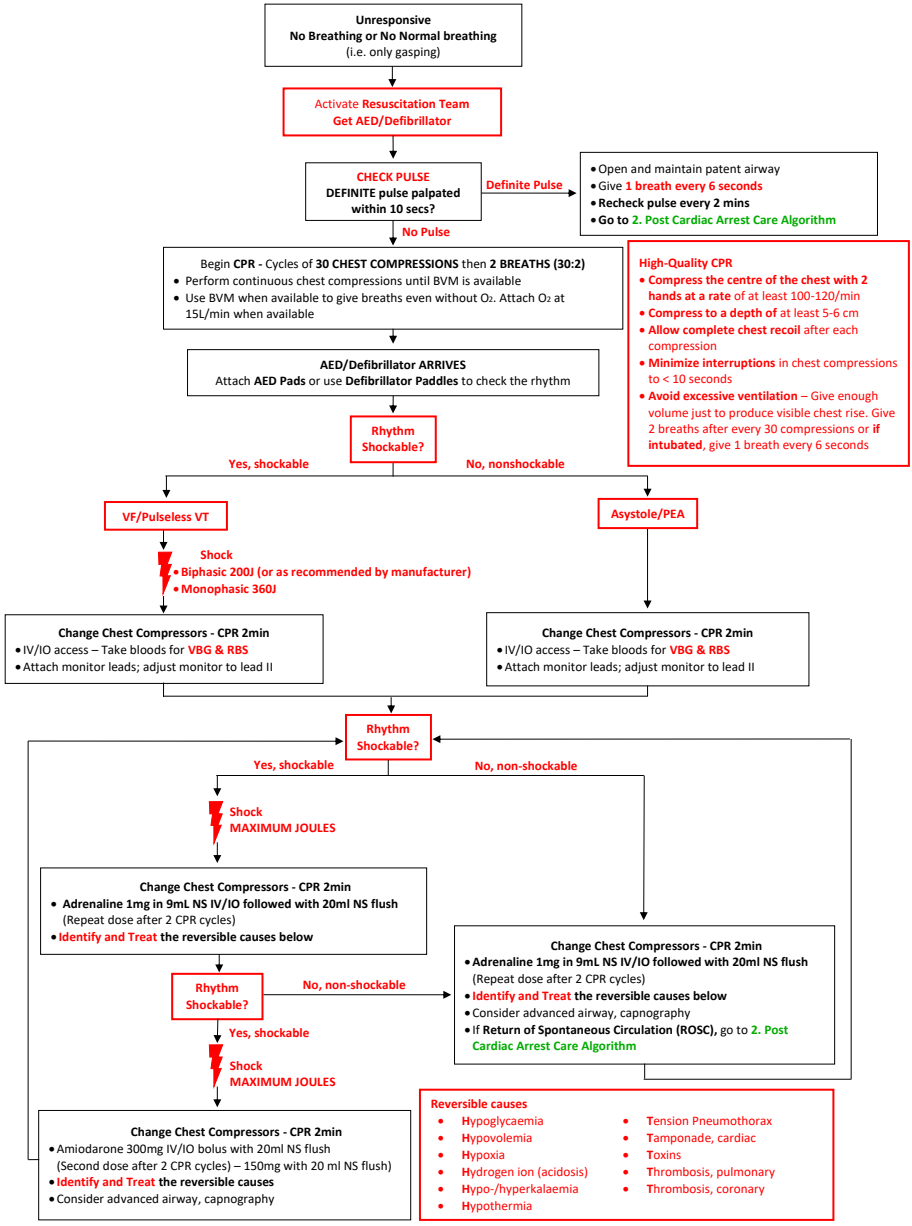
1. Adult Cardiac Arrest Algorithm

This clinical pathway is intended to supplement, rather than substitute for, professional judgment and may be changed depending upon a patient's individual needs. Failure to comply with this pathway does not represent a breach of the standard of care.



2. Post-Cardiac Arrest Care Algorithm

This clinical pathway is intended to supplement, rather than substitute for, professional judgment and may be changed depending upon a patient's individual needs. Failure to comply with this pathway does not represent a breach of the standard of care.

Return of Spontaneous Circulation (ROSC)

- **Activate Resuscitation Team** (if not already present)
- Monitor, support ABCs. Be prepared to provide CPR and defibrillation
- Check vital signs (BP, PR, RR, SPO_2, T^oC, **RBS**)

Optimize Ventilation and Oxygenation

- Consider an advanced airway and waveform capnography
- Avoid excessive ventilation.
  - Start at 10 – 12 breaths/min (**1 breath every 6 seconds**)
  - Titrate FiO_2 to minimum necessary to **maintain SPO_2 94% - 98%**. **DO NOT** aim for 100%
  - Titrate to target $PETCO_2$ of 35 – 45 mmHg

Treat Hypotension (SBP < 100mmHg / MAP < 65mmHg)

- **IV/IO Bolus** (if not contraindicated e.g. pulmonary oedema, renal failure)**:** 1-2 L Ringer's Lactate/Hartmann's Solution
- **Vasopressor infusion if NO response to fluid bolus or if fluid bolus contraindicated:**
  - Adrenaline IV Infusion: 0.1 – 0.5µg/kg/min (7-35µg/min in 70-kg adult)
  - Norepinephrine IV Infusion: 0.1 – 0.5µg/kg/min (7-35µg/min in 70-kg adult)
  - Target MAP to achieve adequate urine output (>0.5mL/kg/hr) and normal or decreasing lactate

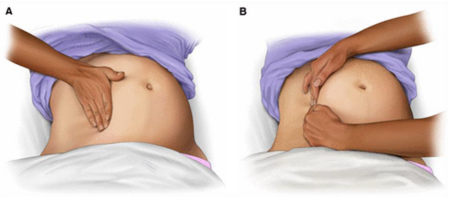
- Get a 12-lead ECG **immediately** if likely cardiac cause. If **STEMI, Unstable Cardiogenic Shock** or **Mechanical Circulatory Support is required – Consult an Interventional Cardiologist**
- **Identify and Treat reversible causes**
  - **H**ypoglycaemia
  - **H**ypovolemia
  - **H**ypoxia
  - **H**ydrogen ion (acidosis)
  - **H**ypo-/hyperkalaemia
  - **H**ypothermia
  - **T**ension Pneumothorax
  - **T**amponade, cardiac
  - **T**oxins
  - **T**hrombosis, pulmonary
  - **T**hrombosis, coronary
- **If patient is stable, transfer to Critical Care Unit (ICU/CCU) attached to a defibrillator**
- Target normothermia and **avoid fever(>37.7^{o}C) for atleast 72 hours** after ROSC.

3. Maternal Cardiac Arrest Algorithm

This clinical pathway is intended to supplement, rather than substitute for, professional judgment and may be changed depending upon a patient's individual needs. Failure to comply with this pathway does not represent a breach of the standard of care.

FIRST RESPONDER

- **Activate Resuscitation Team** (if not already present) **AND OBGYN**
- Document time of onset of maternal cardiac arrest
- Place the patient supine and **perform a left uterine displacement (LUD) with as below**.



- Start resuscitation as per the **1. Adult Cardiac Arrest Algorithm**; place hands slightly higher on the sternum than usual

SUBSEQUENT RESPONDERS

Maternal Interventions

Treat as per 1. Adult Cardiac Arrest Algorithm

- Do not delay defibrillation
- Give typical ACLS drugs and doses
- Ventilate with 100% oxygen
- Monitor wave form capnography and CPR quality
- Provide post-cardiac arrest care as appropriate. See **2. Post-Cardiac Arrest Care Algorithm**

Maternal Modifications

- Start IV access above the diaphragm
- Assess for hypovolaemia and give fluid bolus when required
- Anticipate difficult airway; experienced provider preferred for advanced airway placement
- If patient receiving IV/IO magnesium prearrest, stop magnesium and give IV/IO calcium chloride 10mL in 10% solution, or calcium gluconate 30 mL in 10% solution
- Continue all maternal resuscitative interventions (CPR, positioning, defibrillation, drugs, and fluids) during and after caesarean section

Obstetric Interventions for Patient with an Obviously Gravid Uterus*

- Perform manual uterine displacement (LUD) – displace uterus to the patient's left to relieve aortocaval compression
- Remove both internal and external foetal monitors if present

**An obviously gravid uterus is a uterus that is deemed clinically to be sufficiently large to cause aortocaval compression*

Obstetric and neonatal teams should immediately prepare for possible emergency caesarean section if the pregnancy is determined to be viable

- If no ROSC by **4 minutes** of resuscitative efforts, consider performing immediate emergency caesarean section
- Aim for delivery within **5 minutes** of onset of resuscitative efforts

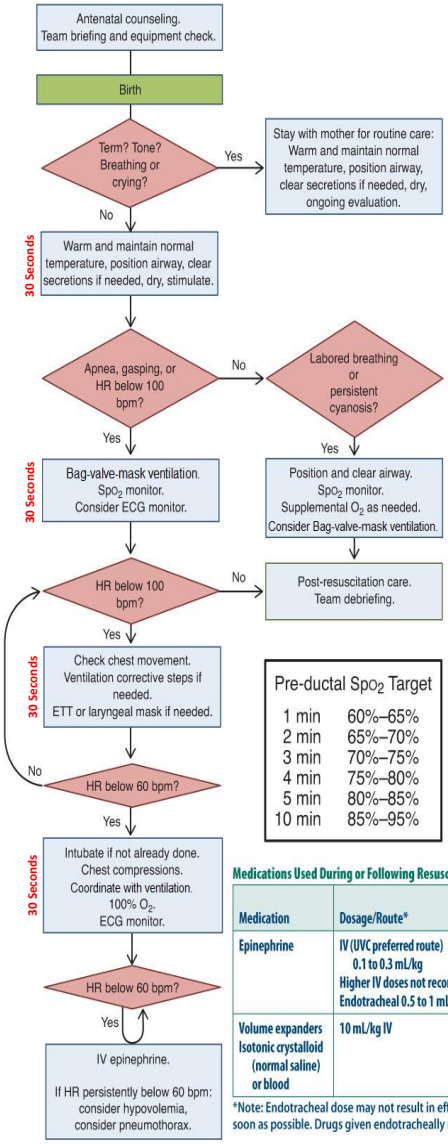
Potential Aetiology of Maternal Cardiac Arrest

Anaesthetic complications
Bleeding: DIC, Uterine atony, Placenta abruption/previa
Cardiac disease (MI/ischaemia/aortic dissection/cardiomyopathy)
Drugs
Embolism: coronary/pulmonary/amniotic fluid embolism
Fever (Sepsis)
General non-obstetric causes of cardiac arrest (H's and T's)
Hypertension/preeclampsia/eclampsia

4. Neonatal Resuscitation Algorithm

This clinical pathway is intended to supplement, rather than substitute for, professional judgment and may be changed depending upon a patient's individual needs. Failure to comply with this pathway does not represent a breach of the standard of care.

The most important and effective action in neonatal resuscitation is ventilation of the baby's lungs.



Airway
- Put baby's head in "neutral" position
- Suction mouth, then nose
- Suction trachea if meconium-stained and NOT vigorous

B Breathing
- Bag-valve-mask ventilation for apnea, gasping, or pulse <100 bpm
- Ventilate at rate of 40 to 60 breaths/minute
- Listen for rising heart rate, audible breath sounds
- Look for slight chest movement with each breath
- Use CO_2 detector after intubation
- Attach a pulse oximeter

C Circulation
- Start compressions if HR is <60 after 30 secs of effective ventilation
- Give (3 compressions: 1 breath) every 2 seconds
- Compress one-third of the anterior-posterior diameter of the chest

D Drugs
- Give epinephrine if HR is <60 after 45 to 60 seconds of compressions and ventilation
- Caution: epinephrine dosage is different for ET and IV routes

Corrective Steps

M	Mask adjustment.
R	Reposition airway.
S	Suction mouth and nose.
O	Open mouth.
P	Pressure increase.
A	Airway alternative.

Pre-ductal SpO_2 Target

1 min	60%–65%
2 min	65%–70%
3 min	70%–75%
4 min	75%–80%
5 min	80%–85%
10 min	85%–95%

Endotracheal Intubation

Gestational Age (weeks)	Weight (kg)	ET Tube Size (ID, mm)	Depth of Insertion* (cm from upper lip)
<28	<1.0	2.5	6-7
28-34	1.0-2.0	3.0	7-8
34-38	2.0-3.0	3.5	8-9
>38	>3.0	3.5-4.0	9-10

*Depth of Insertion (cm) = 6 + weight (in kg)

Medications Used During or Following Resuscitation of the Newborn

Medication	Dosage/Route*	Concentration	Wt (kg)	Total IV Volume (mL)	Precautions
Epinephrine	IV (UVC preferred route) 0.1 to 0.3 mL/kg Higher IV doses not recommended Endotracheal 0.5 to 1 mL/kg	1:10,000	1 2 3 4	0.1-0.3 0.2-0.6 0.3-0.9 0.4-1.2	Give rapidly. Repeat every 3 to 5 minutes if HR <60 with chest compressions.
Volume expanders Isotonic crystalloid (normal saline) or blood	10 mL/kg IV		1 2 3 4	10 20 30 40	Indicated for shock. Give over 5 to 10 minutes. Reassess after each bolus.

*Note: Endotracheal dose may not result in effective plasma concentration of drug, so vascular access should be established as soon as possible. Drugs given endotracheally require higher dosing than when given IV.

5. Rapid Sequence Intubation/Airway Algorithm

This clinical pathway is intended to supplement, rather than substitute for, professional judgment and may be changed depending upon a patient's individual needs. Failure to comply with this pathway does not represent a breach of the standard of care.

Preparation

Identify Predictors of Difficult Intubation (LEMON)

- Look for external markers of difficulty of BVM and Intubation
- Evaluate the **3-3-2 rule**
- **M**allampati score **≥ 3**
- **O**bstruction/**O**besity
- Reduced **N**eck Mobility

If a difficult airway is predicted, **IMMEDIATELY** consult a clinician experienced in airway management and intubation before proceeding.

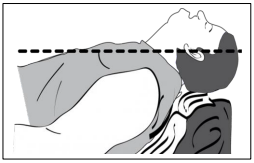
MALE MESS

- **M**ask
- **A**irways (oral and nasal)
- **L**aryngoscopes, **L**aryngeal Mask Airway (LMA)
- **E**ndotracheal tubes – **Adult** Males 8F, Females 7.5F; **Child >1 year** (Age/4) + (4(uncuffed) or 3.5(cuffed))
- **M**onitoring (pulse oximetry, ECG, capnography), **M**agill Forceps
- **E**mergency drugs/trolley
- **S**elf-inflating bag valve resuscitator;
- **S**uction, **S**tylet, **Bougie**
- Plentiful oxygen supply

Pre-oxygenation

- **Attach oxygen via nasal prongs. Turn up to MAXIMUM if patient is unconscious or after sedation. Keep this for the entire intubation process.**
- **Spontaneously breathing patient** – Position patient as below and allow **at least 5 mins** of spontaneous breathing with a tight-fitting **non-rebreather facemask at MAXIMUM** and continue until the patient stops breathing after sedation/paralysis: **Avoid positive pressure ventilation if possible**
- **Patient not breathing or not breathing adequately**– Use a Bag-Valve-Mask (BVM) with a reservoir and O_2 at 15L/min to provide **1 breath every 6 seconds** (synchronized to the patient's breaths) until you can achieve and sustain the highest possible SpO_2

Position the patient



Ensure you have **360° acccess to the patient**

- **Belt/Belly Height** – Head at or just above belt/belly level
- **HoP up** – Head of Patient up to Head of Bed
- **HoB up** – Head of Bed up **30°**; Reverse trendelenburg in High BMI, Late Pregnancy, Spinal Immobilisation
- **Face** Plane parallel to Ceiling (or just **10°** tilt back) & Ear level to Sternal Notch

Assistants ready to help add or maintain external laryngeal manipulation, head elevation, jaw thrust, mouth opening

Paralysis with Induction

Pharmacologic agents and dosages used for rapid sequence intubation

Sedatives	**Dose**		
Ketamine (**Ketamine** is preferred for patients with **hemodynamic instability** or **renal insufficiency)**	2 mg/kg IV		
Midazolam	0.15 to 0.2 mg/kg IV (decrease dose in elderly and critically ill patients)		
Propofol (titrate the dose)	1 to 2.5 mg/kg IV (decrease dose in elderly and critically ill patients)		
Neuromuscular Blocking (NMB) Agents	**Dose**	**Onset**	**Duration**
Succinylcholine (depolarizing NMB) **Contraindications:** • Hyperkalaemia e.g. renal failure • Organophosphate poisoning • Delayed severe burns • Prolonged crush injuries	1.5 mg/kg IV (adults) 2 mg/kg IV (infants) 3mg/kg IV (new-borns)	½ to 1 min	6-10 min
Rocuronium (nondepolarizing NMB) *Rocuronium has a short duration which generally makes it the preferred of the nondepolarizing neuromuscular blockers for ED RSI*	1.2mg/kg IV (shorter onset with longer duration)	1 min	20 mins

Watch video on our YouTube Channel

Pass the tube /Laryngeal Mask Airway (LMA)

Limit attempt to **< 30 seconds**. Proceed down the algorithm **after 30 seconds**

Proof of Intubation/ LMA Insertion

5 Point Auscultation – **Epigastrium,** Bilateral Axillae, Bilateral Lung Bases

Waveform Capnography - Maintain CO_2 level at **35- 45mmHg**

Successful

- Self-inflating bag valve resuscitator ventilation – 1 breath every 6s
- Secure tube at a **depth of 3 x ET Tube size at the teeth/gums**
- Check vital signs (BP, PR, RR, SPO_2, T°C, **RBS**)
- Connect patient to the ventilator. **See 7. Guideline for Initiation of Mechanical Ventilation Algorithm**
- Initiate **postintubation analgesia** and **sedation**
  - Morphine 0.1 – 0.4mg/kg/hr
  - Ketamine (analgesic and sedative) 0.05 – 0.4mg/kg/hr
  - Midazolam 0.02 - 0.1mg/kg/hr
  - Dexmedetomidine 0.2 – 0.7 µg/kg/hr
- Obtain portable CXR to **Confirm Depth of ET Tube NOT location**

Not Successful

Resume BVM ventilation - 1 breath every 3 seconds

See 6. Failed Intubation Algorithm

6. Failed Intubation Algorithm

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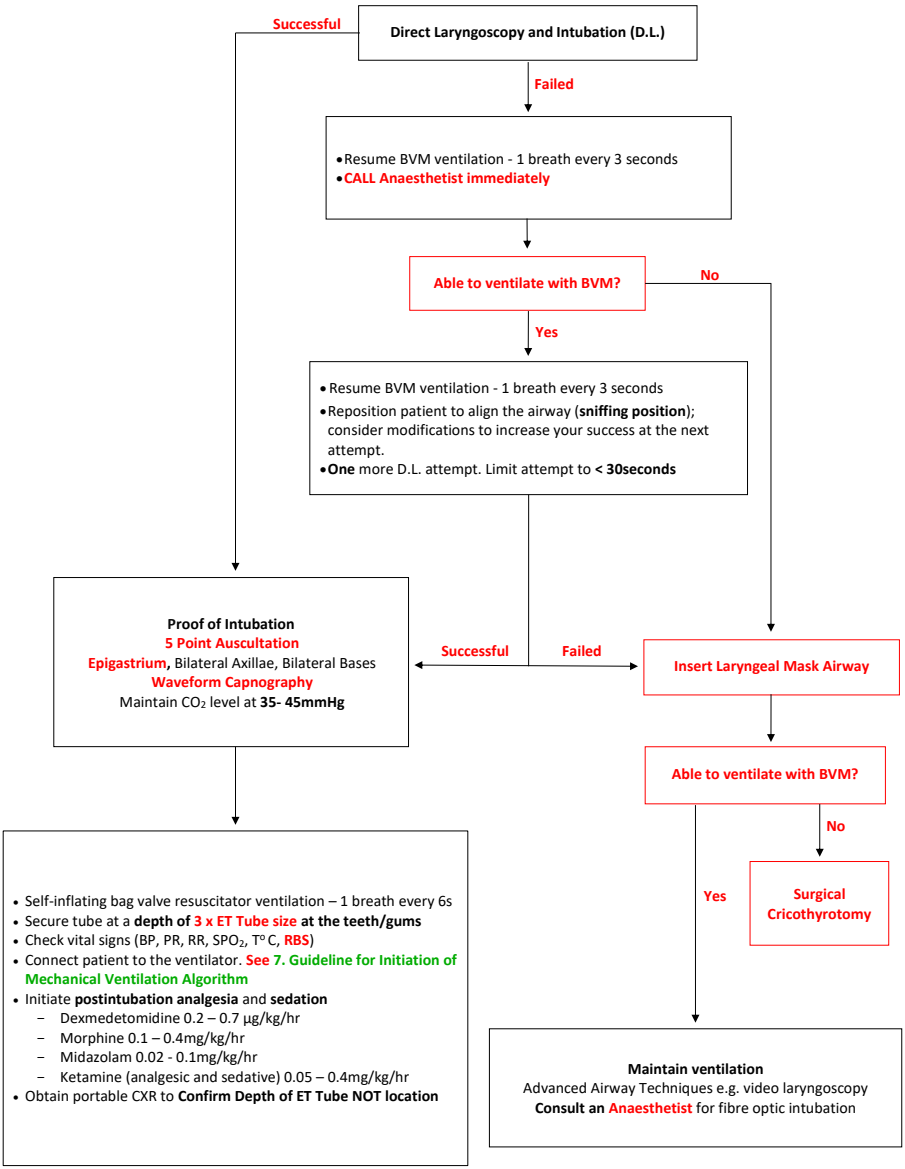

7. Guidelines for Initiation of Mechanical Ventilation Algorithm

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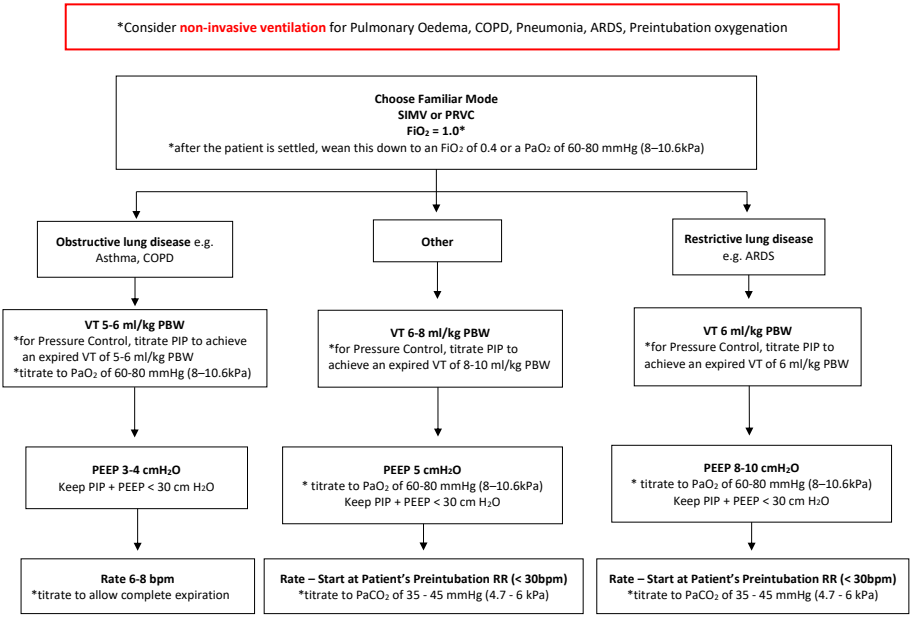


Additional Settings
Pressure support – 8-10 cmH_2O
Inspiratory trigger – 2 cmH_2O below the set PEEP
i times – Adults 1 sec; Toddlers/Children 0.7 sec; Neonates 0.5 sec

Abbreviations: SIMV, Synchronised Intermittent Mandatory Ventilation; PRVC, Pressure Regulated Volume Control; VT, Tidal Volume; PBW, Predicted Body Weight; PEEP, Positive End Expiratory Pressure; PIP, Peak Inspiratory Pressure

The Crashing Intubated Patient (Peri-Arrest or Arrest):
DOPES then **DOTTS**: The first mnemonic is how to diagnose the problem and the second mnemonic is how to fix the problem:

Diagnosing the Problem:

D = Displaced Endotracheal Tube or Cuff
O = Obstructed Endotracheal Tube: Patient biting down, kink in the tube, mucus plug
P = Pneumothorax
E = Equipment Check: Follow the tubing from the ETT back to the ventilator and ensure everything is connected
S = Stacked Breaths: Auto-PEEP. Patient unable to get all the air out from their lungs before initiating the next breath. Inspiratory time is much shorter than expiratory time (I/E ratio is anywhere from 1 to 3 or 1 to 4)

Fixing the Problem (Once you commit to this, do every step even if you fix the problem with one of the earlier letters):

D = Disconnect the Patient from the Ventilator: This fixes stacked breaths by decreasing intra-thoracic pressure and improving venous return
O = O_2 100% Bag Valve Mask: The provider should bag the patient not anyone else because this lets you get a sense of what the potential problem is. Look, Listen, and Feel

- Look: Watch the chest rise and fall, look at ETT and ensure it is the same level it was at when it was put in
- Listen: Air leaks from cuff rupture or cuff above the cords; Bilateral breath sounds; Prolonged expiratory phase
- Feel: Feel the pressure of pilot balloon of endotracheal tube, crepitus; How is the patient bagging (Hard to bag or too easy to bag)

T = Tube Position/Function: Suction catheter to ensure tube is patent; Can also use bougie if you don't have suction catheter, but be gentle (If to aggressive can cause potential harms); Ensure the tube is at the same level it was at when it was put in
T = Tweak the Vent: Decrease respiratory rate, decrease tidal volume, decrease inspiratory time. Biggest bang for your buck is decreasing the respiratory rate. This may cause respiratory acidosis (permissive hypercapnia)
S = Sonography: You can diagnose things much faster than waiting for respiratory therapist to come to the bedside or waiting for stat portable chest x-ray to be done.

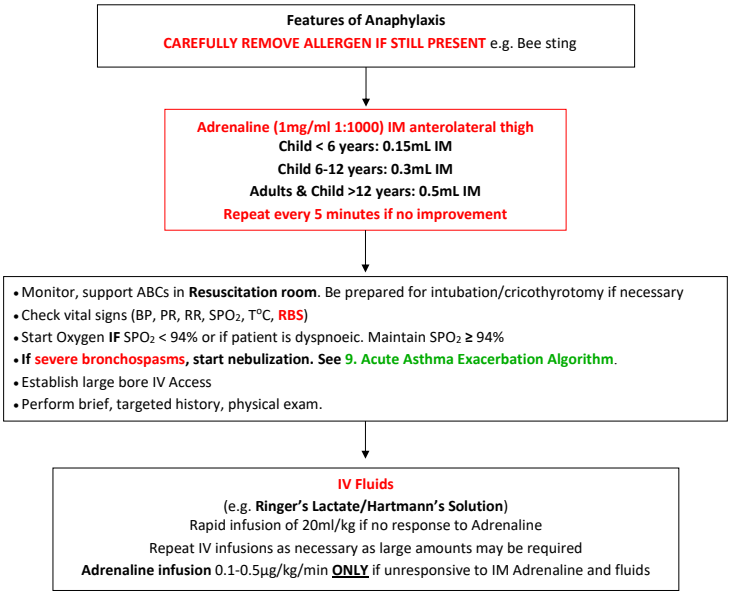
8. Anaphylaxis Algorithm

This clinical pathway is intended to supplement, rather than substitute for, professional judgment and may be changed depending upon a patient's individual needs. Failure to comply with this pathway does not represent a breach of the standard

A patient meets the definition of **anaphylaxis** when **ANY 1** of the following 3 criteria are fulfilled:

1. Acute onset of **mucocutaneous signs AND 1** of the following:
   - respiratory compromise (wheezing-bronchospasm, dyspnoea, stridor, hypoxemia),
   - hypotension (syncope), or
   - hypotonia.
2. Rapid onset of **2 of the following** after exposure to likely allergen:
   - mucocutaneous signs,
   - respiratory compromise,
   - hypotension, or
   - persistent gastrointestinal symptoms.
3. **Hypotension** after exposure to a known allergen.

Patients with **simple allergic reactions** who **DO NOT** meet the criteria for anaphylaxis may be managed similarly **WITHOUT** the use of adrenaline.



Patients with **risk factors for severe and potentially fatal anaphylaxis** may need careful observation for **up to 24 hours**:

- Delayed administration of epinephrine
- Asthmatic component to their anaphylactic reaction
- Previous history of biphasic reactions
- Cardiovascular disease
- Possibility of continuing absorption of allergen
- Poor access to emergency care
- Presentation in the evening or at night
- Severe reactions with slow onset caused by idiopathic anaphylaxis

Patients diagnosed with anaphylaxis who are **not high-risk** should be discharged in the care of others with clear indications for immediate return to the emergency department (ED).

9. Acute Asthma Exacerbation Algorithm

This clinical pathway is intended to supplement, rather than substitute for, professional judgment and may be changed depending upon a patient's individual needs. Failure to comply with this pathway does not represent a breach of the standard of care.

Acute Asthmatic Attack

- Monitor, support ABCs
- Start Oxygen **IF** SPO_2 < 92%. Maintain SPO_2 **≥** 92%; Oxygen should be provided to all patients with severe asthma, even those with normal oxygenation.
- Perform brief, targeted history, physical exam (auscultation, use of accessory muscles, PR, RR)
- **Initiate treatment of underlying cause of exacerbation**
- Check **Peak Expiratory Flow (PEF)** as per **PEF Chart below** and **record predicted or best PEF (%) in patient's clinical notes.**

DO NOT measure PEF in patients with impending/actual respiratory arrest, drowsiness, confusion or silent chest. Start treatment immediately.

DROWSINESS, CONFUSION, OR SILENT CHEST?

- **Consider intubation** (RSI with **Ketamine** if no C/I) and **ventilation** with 100% oxygen; anticipate cardiovascular collapse post-intubation
- Nebulise* with **Salbutamol + Ipratropium bromide (**doses below) **every 20 mins or 3 doses for 1 hour.** A combination of 4 mL volume fill with NS and 6 to 8L/min oxygen flow rate is recommended.
- Give **IV Hydrocortisone 2mg/kg (maximum 200mg) immediately**
- Give high-dose **IV Magnesium, 2gm in 5% Dextrose over 20-min**
- Get **CXR**
- Admit to **HDU/ICU**

MILD or MODERATE
PEF > 50 % predicted or best

Talks in phrases, prefers sitting to lying, not agitated
O_2 saturation (on air) 90-95%
Pulse Rate 100-120 bpm

- Nebulise* with **Salbutamol + Ipratropium bromide** (doses below) **every 20 mins or 3 doses for 1 hour.** A combination of 4 mL volume fill with NS and 6 to 8L/min oxygen flow rate is recommended.
- Give **Oral (**if patient can swallow) **or IV systemic corticosteroids** (dose below) **immediately**

SEVERE
PEF ≤ 50 % predicted or best

Talks in words, sits hunched forwards, agitated
O_2 saturation (on air) < 90%
Pulse Rate > 120 bpm

- Nebulise* with **Salbutamol + Ipratropium bromide (**doses below) **every 20 mins or 3 doses for 1 hour.** A combination of 4 mL volume fill with NS and 6 to 8L/min oxygen flow rate is recommended.
- Give **IV Hydrocortisone 2mg/kg (maximum 200mg) immediately**

†Give high-dose **IV Magnesium, 2gm in 5% Dextrose over 20-min** in patients whose PEF fails to reach > 60% of predicted or personal best **after 1 hour** of treatment

Reassess Hourly (or after every 3 doses)†
Symptoms, physical exam + BP, PR, RR, SpO_2, **PEF**

PEF > 60-80% of predicted or personal best

- No Distress
- Physical Exam – Normal
- Response sustained 60 minutes after last treatment

Discharge Home

- Continue treatment with inhaled SABA – 2 puffs QID for 3-5 days
- Give oral systemic corticosteroids: **Dexamethasone 0.6mg/kg or 12mg for adults as a single dose** or **Prednisone** (see dose in table below)
- Review medication including inhaler technique
- Consider therapy for underlying cause of exacerbation
- **Refer to Chest Physician for follow-up**

Medication	Dose	Comments
Inhaled SABA		
Salbutamol		
Nebulizer solution (0.63 mg/3 mL, 1.25mg/3mL, 2.5 mg/3 mL, 5.0 mg/mL)	5 mg every 20 min for 3 doses, then 2.5–10 mg every 1–4 h as needed, or 10–15 mg/h continuously	Only selective β-agonists are recommended. For optimal delivery, dilute aerosols to minimum of 3 mL at gas flow of 6–8 L/min. Use large-volume nebulizers for continuous administration. May mix with ipratropium nebulizer solution.
pMDI (90µg/puff)	4–10 puffs every 20 min up to 4h, then every 1–4 h as needed	In mild to moderate exacerbations, pMDI plus spacer is as effective as nebulized therapy with appropriate administration technique and coaching by trained personnel.
Systemic (Injected) β2-Agonists		
* **Adrenaline** 1:1,000 (1 mg/mL)	0.3–0.5 mg SC every 20 min for 3 doses	No proven advantage of systemic therapy over aerosol
Anticholinergics		
Ipratropium bromide		
Nebulizer solution (0.25mg/mL)	0.5 mg every 20 min for 3 doses, then as needed	May mix in same nebulizer with salbutamol. Should not be used as first-line therapy; should be added to SABA therapy for severe exacerbations. The addition of Ipratropium has not been shown to provide further benefit once the patient is hospitalized.
pMDI (18 µg/puff)	8 puffs every 20 min as needed up to 3 h	Should use with spacer. Studies have examined Ipratropium bromide MDI for up to 3 h.
Ipratropium with salbutamol		
Nebulizer solution (Each 3-mL vial contains 0.5mg ipratropium bromide and 2.5 mg salbutamol.)	3 mL every 20 min for 3 doses, then as needed	May be used for up to 3 h in the initial management of severe exacerbations. The addition of ipratropium to salbutamol has not been shown to provide further benefit once the patient is hospitalized.
MDI (Each puff contains 18µg Ipratropium bromide and 90µg salbutamol.)	8 puffs every 20 min as needed up to 3 h	Should use with spacer.
Systemic Corticosteroids		
Prednisone	40–80 mg/d in 1 or 2 divided doses until PEF reaches 70% of predicted or personal best	For outpatient "burst," use 40–60 mg in single or 2 divided doses for a total of 5–10 d.
Hydrocortisone	200mg IV then 1mg/kg/dose IV QID	Only if patient cannot tolerate PO corticosteroids

ED = emergency department; ICS = inhaled corticosteroid; MDI = metered-dose inhaler; PEF = peak expiratory flow; SABA = short-acting β2-adrenergic agonist
Notes: There is no known advantage for higher doses of corticosteroids in severe asthma exacerbations, nor is there any advantage for intravenous administration over oral therapy provided gastrointestinal transit time or absorption is not impaired. The total course of systemic corticosteroids for an asthma exacerbation requiring an ED visit or hospitalization may last from 3 to 10 days. For corticosteroid courses of <1 week, there is no need to taper the dose. For slightly longer courses (e.g., up to 10 d), there probably is no need to taper, especially if patients are concurrently taking ICSs. ICSs can be started at any point in the treatment of an asthma exacerbation.

How to Measure Peak Expiratory Flows (PEF)

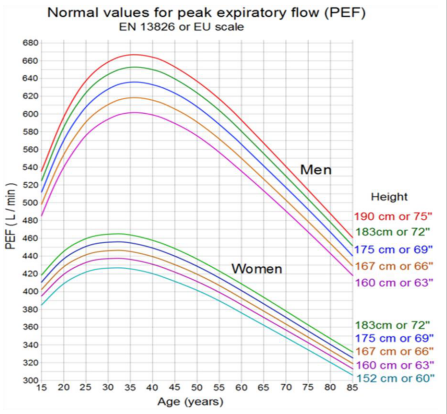
DO NOT measure PEF in patients with impending/actual respiratory arrest, drowsiness, confusion or silent chest. Start treatment immediately.

1. Put the pointer on the gauge of the peak flow meter to 0 or the lowest number on the meter.
2. Attach the mouthpiece to the peak flow meter.
3. While standing, take a deep breath.
4. Put the peak flow meter mouthpiece in your mouth and close your lips tightly around the outside of the mouthpiece. Don't put your tongue inside the mouthpiece.
5. Breathe out as hard and as fast as you can for 1 or 2 seconds. A hard and fast breath usually produces a "huff" sound.
6. Check the number on the gauge and write it down.
7. Repeat the above 3 times and take the patient's best PEF
8. Plot the best PEF on the normal values chart and calculate the percentage as below

$$\frac{\text{Measured PEF}}{\text{Normal PEF}} \times 100\%$$

*available in **MDCalc**

9. Record the PEF in the patient's clinical notes



10. Epistaxis Algorithm

This clinical pathway is intended to supplement, rather than substitute for, professional judgment and may be changed depending upon a patient's individual needs. Failure to comply with this pathway does not represent a breach of the standard of care.

Wear PPE-

ASK THE PATIENT TO BLOW THEIR NOSE TO REMOVE ANY CLOTS & SPRAY THE NARES WITH OXYMETAZOLINE SPRAY

Have the patient squeeze the distal alae while sitting up, bent forward at the waist over a vomit bucket, and **expectorating** blood for **15mins. USE A WATCH!!** Ask the patient **NOT** to swallow any blood. A **clamping device** constructed of four tongue blades secured together by 1-inch tape over the distal alae can be used to clamp the nose closed.

- Monitor, support ABCs
- Check vital signs (BP, PR, RR, SPO_2, T° C)
- Perform brief, targeted history, physical exam
  - Nasal trauma from nose picking/blowing is the most common cause of epistaxis.
  - Hypertension **DOES NOT** cause epistaxis but may prolong it. Therapy should focus on control of the haemorrhage rather than reduction of the blood pressure. **DO NOT PRESCRIBE ANTI-HYPERTENSIVE THERAPY FOR EPISTAXIS**.
- **DO NOT order lab investigations routinely**
- For patients with severe or recurrent haemorrhage with a lot of clots, throwing up blood, or with unstable vital signs or underlying medical conditions, a FBC should be performed, as well as a type and screen.

Bleeding Controlled

Yes

- Repeat vital signs (BP, PR, RR, SPO_2, T° C)
- **Remove any cotton pledgets** and observe the patient for bleeding for at least **an hour** after control. Encourage the patient to walk or perform other activities that he or she will need to resume when returning home.
- Patients with underlying medication use (aspirin, NSAIDS, warfarin) or renal or hepatic dysfunction, order FBC, UEC & ?LFTs and coagulation studies - consult an **ENT Surgeon/Physician**
- If cause identified to be from nasal picking/blowing with no underlying medication use (aspirin, NSAIDS, warfarin) or renal or hepatic dysfunction, discharge patient (with ENT follow-up if recurrent).
- Follow-up instructions - **Vaseline** or a similar moisturizing agent should be applied liberally in the nose **TID** for **7-10 days** to promote healing of friable mucosa and superficial vessels.

No

Insert a 15-cm piece of cotton pledget soaked in **Adrenaline 1 mg + 5 mL Lignocaine 1%** in the bleeding nostril for **10 mins. USE A WATCH!!**

Bleeding Controlled

Yes

No

Insert a 15-cm piece of cotton pledget soaked in injectable form of **Tranexamic acid (500 mg in 5 mL)** in the bleeding nostril for **10 mins. USE A WATCH!!**

Bleeding Controlled

Yes

No

Watch video on our YouTube Channel

Pack the bleeding nostril with a **nasal tampon** or a **bacitracin ointment-soaked gauze.** The tampon should be coated with **bacitracin ointment** or **xylocaine jelly** to facilitate placement.

Bleeding Controlled

Yes

No

Pack the **contralateral naris** with a **nasal tampon** or a **bacitracin ointment-soaked gauze** to provide a counterforce to promote tamponade

Bleeding Controlled

Yes

No

- Do **NOT** remove the contralateral nasal pack.
- Insert a lubricated **foley catheter (size 12 or 14 F)** until the tip and balloon is entirely in the nasopharynx. Fill the balloon with sterile water (usually **5-10cc**) to allow it to be pulled snugly against the posterior nasal choana with anterior traction. The Foley is secured by placing an umbilical or c-clamp on the catheter at the level of the nasal ala with padding in between to prevent pressure injury.

Bleeding Controlled

Yes

No

While the foley is still in-situ, pack the nostril of the bleeding side using a **nasal tampon** or a **bacitracin ointment-soaked gauze**.

* The tampon should be coated with bacitracin ointment or KY-Jelly to facilitate placement.

- Repeat vital signs (BP, PR, RR, SPO_2, T° C)
- Monitor, support ABCs
- Establish IV access and order FBC, UEC & ? LFTs, coagulation studies and a type and screen if warranted
- If cause identified to be from nasal picking/blowing with no underlying medication use (aspirin, NSAIDS, warfarin) or renal or hepatic dysfunction, consult an **ENT Surgeon**.
- Patients with underlying medication use (aspirin, NSAIDS, warfarin) or renal or hepatic dysfunction - consult a **Physician &** an **ENT Surgeon**

11. Chest Pain (Acute Coronary Syndrome) Algorithm

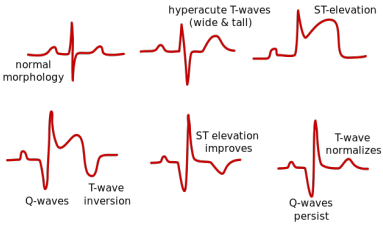
This clinical pathway is intended to supplement, rather than substitute for, professional judgment and may be changed depending upon a patient's individual needs. Failure to comply with this pathway does not represent a breach of the standard of care.

Chest Discomfort Suggestive of Ischemia
(includes **anginal equivalents** (atypical symptoms) like exertional pain in the ear, jaw, neck, shoulder, arm, back, or epigastric area; exertional dyspnoea; nausea and vomiting; diaphoresis; and fatigue.

- Monitor, support ABCs in the **Resuscitation Room (ER)**. Be prepared to provide CPR, Defibrillation and **?Thrombolysis/Fibrinolysis**
- **Obtain/review 12-lead ECG within 10 minutes of arrival to ED**
  - Do a **V4R** if ST elevation in lead V1 with simultaneous ST depression in V2 -? **Right sided STEMI**
  - Do **V7 - V9** if ST depressions ≥ 1 mm with upright T-waves in ≥ 2 contiguous anterior precordial leads (V1 to V3) -? **Posterior STEMI**
  - If there is **ST elevation in aVR ≥ 1mm** and **aVR ≥ V1** with widespread horizontal ST depression, most prominent in leads I, II and V4-6 – **consult an Interventional Cardiologist** immediately for PCI (**Left main coronary artery occlusion/Proximal LAD lesion/Severe sub endocardial ischaemia, nonlocalized**)
  - Sinus Tachycardia, T wave inversion in III & V1, V3 or (S1, Q3, T3) pattern -? **See 15. Pulmonary Embolism Algorithm**
- Check vital signs (BP, PR, RR, SPO_2, T°C, **RBS**)
- Start Oxygen **IF** SPO_2 < 90% or if patient is dyspnoeic. Maintain SPO_2 **≥** 90%
- Perform brief, targeted history, physical exam – **Indicate time of symptoms onset**

- **Consider other life-threatening causes of chest pain** (**pulmonary embolus, cardiac tamponade, aortic dissection, tension pneumothorax, oesophageal rupture**)
- **Review initial 12-lead ECG**

Sequence of ECG changes seen during evolution of myocardial infarction - In the early stages of acute myocardial infarction the electrocardiogram may be normal or near normal; **< ½ of patients with acute myocardial infarction have clear diagnostic changes on their first trace**. **About 10%** of patients with a proved acute myocardial infarction (on the basis of clinical history and enzymatic markers) fail to develop ST segment elevation or depression. In most cases, however, serial electrocardiograms show evolving changes that tend to follow well recognised patterns.



ST Elevation	MI Description	Coronaries affected
V2 – V5	Anterior	LAD
V1 – V2	Septal	Septal LAD
II, III, aVF	Inferior	RCx (20%) or RCA (80%)
V1 – V4	**Anteroseptal**	
V3 – V6, I, aVL	**Anterolateral**	
I, aVL, V5, V6	Lateral	LCx
V7, V8, V9	Posterior	RCx
V1, V4R	RV	RCA

***** LAD, Left Anterior Descending; RCx, Right Circumflex; RCA, Right Coronary Artery; LCx, Left Circumflex; V4R, Right sided V4.

- **Sgarbossa's Criteria** for patients with **Left Bundle Branch Blocks (LBBB)** available in **MDCalc**

ST elevation
ST-Elevation MI (STEMI)
ST elevation at the J point in at least two contiguous leads of ≥ 1 mm

→ **See 12. STEMI Algorithm**

ST depression > 0.5mm or dynamic T-wave inversion ≥ 2mm; strongly suspicious for ischemia
High-Risk Unstable Angina/Non-ST-Elevation MI (UA/NSTEMI)

Normal or Non-diagnostic changes in ST segment or T wave
Intermediate/Low Risk UA

→ **See 13. NSTEMI/UA Algorithm**

12. STEMI Algorithm

This clinical pathway is intended to supplement, rather than substitute for, professional judgment and may be changed depending upon a patient's individual needs. Failure to comply with this pathway does not represent a breach of the standard of care.

ST-Elevation MI (STEMI)

- Attach the patient to a **DEFIBRILATOR**
- Establish IV access in **left forearm or antecubital vein** and send blood samples for **UEC, & hsTroponin**
- **Aspirin 300mg** to chew (if not given by EMS, not allergic, no active upper GI bleeding or retinal bleeding, not a haemophiliac)
- **Nitroglycerin sublingual spray 0.4mg SL** for pain relief **every 5mins** up to relief of discomfort or **MAX 3 doses** reached. **DO NOT** give nitroglycerin if:
  - SBP < 90mmHg (or 30 mm Hg below the patient's known baseline),
  - Heart rate > 100 bpm, or < 50 bpm.
  - Right ventricular infarction (right ventricular infarction causes a preload dependent state)
  - Use of sildenafil or vardenafil within the previous 24 hours or tadalafil within the previous 48 hours.
- **Fentanyl 50µg IV** if pain is **NOT** relieved by the 3 doses of SL nitroglycerin. Repeat **once** if still in pain after 5 mins. For persistent pain, **consult a Cardiologist/Physician**. Consider **IVI Nitroglycerin (see C/I above)**

Time from onset of symptoms?

- **> 12 hours** → **Consult Interventional Cardiologist**
- **≤ 12 hours** → **Consult an Interventional Cardiologist to determine if the patient is for Thrombolysis/Fibrinolysis OR Primary PCI**

Primary PCI

- **Obtain informed consent**
- **Give**:
  1. Clopidogrel (600mg) **OR** Prasugrel (60mg) **OR** Ticagrelor (180mg)
  2. **Enoxaparin** 0.5mg/kg IV bolus
- **Transfer to Cath lab CONNECTED TO A DEFIBRILLATOR within 30 minutes of arrival to the ER**

Thrombolysis/Fibrinolysis

Give:

1. **Clopidogrel 300mg (75 mg if age > 75 years)**
2. **Enoxaparin:**
   - If age <75 y: 30-mg IV bolus, followed in 15 min by 1 mg/kg SC (max.100 mg for the first 2 doses)
   - If age ≥ 75 y: no bolus, 0.75 mg/kg SC (max. 75 mg for the first 2 doses)
   - Regardless of age, if CrCl < 30 mL/min: 1 mg/kg SC

Review/Complete Fibrinolysis Checklist

Absolute Contraindications

- □ Any prior intracranial haemorrhage
- □ Known structural cerebral vascular lesson (e.g., AVM)
- □ Known malignant intracranial neoplasm (primary or metastatic)
- □ Ischaemic stroke within 6 months EXCEPT acute ischaemic stroke within 4.5 hours
- □ Suspected aortic dissection
- □ Active bleeding or bleeding diathesis (excluding menses)
- □ Significant closed-head trauma or facial trauma within 1 month
- □ Intracranial or intraspinal surgery within 1 month
- □ Severe uncontrolled hypertension (unresponsive to emergency therapy)
- □ For streptokinase, prior treatment with streptokinase within the previous 6 months
- □ Non-compressible vascular punctures in the past 24 hrs

Relative Contraindications

- □ Severe hypertension on presentation (SBP > 180 mmHg or DBP > 110 mmHg) - Lower BP first before fibrinolysis
- □ History of TIA in the preceding 6 months
- □ Traumatic or prolonged (>10 minutes) CPR
- □ Major surgery (< 3 weeks)
- □ Recent (within 2 to 4 weeks) internal bleeding
- □ Pregnancy or within 1-week post-partum
- □ Active peptic ulcer
- □ Oral anticoagulant therapy

No contraindications for Thrombolysis/Fibrinolysis

- **Obtain informed consent for fibrinolysis/thrombolysis**
- Ensure patient is **connected to a defibrillator** (ECG, SPO_2, BP) and repeat baseline vitals. **Administer fibrinolysis/thrombolysis within 10 mins of STEMI diagnosis**

Fibrinolytic Agent	Dose	Fibrin Specificity*	Antigenic	Patency Rate (90-min TIMI 2 or 3 flow)
Fibrin-specific:				
Tenecteplase (TNK-tPA) ***Half dose in patients ≥75 yrs)**	To reconstitute, mix the 50-mg vial in 10 mL sterile water (5 mg/mL). Give IV bolus based on weight as below: < 60 kg - 30 mg (6 mL) 60 to 69 kg - 35 mg (7 mL) 70 to 79 kg - 40 mg (8 mL) 80 to 89 kg - 45 mg (9 mL) ≥ 90 kg - 50 mg (10 mL)	+ + + +	No	85%
Reteplase (rPA)	10 U+10-U IV boluses given 30 min apart	+ +	No	84%
Alteplase (tPA)	Bolus 15 mg IV, then give infusion of 0.75 mg/kg for 30 min (maximum 50 mg), then 0.5 mg/kg (maximum 35 mg) over the next 60 min; total dose not to exceed 100 mg.	+ +	No	73% to 84%
Non–fibrin-specific:				
Streptokinase	Set up second IV line for the Streptokinase. The adult dose of streptokinase for STEMI is 1.5 Million U in 50 mL of 5% dextrose in water (D5W) given IV over 30-60 minutes. Allergic reactions force the termination of many infusions before a therapeutic dose can be administered. Run Ringer's Lactate/Hartmann's Solution TKVO in other line	No	Yes§	60% to 68%

*Strength of fibrin specificity; "+ + + +" is more strong, "+ +" is less strong.

§Streptokinase is highly antigenic and absolutely contraindicated within 6 mo of previous exposure because of the potential for serious allergic reaction.

IV indicates intravenous; rPA, reteplase plasminogen activator; TIMI, Thrombolysis In Myocardial Infarction; TNK-tPA, tenecteplase tissue-type plasminogen activator; and tPA, tissue-type plasminogen activator.

- Monitor vital signs (BP, PR, RR, SPO_2) **every 15 minutes** during the infusions
- Continue monitoring patient for **30mins after the end of the infusions**
- **Transfer patient to CCU/ICU CONNECTED TO A DEFIBRILLATOR**

13. NSTEMI/Unstable Angina Algorithm

This clinical pathway is intended to supplement, rather than substitute for, professional judgment and may be changed depending upon a patient's individual needs. Failure to comply with this pathway does not represent a breach of the standard of care.

ST depression > 0.5mm or dynamic T-wave inversion ≥ 2mm; strongly suspicious for ischemia
High-Risk Unstable Angina/Non-ST-Elevation MI (UA/NSTEMI)

Normal or Non-diagnostic changes in ST segment or T wave
Intermediate/Low Risk UA

- Establish IV access and send blood samples for **UEC, & hsTroponin** **(obtain hsTroponin at least 4 hours after symptom onset, not before)**
- **Aspirin 300mg** to chew (if not given by EMS, not allergic, no active upper GI bleeding or retinal bleeding, not a haemophiliac)
- **Nitroglycerin sublingual spray 0.4mg SL** for pain relief **every 5mins** up to relief of discomfort or **MAX 3 doses** reached. **DO NOT** give nitroglycerin if:
  - SBP < 90mmHg (or 30 mm Hg below the patient's known baseline),
  - Heart rate > 100 bpm, or < 50 bpm.
  - Right ventricular infarction (right ventricular infarction causes a preload dependent state)
  - Use of sildenafil or vardenafil within the previous 24 hours or tadalafil within the previous 48 hours.
- **Fentanyl 50µg IV** if pain is **NOT** relieved by the 3 doses of SL nitroglycerin. Repeat **once** if still in pain after 5 mins. For persistent pain, **consult a Cardiologist/Physician**. Consider **IVI nitroglycerin (see C/I above)**
- **Consider CXR**

* available in MDCalc

The HEART Score for Chest Pain Patients in the ED		
History	• Highly Suspicious • Moderately Suspicious • Slightly or Non-Suspicious	• 2 points • 1 point • 0 points
ECG	• Significant ST-Depression • Nonspecific Repolarization • Normal	• 2 points • 1 point • 0 points
Age	• ≥ 65 years • > 45 - < 65 years • ≤ 45 years	• 2 points • 1 point • 0 points
Risk Factors	• ≥ 3 Risk Factors or History of CAD • 1 or 2 Risk Factors • No Risk Factors	• 2 points • 1 point • 0 points
Troponin	• ≥ 3 x Normal Limit • > 1 - < 3 x Normal Limit • ≤ Normal Limit	• 2 points • 1 point • 0 points
Risk Factors: DM, current or recent (<one month) smoker, HTN, HLP, family history of CAD, & obesity		
Score 0 – 3: 1.7% MACE over next 6 weeks; **Score 4 – 6:** 16.6% MACE over next 6 weeks; **Score 7 – 10:** 50.1% MACE over next 6 weeks		

Backus BE et al. A Prospective Validation of the HEART Score for Chest Pain Patients at the Emergency Department. International Journal of Cardiology. 2013. 168; 2153 – 2158. PMID: 23465250

Repeat 12 lead ECG **in 30 mins**/Continuous ST-segment monitoring → **STEMI** **See 12. STEMI Algorithm**

hsTroponin > lab cutoff OR HEART score > 3 points OR ST depression OR Dynamic ECG changes

Yes → **Consult a Cardiologist/Physician**

No → If hsTroponin done < **4 hours** from symptom onset, then **repeat the hsTroponin at least 4 hours after symptom onset**.

If hsTroponin done < **4 hours** from symptom onset, then **repeat the hsTroponin at least 4 hours after symptom onset**. → **hsTroponin ≥ lab cutoff** → **Consult a Cardiologist/Physician**

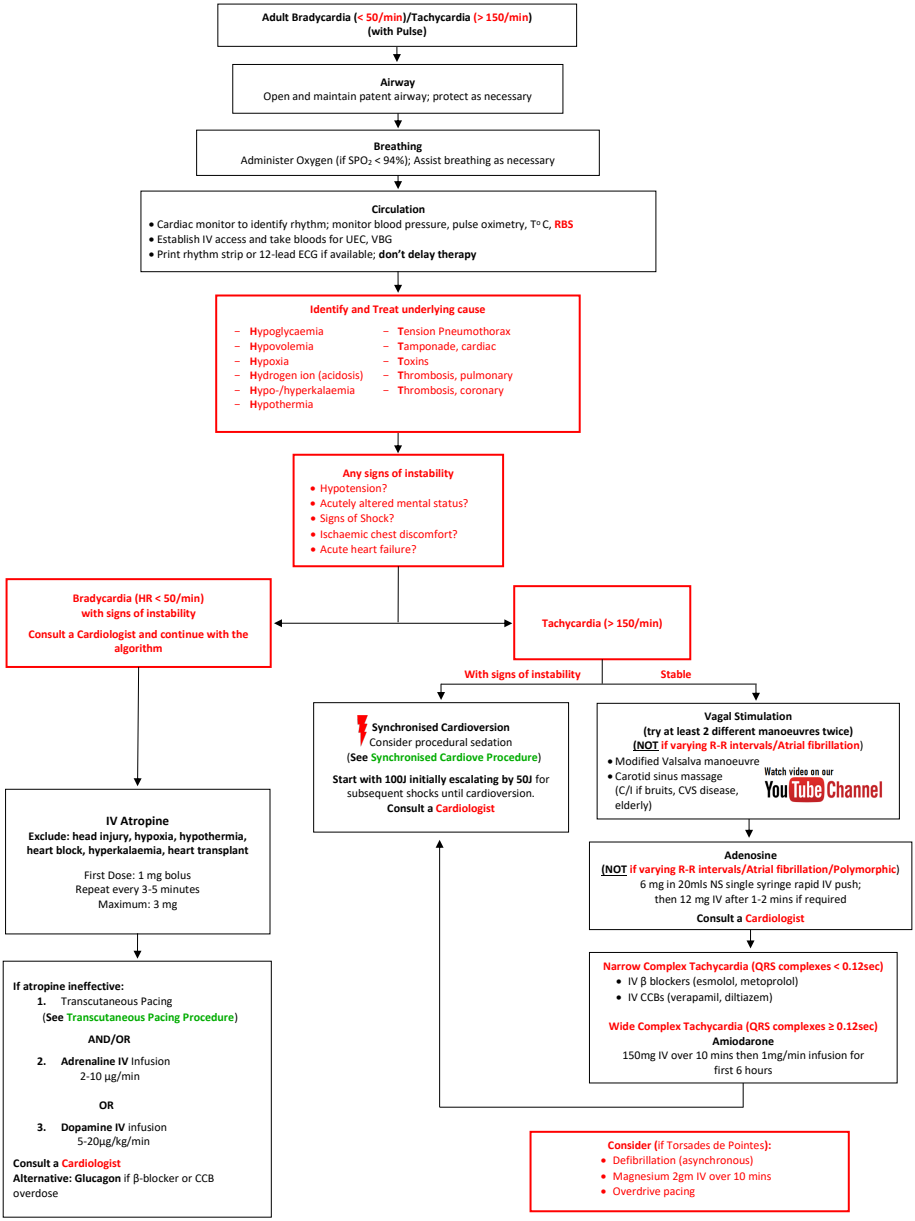
hsTroponin < lab cutoff

If no evidence of ischaemia or infarction by testing, can discharge ± cardiology follow-up

Criteria for Discharge (must meet ALL the criteria)
- **Two ECGs** which are **Normal** and **No ST Depression** and **No Dynamic changes**
- **hsTroponin < lab cutoff** at **≥ 4 hours** from onset of symptoms **OR** 3 hours from admission to ER

14. Adult Bradycardia (< 50/min)/Tachycardia (> 150/min) (with Pulse)

This clinical pathway is intended to supplement, rather than substitute for, professional judgment and may be changed depending upon a patient's individual needs. Failure to comply with this pathway does not represent a breach of the standard of care.



Transcutaneous Pacing Procedure

Watch video on our YouTube Channel

1. **See 14. Adult Bradycardia (< 50/min)/Tachycardia (> 150/min) (with Pulse)** for indications. **Inotropes** may be used if transcutaneous pacing is **NOT** available.
2. **Explain the procedure to the patient**
3. **Consider procedural sedation and analgesia**
4. Place the pacing pads on the chest of the patient as per package instructions
5. Connect the pads cable to the pacing machine if not already connected
6. **Turn the pacer ON**. Observe for **markers (•)** indicating the R-wave on the screen. Some machines require that you **START pacing** after turning the pacer on. Observe for **pacing spikes (|)** on the baseline.
7. Set the **Rate** to approximately 60-70 bpm.
8. Set **current milliamperes (mA)** output as follows: Increase milliamperes (mA) from minimum setting **until every pacer spike is immediately followed by a wide QRS and a broad T wave** – This is termed as **Electrical Capture.**
9. Confirm by checking the patient's **femoral pulse** to see if the pulse rate matches the rate set above i.e. 60-70bpm. This is termed as **Mechanical Capture.**
10. Recheck the patient's vital signs and confirm the patient's signs of shock are resolving i.e. increase in blood pressure, improved mentation, etc. This is termed as **Physiological Capture.**
11. If all the above is achieved, increase the current milliamperes by **10%** for safety margin
12. Set the **Mode** to '**Fixed mode**'
13. Transfer care to a **Cardiologist** without delay. **DO NOT STOP PACING** unless instructed to by a **Cardiologist**.

Trouble Shooting

- **Pacing Spikes not seen on the base line** – Confirm that you have pressed the **START** button
- **No Electrical Capture** – Confirm that the pads are firmly pressed on the patient's chest. Continue increasing the milliamperes. There is no set minimum or maximum.
- **No Mechanical Capture** – Increase the milliamperes by increments of 5-10mA and recheck the pulse
- **No Physiological Capture** – Consider hypovolaemia as the cause of shock and give a small fluid bolus (250-500mls) and recheck the patient. If not, increase the set rate to 80bpm, confirm electrical capture and mechanical capture and recheck the patient
- **In all cases, consult a Cardiologist**.

Transferring a patient to another transcutaneous pacer (Handing Over Pacing)

1. **DO NOT** disconnect the patient from the **original pacing machine**
2. Set the **original pacing machine** to **'Demand mode'**

The following steps are performed on the new pacing machine;

3. Place a **new set of pacing pads** on the chest of the patient in the **anteroposterior position.** Place the anterior pad directly over the heart at the precordium to the left of the lower sternal border; place the posterior pad under the patient's body beneath the heart and immediately below the scapula.
4. Connect the pads cable to the **new pacing machine** if not already connected
5. **Turn the pacer ON**. Observe for **markers (•)** indicating the R-wave on the screen. Some machines require that you **START pacing** after turning the pacer on. Observe for **pacing spikes (|)** on the baseline.
6. Set the **Rate** higher than the rate in the original pacing machine e.g. **80-90 bpm**.
7. Set **current milliamperes (mA)** output as follows: Increase milliamperes (mA) from minimum setting **until every pacer spike is immediately followed by a wide QRS and a broad T wave** – This is termed as **Electrical Capture.**
8. Confirm by checking the patient's **femoral pulse** to see if the pulse rate matches the rate set above i.e. 80-90bpm. This is termed as **Mechanical Capture.**
9. Recheck the patient's vital signs and confirm the patient's signs of shock are resolving i.e. increase in blood pressure, improved mentation, etc. This is termed as **Physiological Capture.**
10. If all the above is achieved, increase the current milliamperes by **10%** for safety margin
11. At this point, the **original pacing machine** will be in a **'Standby mode'**
12. Disconnect the **original pacing machine**

Synchronized Cardioversion Procedure

Watch video on our YouTube Channel

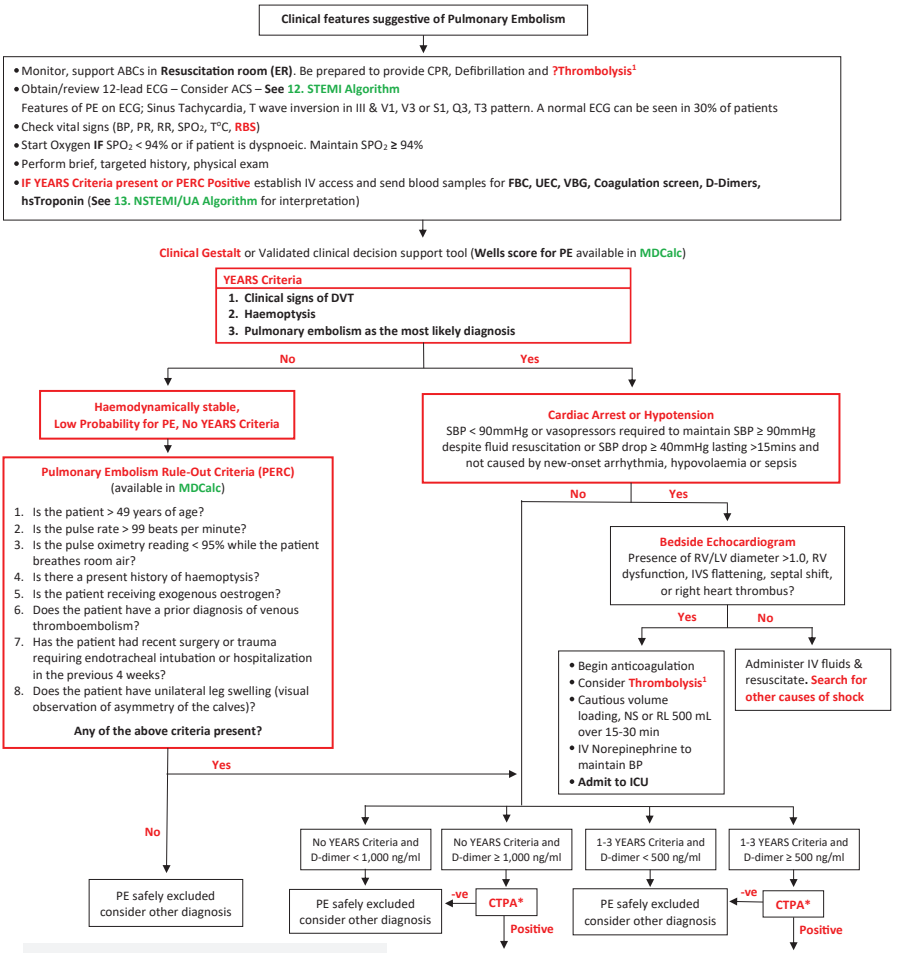
1. **See 14. Adult Bradycardia (< 50/min)/Tachycardia (> 150/min) (with Pulse)** for indications.
2. **Explain the procedure to the patient**
3. **Consider procedural sedation and analgesia**
4. Place the defibrillation pads on the chest of the patient as per package instructions
5. Connect the pads cable to the pacing machine if not already connected
6. **Turn the defibrillator ON**.
7. Select the appropriate energy level e.g. 50-100J. In paediatrics, begin with 0.5-1 J/kg; if not effective, increase to 2 J/kg.
8. **Activate the synchronize mode** by pressing the synchronize button.
9. Check to verify that the machine is correctly sensing the R wave. Observe for **markers (•)** indicating the R-wave on the screen.
10. Charge the machine to the ordered energy level.
11. Before discharging the current, shout **'CLEAR'** and ensure no one (including yourself) is touching the patient, bed or equipment connected to the patient.
12. **SHOCK** the patient.
13. If no change in rhythm, increase the energy level e.g. by 50J in adults or to 2J/Kg in paediatrics, and **repeat steps 8 -12**
14. Consult a **Cardiologist** without delay.

Trouble Shooting

- **In case you do not get a rhythm change after giving a shock, consider;**
  - Potential underlying causes e.g. Hs and Ts
  - Poor pads connection
  - Need for higher energy levels
- **In all cases, consult a Cardiologist**.

15. Pulmonary Embolism Algorithm

This clinical pathway is intended to supplement, rather than substitute for, professional judgment and may be changed depending upon a patient's individual needs. Failure to comply with this pathway does not represent a breach of the standard of care.



* **Compression ultrasound of lower extremities** can be performed as the initial diagnostic imaging modality in any of the following situations;

- patients with obvious signs of deep vein thrombosis (DVT) for whom venous ultrasound is readily available
- patients with relative contraindications for CT scan (e.g., borderline renal insufficiency, CT contrast agent allergy)
- **in pregnant patients**
- patients with a moderate to high clinical risk of PE with a negative or inconclusive CTPA or an inconclusive V/Q scan.

A **positive finding** in a patient with symptoms consistent with PE can be considered evidence for diagnosis of VTE disease and potentially eliminate the need to expose the patient to the radiation from either a CTPA or V/Q scan.

[1]Indications for Thrombolysis in PE (rule out contraindication to Thrombolysis)

- Cardiac Arrest (consider if PEA Rhythm, unilateral leg swelling, POCUS findings)
- SBP < 90mmHg or vasopressors required to maintain SBP ≥ 90mmHg despite fluid resuscitation or SBP drop ≥ 40mmHg lasting >15mins and not caused by new-onset arrhythmia, hypovolaemia or sepsis

Tenecteplase	Weight-based dose (range **30 mg-50 mg**) via IV push over 5-10 seconds, then continue CPR for at least 30 minutes after drug administration.
Alteplase	100 mg over 2 hours; or **Cardiac Arrest:** 50mg IV bolus. Repeat once after 15 mins if no ROSC. Continue CPR for at least 30 mins after last dose

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16. Hypertension Algorithm

This clinical pathway is intended to supplement, rather than substitute for, professional judgment and may be changed depending upon a patient's individual needs. Failure to comply with this pathway does not represent a breach of the standard of care.

BP ≥ 140/90mmHg

- Monitor, support ABCs
- Check vital signs (BP, PR, RR, SPO_2, T°C, **RBS**)
- Start Oxygen **IF** SPO_2 < 94%. Maintain SPO_2 ≥ 94%
- Perform brief, targeted history and physical exam
- Obtain/review 12-lead ECG (if indicated)
- Send samples for **FBC, UEC, TSH and Urinalysis** (for proteinuria) and **PDT** (as applicable)
- **DO NOT ADMINISTER ORAL ANTIHYPERTENSIVES (e.g. nifedipine) TO LOWER THE BLOOD PRESSURE IN THE ED.**
- Allow patient to rest awaiting results. Repeat BP checks hourly.

Are there any features of progressive or impending end organ damage (especially if BP > 180/110 mmHg)?

a) Neurological
- Cerebral vascular accident/cerebral infarction
- Hypertensive encephalopathy
- Subarachnoid haemorrhage
- Intracranial haemorrhage

b) Cardiovascular
- Acute pulmonary oedema
- Congestive heart failure
- Myocardial ischemia/infarction
- Acute left ventricular dysfunction
- Aortic dissection

c) Other
- Acute renal failure/insufficiency
- Retinopathy
- Pre-eclampsia/Eclampsia
- Micro angiopathic haemolytic anaemia

Headache/Epistaxis is **NOT** a hypertensive emergency, no matter how high the blood pressure. It is likely the headache/epistaxis is causing the hypertension, not the other way around. Treat the headache/epistaxis and the pressure will come down.

No

Known Hypertension – Resume regular treatment; if unknown, **low dose thiazide type diuretic** for most; may consider ACE inhibitor, ARB, β-blocker, CCB. Follow-up as below (**see Guideline for prevention, detection, evaluation and management of high blood pressure in adults**)

New Onset Hypertension - Final BP prior to discharge
- **BP > 160/100 – low dose thiazide type diuretic** for most; may consider ACE inhibitor, ARB, β-blocker, CCB. (**see Guideline for prevention, detection, evaluation and management of high blood pressure in adults**). Follow-up as below
- **BP < 160/100** – Follow-up as below

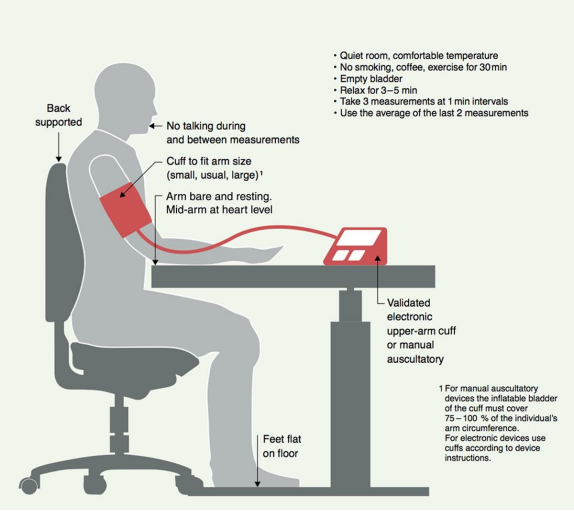
Daily BP checks at nearest clinic and follow-up in a **Medical Clinic in 1 week** with BP chart

Yes

See 17. Hypertensive Emergencies Algorithm

Guideline for the Prevention, Detection, Evaluation, and Management of High Blood Pressure in Adults

BLOOD PRESSURE MEASUREMENT TECHNIQUES



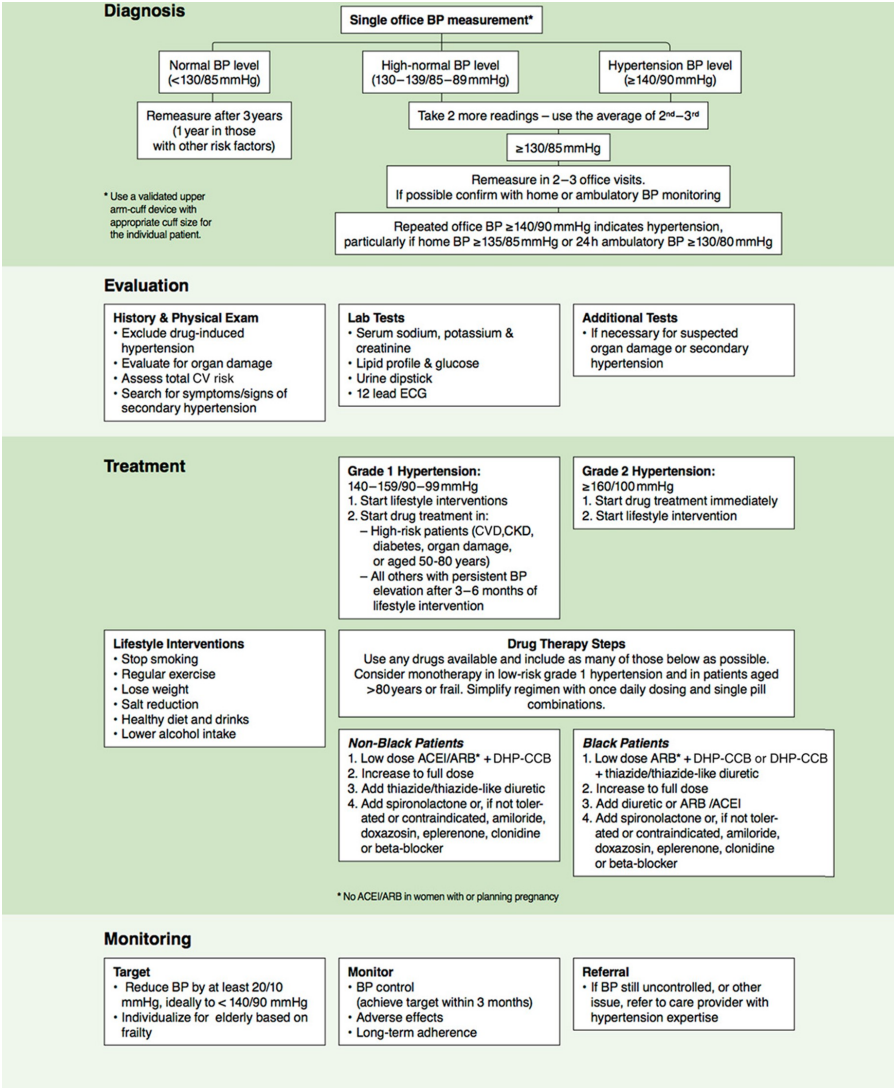
1. Note the time of most recent BP medication taken before measurements.
2. At the first visit, record BP in both arms. Use the arm that gives the higher reading for subsequent readings.
3. At each visit, take 3 measurements with 1 min intervals between them. Calculate the average of the last 2 measurements. If BP of first reading is < 130/85 mmHg, no further measurement is required.
4. Blood pressure of 2-3 visits **≥ 140/90 mmHg** indicates hypertension.
5. Provide patients the SBP/DBP readings both verbally and in writing.

Category	Systolic (mm Hg)		Diastolic (mm Hg)
Normal BP	<130	and	<85
High-normal BP	130–139	and/or	85–89
Grade 1 hypertension	140–159	and/or	90–99
Grade 2 hypertension	≥160	and/or	≥100

DIAGNOSTIC WORKUP OF HYPERTENSION

- Assess risk factors and comorbidities
- Reveal identifiable causes of hypertension
- Assess presence of target organ damage
- Conduct history and physical examination
- **Obtain/review 12-lead ECG, RBS, FBC, UEC, TSH, Urinalysis for proteinuria, Lipid profile**

Blood Pressure (BP) Thresholds and Recommendations for Treatment and Follow-Up



* Calculate the 10-year risk for first atherosclerotic cardiovascular disease events (ASCVD; nonfatal myocardial infarction, coronary heart disease–related death, or fatal or nonfatal stroke) with the **ASCVD Risk Calculator (**available in **MDCalc**)

Best Proven Nonpharmacologic Interventions for Prevention and Treatment of Hypertension*

	Nonpharmacologic Intervention	Dose	Approximate Impact on SBP	
			Hypertension	Normotension
Weight loss	Weight/body fat	Ideal body weight is best goal but at least 1 kg reduction in body weight for most adults who are overweight. Expect about 1 mm Hg for every 1 kg reduction in body weight.	-5 mm Hg	-2/3 mm Hg
Healthy diet	DASH dietary pattern	Diet rich in fruits, vegetables, whole grains, and low-fat dairy products with reduced content of saturated and trans l fat	-11 mm Hg	-3 mm Hg
Reduced intake of dietary sodium	Dietary sodium	<1,500 mg/d is optimal goal but at least 1,000 mg/d reduction in most adults	-5/6 mm Hg	-2/3 mm Hg
Enhanced intake of dietary potassium	Dietary potassium	3,500–5,000 mg/d, preferably by consumption of a diet rich in potassium	-4/5 mm Hg	-2 mm Hg
Physical activity	Aerobic	• 120–150 min/wk • 65%–75% heart rate reserve	-5/8 mm Hg	-2/4 mm Hg
	Dynamic Resistance	• 90–150 min/wk • 50%–80% 1 rep maximum • 6 exercises, 3 sets/exercise, 10 repetitions/set	-4 mm Hg	-2 mm Hg
	Isometric Resistance	• 4 x 2 min (hand grip), 1 min rest between exercises, 30%–40% maximum voluntary contraction, 3 sessions/wk • 8–10 wk	-5 mm Hg	-4 mm Hg
Moderation in alcohol intake	Alcohol consumption	In individuals who drink alcohol, reduce alcohol† to: • Men: ≤2 drinks daily • Women: ≤1 drink daily	-4 mm Hg	-3 mm Hg

*Type, dose, and expected impact on BP in adults with a normal BP and with hypertension.

†In the United States, one "standard" drink contains roughly 14 grams of pure alcohol, which is typically found in 12 ounces of regular beer (usually about 5% alcohol), 5 ounces of wine (usually about 12% alcohol) and 1.5 ounces of distilled spirits (usually about 40% alcohol).

Evidence-Based Dosing for Antihypertensive Drugs

Class	Drug	Usual Dose, Range (mg per day)*	Daily Frequency	Comments
Primary Agents				
Thiazide or thiazide-type diuretics	**Chlorthalidone**	12.5–25	1	• Chlorthalidone preferred based on prolonged half-life and proven trial reduction of CVD • Monitor for hyponatremia and hypokalemia, uric acid and calcium levels. • Use with caution in patients with history of acute gout unless patient is on uric acid-lowering therapy.
	Hydrochlorothiazide	25–50	1	
	Indapamide	1.25–2.5	1	
	Metolazone	2.5–10	1	
ACE Inhibitors	**Benazepril**	10–40	1 or 2	• Do not use in combination with ARBs or direct renin inhibitor • Increased risk of hyperkalemia, especially in patients with CKD or in those on K+ supplements or K+-sparing drugs • May cause acute renal failure in patients with severe bilateral renal artery stenosis • Do not use if history of angioedema with ACE inhibitors. • Avoid in pregnancy
	Captopril	12.5–150	2 or 3	
	Enalapril	5–40	1 or 2	
	Fosinopril	10–40	1	
	Lisinopril	10–40	1	
	Moexipril	7.5–30	1 or 2	
	Perindopril	4–16	1	
	Quinapril	10–80	1 or 2	
	Ramipril	2.5–10	1 or 2	
	Trandolapril	1–4	1	
ARBs	**Azilsartan**	40–80	1	• Do not use in combination with ACE inhibitors or direct renin inhibitor • Increased risk of hyperkalemia in CKD or in those on K+ supplements or K+-sparing drugs • May cause acute renal failure in patients with severe bilateral renal artery stenosis • Do not use if history of angioedema with ARBs. Patients with a history of angioedema with an ACEI can receive an ARB beginning 6 weeks after ACEI discontinued. • Avoid in pregnancy
	Candesartan	8–32	1	
	Eprosartan	600–800	1 or 2	
	Irbesartan	150–300	1	
	Losartan	50–100	1 or 2	
	Olmesartan	20–40	1	
	Telmisartan	20–80	1	
	Valsartan	80–320	1	
CCB—dihydropyridines	**Amlodipine**	2.5–10	1	• Avoid use in patients with HFrEF; amlodipine or felodipine may be used if required • Associated with dose-related pedal edema, which is more common in women than men
	Felodipine	5–10	1	
	Isradipine	5–10	2	
	Nicardipine SR	5–20	1	
	Nifedipine LA	60–120	1	
	Nisoldipine	30–90	1	
CCB—nondihydropyridines	**Diltiazem SR**	180–360	2	• Avoid routine use with beta blockers due to increased risk of bradycardia and heart block • Do not use in patients with HFrEF • Drug interactions with diltiazem and verapamil (CYP3A4 major substrate and moderate inhibitor)
	Diltiazem ER	120–480	1	
	Verapamil IR	40–80	3	
	Verapamil SR	120–480	1 or 2	
	Verapamil-delayed onset ER (various forms)	100–480	1 (in the evening)	

17. Hypertensive Emergencies Algorithm

This clinical pathway is intended to supplement, rather than substitute for, professional judgment and may be changed depending upon a patient's individual needs. Failure to comply with this pathway does not represent a breach of the standard of care.

BEGIN 16. HYPERTENSION ALGORITHM
Features of progressive or impending end organ damage (especially if BP > 180/120 mmHg)?

- Monitor, support ABCs
- Check vital signs (BP, PR, RR, SPO_2, T°C, **RBS**)
- Start Oxygen **IF** SPO_2 < 94%. Maintain SPO_2 **≥** 94%
- Establish IV Access and send samples for **FBC, UEC, Urinalysis** (for proteinuria) and **PDT** (as applicable)
- Obtain/review 12-lead ECG
- Perform brief, targeted history, physical exam
- **Consult a Physician/ (Obstetrician for Eclampsia)** and consider treatments as below **in consultation** with a **Physician/Obstetrician**

See Hypertensive Emergencies Drug Infusions for Dosages and Precautions

Neurological Emergencies

Hypertensive Encephalopathy - Reduce mean arterial pressure (MAP) **20-25% immediately**. **Drugs:** Labetalol, Nicardipine **Alt.** Nitroprusside

Acute Ischemic Stroke

- In patients with markedly elevated blood pressure (**SBP > 220mmHg or DBP > 120 mm Hg**) **who do not receive fibrinolysis**, a reasonable goal is to lower blood pressure by **15% during the first 24 hours after onset of stroke.**
- **With indication for fibrinolysis and SBP > 185mmHg or DBP > 110mmHg** – Reduce mean arterial pressure (MAP) **15% over 1 hour**. **Drugs:** Labetalol, Nicardipine **Alt.** Nitroprusside. If BP is not maintained at or below 185/110mmHg, **do not administer rtPA**
- **After fibrinolysis** - the **SBP** should be maintained **< 180mmHg** and **DBP < 105mmHg** for **24 hours.**

Acute Haemorrhagic Stroke and SBP >150mmHg - **No evidence** exists to suggest that HTN provokes **further bleeding** in patients with ICH. A precipitous fall in SBP may compromise cerebral perfusion and increase mortality. Reduce **SBP to a target of 140 mmHg** with the goal of maintaining in the **range of 130 to 150 mmHg. Drugs:** Labetalol, Nicardipine.

Subarachnoid Haemorrhage - Maintain **SBP < 160mmHg** until the aneurysm is treated or cerebral vasospasm occurs. Oral **nimodipine** is used to **prevent delayed ischemic neurological deficits**, but it is **NOT indicated** for treating acute hypertension.

Cardiovascular Emergencies

Acute Coronary Event - Reduce mean arterial pressure (MAP) **< 140mmHg immediately**. Thrombolytics are **contraindicated** if BP is **>185/100 mmHg**. **Drugs:** Nitroglycerine, Labetalol

Acute Cardiogenic Pulmonary Oedema - Reduce mean arterial pressure (MAP) **< 140mmHg immediately**. **Drugs:** Nitroprusside or Nitroglycerine (with loop diuretic)

Acute aortic disease – **Immediately** reduce the **SBP < 120mmHg** and **heart rate < 60bpm** and maintain it at this level unless signs of end-organ hypo perfusion are present. **Drugs:** Esmolol and Nitroprusside or Nitroglycerine or Nicardipine. **Alt.** Labetalol or Metoprolol. **Avoid β-blockers** if there is;

- aortic valvular regurgitation or
- suspected cardiac tamponade.

Other Disorders

Cocaine toxicity/Pheochromocytoma - Hypertension and tachycardia from cocaine toxicity rarely require specific treatment.

- **Benzodiazepines** are the preferred agents for cocaine-associated acute coronary syndromes.
- Pheochromocytoma treatment guidelines are similar to that of cocaine toxicity. **β-blockers can be added** for BP control only **after α-blockade.**

Preferred medications - Diazepam, Phentolamine, Nitroglycerin/nitroprusside
Medications to avoid - β-adrenergic antagonists prior to phentolamine administration

Preeclampsia/eclampsia - In women with eclampsia or preeclampsia, **SBP** should be **< 160 mmHg** and **DBP <110 mm Hg** in the prepartum and intrapartum periods. If the **platelet count is < 100,000 cells/mm^3** BP should be maintained below **150/100mmHg.** Patients with eclampsia or preeclampsia should also be loaded with **IV Magnesium sulphate 4gm** diluted in 100mL NS over 15 mins then with an **infusion of 2gm/hr** to avoid seizures.
Preferred medications - Hydralazine, Labetalol, Nifedipine
Medications to avoid - Nitroprusside, Angiotensin-converting enzyme inhibitors, Esmolol

Hypertensive Emergencies Drug Infusions

*For adults with a compelling condition (i.e., aortic dissection, severe preeclampsia or eclampsia, or pheochromocytoma crisis), SBP should be reduced to < 140 mm Hg during the first hour and to < 120 mm Hg in aortic dissection. For adults without a compelling condition, SBP should be reduced by no more than 25% within the first hour; then, if stable, to 160/100 mm Hg within the next 2 to 6 hours; and then cautiously to normal during the following 24 to 48 hours.

AGENT	MOA	DOSE	ONSET/DURATION OF ACTION (AFTER DISCONTINUATION)	PRECAUTIONS
Parenteral Vasodilators				
Nitroglycerin	Decreases coronary vasospasm, which increases coronary blood flow. Also, induces vessel dilatation, decreasing cardiac workload.	Initial 5 mcg/min; increase in increments of 5 mcg/min every 3–5 min to a maximum of 20 mcg/min.	2-5 min / 5-10 min	Use only in patients with acute coronary syndrome and/or acute pulmonary oedema. Do not use in volume-depleted patients.
Hydralazine	Decreases systemic resistance through direct vasodilation of arterioles.	Initial 10 mg via slow IV infusion (maximum initial dose 20 mg); repeat every 4–6 h as needed.	10 min / > 1 hr	BP begins to decrease within 10–30 min and the fall lasts 2–4 h. Unpredictability of response and prolonged duration of action do not make hydralazine a desirable first-line agent for acute treatment in most patients.
Parenteral Adrenergic Inhibitors				
Labetalol	α, β1, β2 Blocker	Initial 0.3–1.0 mg/kg dose (maximum 20 mg) slow IV injection every 10 min or 0.4–1.0 mg/kg/h IV infusion up to 3 mg/kg/h. Adjust rate up to total cumulative dose of 300 mg. This dose can be repeated every 4–6 h.	5-10 min / 15-30 min	Contraindicated in reactive airways disease or chronic obstructive pulmonary disease. Especially useful in hyperadrenergic syndromes. May worsen HF and should not be given in patients with 2nd or 3rd degree heart block or bradycardia.
Esmolol	Ultra-short-acting β-adrenergic blocker	Loading dose 500–1,000 mcg/kg/min over 1 min followed by a 50 mcg/kg/min infusion. For additional dosing, the bolus dose is repeated, and the infusion increased in 50 mcg/kg/min increments as needed to a maximum of 200 mcg/kg/min.	1-5 min / 15-30 min	Contraindicated in patients with concurrent beta-blocker therapy, bradycardia and/or decompensated HF Monitor for bradycardia. May worsen HF. Higher doses may block beta2 receptors and impact lung function in reactive airway disease.

18. Stroke Algorithm

This clinical pathway is intended to supplement, rather than substitute for, professional judgment and may be changed depending upon a patient's individual needs. Failure to comply with this pathway does not represent a breach of the standard of care.

Identify signs of Possible Acute Stroke Patient **MUST** be seen by the doctor **within 10 minutes** of arrival	
Test	**Findings**
Facial Droop: Have patient show teeth or smile	**Normal –** both sides of face move equally **Abnormal** – one side of face does not move as well as the other
Arm Drift: 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 **Abnormal –** one arm does not move, or one arm drifts down compared with the other
Abnormal Speech: Have the patient repeat a sentence	**Normal –** patient uses correct words with no slurring **Abnormal –** patient slurs words, uses the wrong words, or is unable to speak

Interpretation: If any **1 of these 3** signs is abnormal, the probability of a stroke is **72%**. The presence of **ALL 3 findings** indicates that the probability of stroke is **>85%**

Posterior Circulation Stroke: Patients present with acute onset dizziness/vertigo, inability to walk, nausea, vomiting. HINTS exam is reported to be up to 99% accurate in making this diagnosis. **Order MRI not CT**.

Watch video on our YouTube Channel

- Monitor, support ABCs in the **Resuscitation Room (ER)**
- Check vital signs (BP, PR, RR, SPO_2, T° C).
- Start Oxygen **IF** $SPO_2 \leq 94\%$. Maintain $SPO_2 > 94\%$
- **Check Glucose** and treat if **< 3.3mmol/L** with 50mL 50% Dextrose bolus. Maintain blood glucose between **7.7- 10mmol/L**
- Establish **18G IV Access** and send samples for **FBC, UEC, Coagulation Screen**
- Perform brief, targeted history, physical exam; **indicate time when patient last known normal**

Time from onset of symptoms*

***for patients who wake up with stroke symptoms, consider the time the patient went to sleep as the time of symptom onset**

0 - 4.5 hours	4.5 - 9 hours	9 - 24 hours	> 24 hours
ER Doctor & Nurse MUST accompany patient to radiology **IMMEDIATELY** with **Stroke Box** (must include **Stroke Fibrinolysis Protocol & Fibrinolytic) & Monitor**	**ER Doctor & Nurse MUST** accompany patient to radiology **IMMEDIATELY**.	**ER Nurse MUST** accompany patient to radiology & inform **ER Doctor IMMEDIATELY** the MRI is complete	
Obtain **non-contrast enhanced Brain CT Scan within 20 minutes** of patient arrival •**No Haemorrhage** Consult a **Neurologist IMMEDIATELY and start the Stroke Fibrinolysis Protocol in Radiology** •**Haemorrhage** Consult a **Neurosurgeon**	Obtain **non-contrast enhanced Brain CT Scan & Cerebral Angiogram within 20 minutes** of patient arrival •**No Haemorrhage** Consult a **Neurologist IMMEDIATELY** •**Haemorrhage** Consult a **Neurosurgeon**	Obtain **Brain MRI Limited Stroke Protocol within 20 minutes** of patient arrival •**No Haemorrhage** Consult a **Neurologist IMMEDIATELY** •**Haemorrhage** Consult a **Neurosurgeon**	Obtain **non-contrast enhanced Brain CT Scan** •**No Haemorrhage** – Give 300mg Aspirin – **Admit Stroke Unit** •**Haemorrhage** Consult a **Neurosurgeon**

National Institutes of Health Stroke Scale (NIHSS)

(Available in **MDCalc**)

1a. Level of consciousness	□ 0 = Alert; keenly responsive □ 1 = Not alert, but rousable by minor stimulation □ 2 = Not alert; requires repeated stimulation □ 3 = Unresponsive or responds only with reflex	**7. Limb ataxia**	□ 0 = Absent □ 1 = Present in one limb □ 2 = Present in two limbs
b. Level of consciousness questions: **What is the month?** **What is your age?**	□ 0 = Both answers correct □ 1 = Answers one question correctly □ 2 = Answers both questions incorrectly	**8. Sensory**	□ 0 = Normal; no sensory loss □ 1 = Mild-to-moderate sensory loss □ 2 = Severe to total sensory loss
c. Level of consciousness commands:	□ 0 = Performs both tasks correctly □ 1 = Performs one task correctly □ 2 = Performs neither task correctly	**9. Best language**	□ 0 = No aphasia; normal □ 1 = Mild to moderate aphasia □ 2 = Severe aphasia □ 3 = Mute, global aphasia
2. Best gaze	□ 0 = Normal □ 1 = Partial gaze palsy □ 2 = Forced deviation	**10. Dysarthria**	□ 0 = Normal □ 1 = Mild to moderate dysarthria □ 2 = Severe dysarthria
3. Visual	□ 0 = No visual loss □ 1 = Partial hemianopia □ 2 = Complete hemianopia □ 3 = Bilateral hemianopia	**11. Extinction and inattention**	□ 0 = No abnormality □ 1 = Visual, tactile, auditory, spatial, or personal inattention □ 2 = Profound hemi-inattention or extinction
4. Facial palsy	□ 0 = Normal symmetric movements □ 1 = Minor paralysis □ 2 = Partial paralysis □ 3 = Complete paralysis of one or both sides	**Total Score = 0 - 42**	

		LA	**RA**	**LL**	**RL**	**Time**	**Total Score**
5. Motor Arm **a. Left Arm (LA)** **b. Right Arm (RA)** **6. Motor Leg** **a. Left Leg (LL)** **b. Right Leg (RL)**	0 = No drift 1 = Drift 2 = Some effort against gravity 3 = No effort against gravity; limb falls 4 = No movement	□ 0 □ 1 □ 2 □ 3 □ 4	□ 0 □ 1 □ 2 □ 3 □ 4	□ 0 □ 1 □ 2 □ 3 □ 4	□ 0 □ 1 □ 2 □ 3 □ 4		

Stroke Fibrinolysis Protocol

This clinical pathway is intended to supplement, rather than substitute for, professional judgment and may be changed depending upon a patient's individual needs. Failure to comply with this pathway does not represent a breach of the standard of care.

Probable Acute Ischaemic Stroke
BEGIN 18. STROKE ALGORITHM

Review/Complete Fibrinolysis Checklist

Inclusion and Exclusion Characteristics of Patients With Ischemic Stroke Who Could Be Treated With IV rtPA Within 3 Hours From Symptom Onset

Inclusion criteria
- Diagnosis of ischemic stroke causing measurable neurological deficit
- Onset of symptoms < 3 hours before beginning treatment
- Aged ≥18 years

Exclusion criteria
- Severe head trauma or prior stroke in the previous 3 months
- Symptoms suggest subarachnoid haemorrhage
- History of previous intracranial haemorrhage
- Intracranial neoplasm, AVM, or aneurysm
- Recent intracranial or intraspinal surgery
- Elevated blood pressure (systolic >185 mmHg or diastolic >110 mmHg). Lower BP first before fibrinolysis
- Active internal bleeding
- Seizure at onset with postictal residual neurological impairments secondary to a postictal phenomenon and not a stroke
- Acute bleeding diathesis, including but not limited to
  - Platelet count <100 000/mm^3
  - Heparin received within 48 h resulting in abnormally elevated aPTT above the upper limit of normal
  - Current use of anticoagulant with INR >1.7 or PT >15 s
  - Current use of direct thrombin inhibitors or direct factor Xa inhibitors with elevated sensitive laboratory tests (e.g., aPTT, INR, platelet count, ECT, TT, or appropriate factor Xa activity assays)
- Blood glucose concentration <50 mg/dL (2.7 mmol/L)
- Mild nondisabling stroke (NIHSS score 0–5)

Relative exclusion criteria
Recent experience suggests that under some circumstances, with careful consideration and weighting of risk to benefit, patients may receive fibrinolytic therapy despite ≥1 relative contraindications. Consider risk to benefit of intravenous rtPA administration carefully if any of these relative contraindications is present
- Pregnancy
- Arterial puncture at non-compressible site in previous 7 days
- Major surgery or serious trauma within previous 14 days
- Recent gastrointestinal or urinary tract haemorrhage (within previous 21 days)
- Recent acute myocardial infarction (within previous 3 months)

Additional Inclusion and Exclusion Characteristics of Patients with Acute Ischemic Stroke Who Could Be Treated With IV rTPA within 3 to 4.5 Hours From Symptom Onset

Main inclusion criteria
- Diagnosis of ischemic stroke causing measurable neurologic deficit
- Onset of symptoms within 3 to 4.5 hours before beginning treatment
- Patients with AIS who awake with stroke symptoms or have unclear time of onset >4.5 h from last known well or at baseline state and who have a DW-MRI lesion smaller than one-third of the MCA territory and no visible signal change on FLAIR.

Exclusion criteria
- Age > 80 years
- Very severe stroke symptoms (NIHSS score >25) or Mild nondisabling stroke (NIHSS score 0–5)
- Taking oral anticoagulant regardless of INR
- History of both diabetes and prior ischemic stroke
- Those with imaging evidence of ischemic injury involving more than one third of the middle cerebral artery territory

NOTES
- A physician with expertise in acute stroke care may modify this list.
- Onset time is defined as either the witnessed onset of symptoms or the time last known normal if symptom onset was not witnessed.
- In patients without recent use of oral anticoagulants or heparin, treatment with IV rtPA can be initiated before availability of coagulation test results but should be discontinued if INR is >1.7 or PT is abnormally elevated by local laboratory standards.
- In patients without history of thrombocytopenia, treatment with IV rtPA can be initiated before availability of platelet count but should be discontinued if platelet count is <100 000/mm^3.

- **Repeat NIH Stroke Scale:** are deficits rapidly improving to normal?
- **Patient remains candidate for fibrinolytic therapy?**

Candidate

Review risks/benefits with patient and family. If acceptable, obtain CONSENT FOR FIBRINOLYSIS
- **Ensure patient is attached to monitor** (ECG, SPO_2, BP) and repeat baseline vitals. Treat BP if indicated **(See 17. Hypertensive Emergencies Algorithm)**
- Set up **second IV line** for the fibrinolysis. Run NS/RL TKVO in other line
- **ALTEPLASE (**give **within 60 minutes** of patient arrival**)**

- **The recommended dose of alteplase is 0.9 mg/kg (maximum 90 mg) infused over 60 minutes, with 10% of the total dose administered as an initial IV bolus over 1 minute.**

- Measure blood pressure and perform neurological assessments **every 15 minutes** during and after IV rtPA infusion for **2 hours**, then **every 30 minutes** for **6 hours**, then **hourly until 24 hours** after IV rtPA treatment.
- **Admit to stroke unit**

Not a Candidate

- **Admit to stroke unit**
- Administer **aspirin 325mg PO/PR**
- In patients already taking **statins**, continue treatment
- Monitor blood glucose and temperature and treat if indicated. Maintain blood glucose between 7.7mmol/L and 10mmol/L
- Initiate supportive therapy; treat comorbidities

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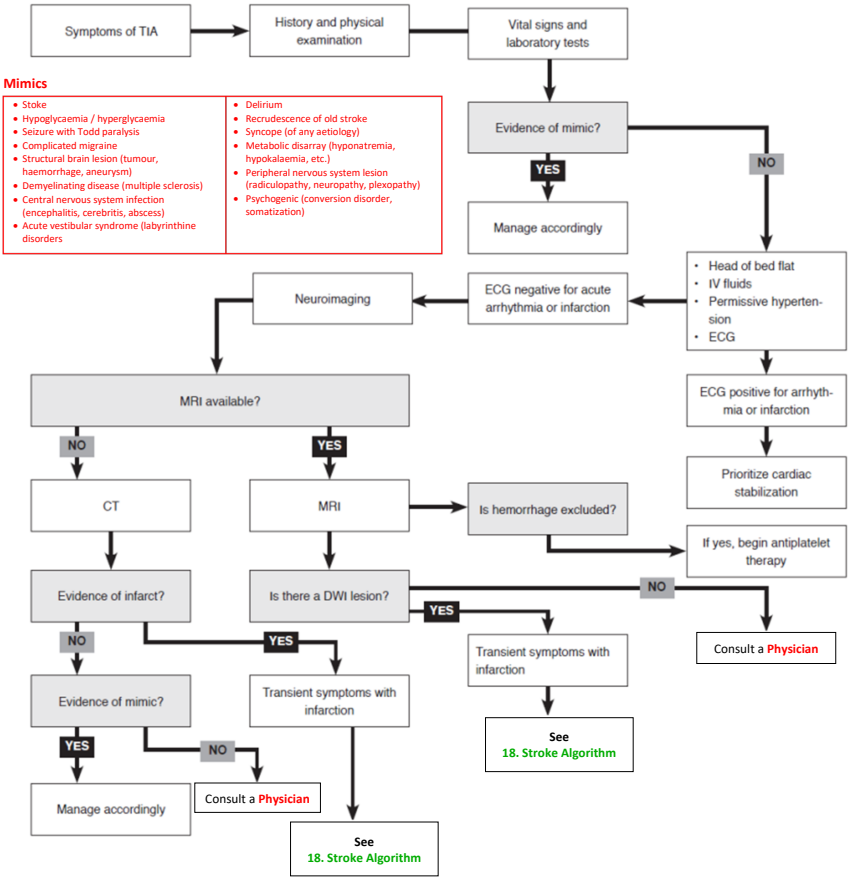
19. Transient Ischemic Attack (TIA) Algorithm

This clinical pathway is intended to supplement, rather than substitute for, professional judgment and may be changed depending upon a patient's individual needs. Failure to comply with this pathway does not represent a breach of the standard of care.

The AHA/ASA has endorsed the current definition of TIA as "a transient episode of neurological dysfunction caused by focal brain, spinal cord, or retinal ischemia, without radiological evidence of acute infarction." The new definition of TIA completely eliminates the element of time and emphasizes neuroimaging instead.

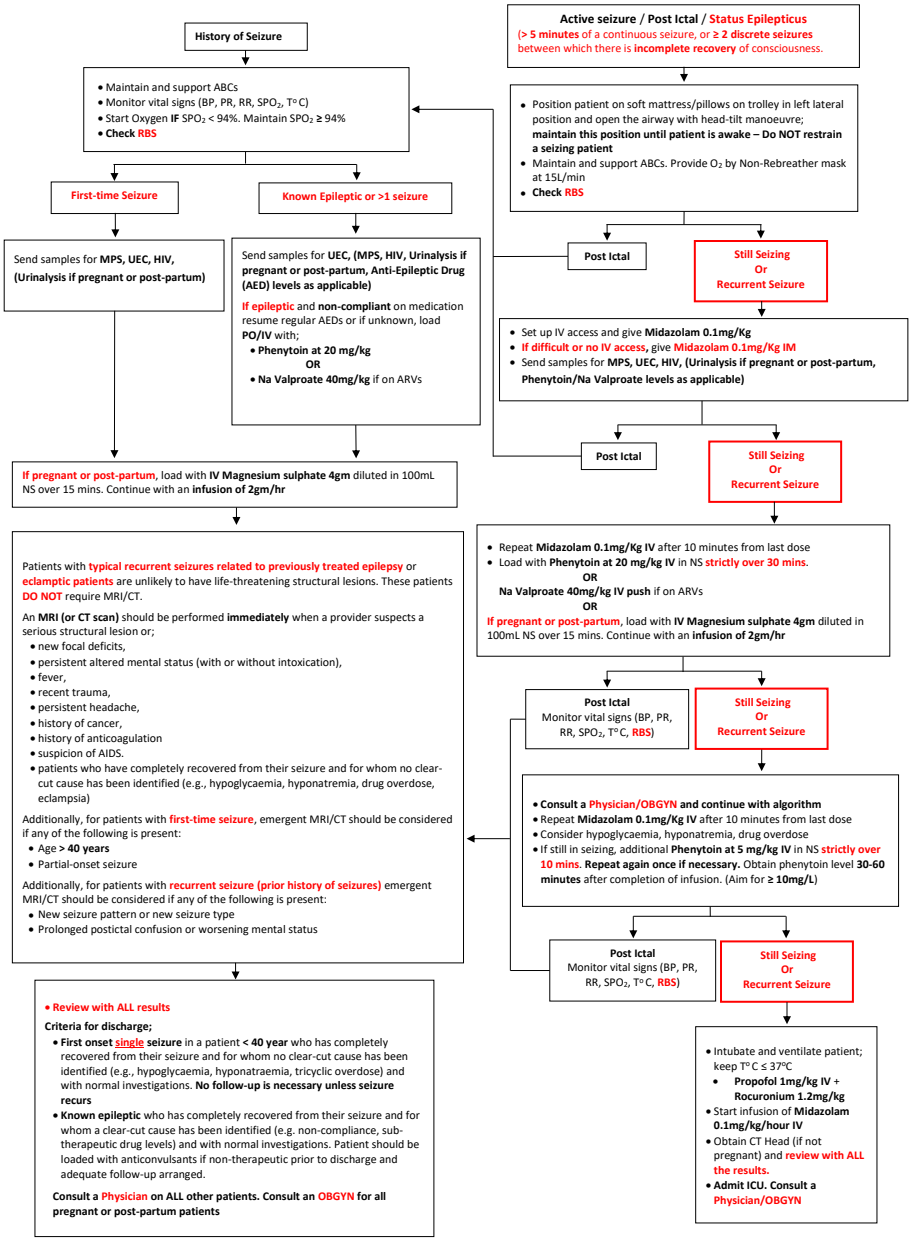


Abbreviations: CT, computed tomography; DMI, diffusion-weighted imaging; ECG, electrocardiogram; ED, emergency department; IV, intravenous; MRI, magnetic resonance imaging; TIA, transient ischaemic attack.

- Complete etiologic workup within 48 hours **(Class II)**
- Recommend carotid vessel imaging, when appropriate **(Class II)**
- Disposition to ED outpatient unit, inpatient, or urgent TIA clinic, depending on local resources and institutional standards **(Class II)**

20. Seizures Algorithm

This clinical pathway is intended to supplement, rather than substitute for, professional judgment and may be changed depending upon a patient's individual needs. Failure to comply with this pathway does not represent a breach of the standard of care.



21. Syncope Algorithm

This clinical pathway is intended to supplement, rather than substitute for, professional judgment and may be changed depending upon a patient's individual needs. Failure to comply with this pathway does not represent a breach of the standard of care.

History of Syncope

Syncope is a symptom complex that is composed of a **brief loss of consciousness** associated with an **inability to maintain postural tone** that "**spontaneously**" (i.e., no postictal period with a rapid recovery) and "**completely**" (no residual neurologic deficit) resolves **without medical intervention. Near-syncope** is defined as a patient almost losing consciousness, and it is approached in the same way as syncope.

Consider seizure - tongue biting, head turning during loss of consciousness, no recollection of abnormal behaviour, prolonged limb jerking (lasting minutes), incontinence post-event confusion, and prodromal aura.

Yes → **Go to 20. Seizures Algorithm**

No

- **Check RBS** – If RBS < 3.3 mmol/L – **see 29. Hypoglycaemia Algorithm**
- **12 lead ECG** - Look for evidence of ischemia/infarction, dysrhythmias, atrioventricular blocks, Brugada syndrome (RBBB with J-wave elevation of ≥ 2 mm), prolonged QT interval, ventricular pre-excitation, hypertrophic cardiomyopathy
- **Consider dangerous causes of syncope**

Neurally mediated syncope
- Subarachnoid haemorrhage
- Seizure

Orthostatic hypotension-mediated syncope
- Ectopic pregnancy
- Gastrointestinal haemorrhage
- Medication-induced orthostatic hypotension*

Cardiovascular-mediated syncope
- Dysrhythmias
- Acute coronary syndromes (rare < 2%)
- Aortic dissection
- Pulmonary Embolism (rare < 1%)
- Patients with bradycardia*

* patients who may benefit from intervention.

None of the above

The San Francisco Syncope Rule (SFSR) (available in **MDCalc**)
The SFSR uses five factors (**CHESS predictors**) to predict serious adverse outcomes at 7 or 30 days in patients presenting to the ED.

1. History of **C**ongestive Heart Failure
2. **H**aematocrit **< 30% (H**b < 10g/d**L)** (test if clinically indicated)
3. **E**CG abnormality (see above)
4. History of **S**hortness of breath
5. **S**BP **< 90 mm Hg** after arrival in the ED

SFSR is associated with a pooled negative predictive value of 97%, sensitivity of 87%, and negative LR of 0.28. Patients with negative SFSR scores had < 3% risk for serious outcomes.

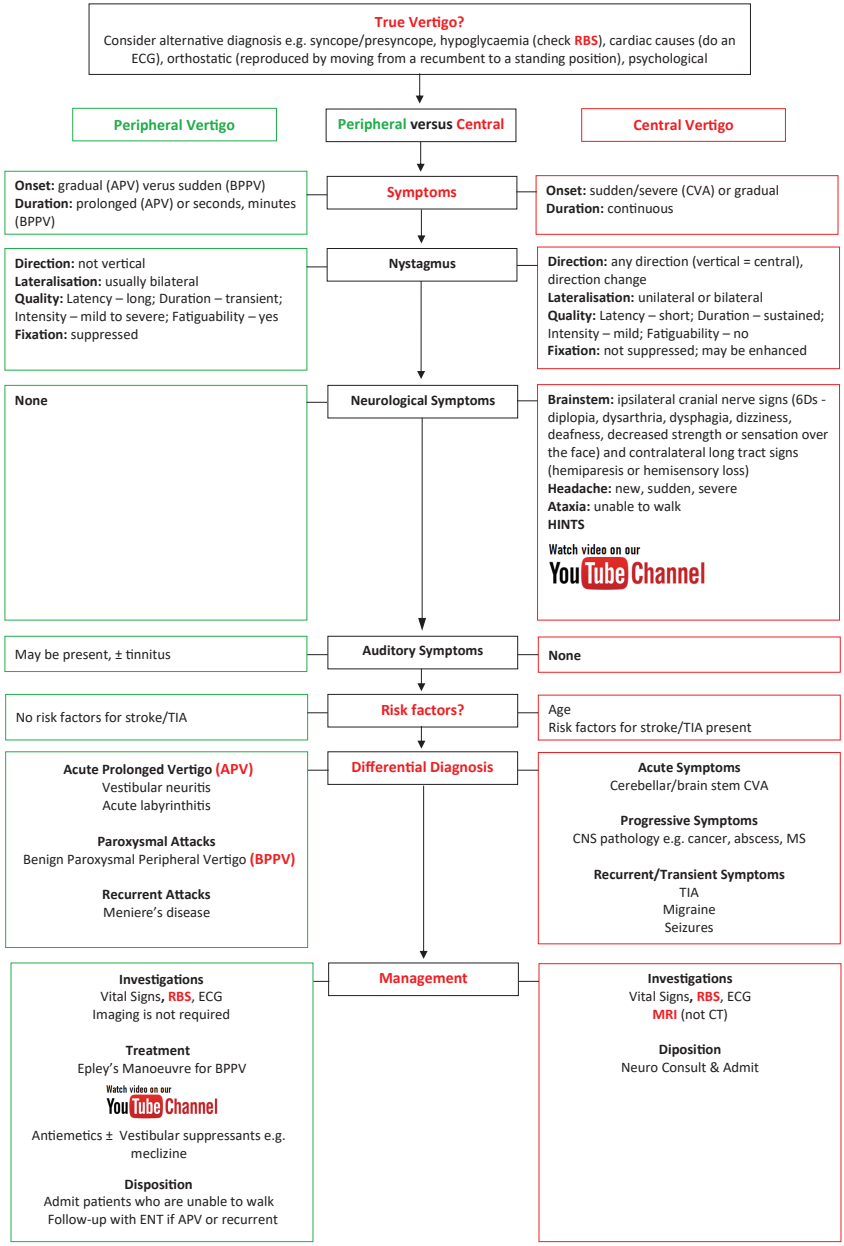
Does the patient have ANY of the 5 SFSR predictors?

Yes → **Consult a Physician**

No → **Discharge**

22. Dizziness (Vertigo) Algorithm

This clinical pathway is intended to supplement, rather than substitute for, professional judgment and may be changed depending upon a patient's individual needs. Failure to comply with this pathway does not represent a breach of the standard of care.



23. Trauma Management Pathway

This clinical pathway is intended to supplement, rather than substitute for, professional judgment and may be changed depending upon a patient's individual needs. Failure to comply with this pathway does not represent a breach of the standard of care.

SAMPLE HISTORY
Signs and **S**ymptoms
Allergies
Medication
Past Medical History/**P**regnancy
Last meal/Last Tetanus Injection/Last Medication/Drug/Alcohol intake
Events preceding presentation

ACTIVATE THE TRAUMA TEAM (see Trauma Team Activation Criteria)

PRIMARY SURVEY + RESUSCITATION (C-ABCDE)
STOP ANY EXTERNAL MASSIVE BLEEDING IMMEDIATELY (see Specific Measures in Severe Bleeding on the next page)
C-Spine – Cleared Clinically (**see 24. C-Spine Clearance Algorithm**)? Perform **Manual In-Line Stabilization (MILS)** then apply **Head Blocks or Blanket Rolls** taped to the patient's head and trolley. **DO NOT APPLY A C-COLLAR**
+ If suspected trauma and not cleared clinically, **Head Blocks** or **Blanket Rolls** strapped to the patient's head and trolley
Airway – Open? Maintainable? Intubate?
+ Rapid Sequence Intubation?
Breathing – Rate? SPO_2? Air Entry Bilaterally? Pneumothorax? Haemothorax? Flail Chest? Open sucking chest wound?
+ Supplementary Oxygenation? – Non-Rebreather mask
+ Immediate decompression for Tension Pneumothorax with subsequent immediate Intercostal Chest Drain Insertion?
+ Emergency Intercostal Chest Drain for Massive Haemothorax or Open sucking chest wound
Circulation – Active Bleeding Control? Pulse? CPR? BP? Signs of Shock? Open Book Pelvic Fracture?
+ Control Active Bleeding;
  - **Apply a Pelvic wrap to an Open Book Pelvic Fracture**
+ Insert 2 large bore IV lines and give appropriate fluid resuscitation (NS/RL/whole blood). Give **Tranexamic acid loading dose 15mg/kg over 10 min then infusion of 1.5mg/kg/h for 8 hours** to ALL trauma patients **with, or at risk of, significant bleeding, adults within 3 h of injury with a GCS score of 9-12 or 13-15 with any intracranial bleeding on CT scan**
+ **FHG, UEC, GXM** and request adequate supplementary blood and blood products
+ **Extended Focussed Assessment with Sonography in Trauma (EFAST) – ONLY** for;
  - Penetrating chest trauma – Pneumothorax? Haemothorax? Pericardial Effusion?
  - **Unstable** blunt chest and abdominal trauma – Haemothorax? Hemoperitoneum?
  - Unexplained hypotension - ? Free fluid in pleural, pericardial or peritoneal cavity
Disability – GCS? (available in **MDCalc**) Pupils? **RBS**?
+ Correct Hypoglycaemia – 50mls 50% Dextrose IV
+ **Give appropriate analgesia e.g. Fentanyl 1µg/kg IV (see Analgesia Chart and 42. Pain Management Algorithm for Regional Anaesthesia)**
+ **Give IV Phenytoin (20mg/kg) for Severe Head Injury (GCS ≤ 8)**
Expose patient
+ Check temperature and avoid hypo- or hyperthermia

SECONDARY SURVEY (HEAD-TO-TOE SURVEY)
CNS – Lacerations? Fractures? Signs of Base of Skull Fractures – Racoon Eyes, Battle Sign, Otorrhea, Rhinorrhoea? Focal Neurology?
Chest – Lacerations? Rib Fractures?
Abdomen – Lacerations? Distension? Tenderness? **EFAST**?
Limbs – Lacerations? Fractures? Distal Pulses and Neurology?
Log roll patient – Lacerations? Spine tenderness?

Do not forget to **CLEAN ALL OPEN WOUNDS** with running tap water for at least 10 minute and **SPLINT ALL FRACTURES.** Give **Tetanus Toxoid – see 26. Bites (Animal & Human), Tetanus & Rabies. Give ANTIBIOTICS within 1 hour of injury for ALL COMPOUND FRACTURES**. Therapeutic doses of cefazolin, clindamycin, for 48 hrs are appropriate; with contamination, consider anaerobic antibiotics (penicillins, clindamycin, metronidazole); **NO ANTIBIOTICS** are required for soft tissue injuries unless there is evidence of an infection.

RADIOLOGICAL INVESTIGATIONS
- **C-Spine X-rays** (AP, Lateral AND Open Mouth) – **see 24. C-Spine Clearance Algorithm**. If doing a CT head, do CT Spine instead of C-spine X-rays if indicated.
  C-spine is **NOT** cleared on X-rays/CT **BUT on resolution of patient symptoms**
- **CXR – ONLY** for patients with chest trauma - Pneumothorax? Haemothorax? Lung Contusion? Widened Mediastinum? Rib fractures? Follow-up with **CT-Chest plus angiogram** for Lung Contusion? Widened Mediastinum?
- **Pelvic X-ray – ONLY** for patients with;
  - lower abdominal pain
  - lower back pain
  - femur fractures
  - clinically tender pelvis
  - patients unable to mobilize
- **CT Head – ONLY** for;
  - GCS <15 (for GCS 15 – **see 25. Mild Traumatic Brain Injury Algorithm**)
  - Skull fractures including Base of Skull Fractures (**DO NOT ORDER SKULL X-Rays**)
- **CT-Abdomen –** For the **haemodynamically stable** patient with suspected blunt abdominal trauma
- **Knee X-ray – See Ottawa Knee Rule in MDCalc**
- **Ankle X-ray – See Ottawa Ankle Rule in MDCalc**

Where a reliable clinical assessment is not possible ALL the investigations should be done.

SPECIFIC MEASURES IN SEVERE BLEEDING

HEAD & NECK

SCALP - Staple, Sutures, Lidocaine/Adrenaline, Pressure Dressing

EPISTAXIS - ANTERIOR - Manual Pressure, Adrenaline Soaked Gauze, Rapid Rhino

EPISTAXIS- POSTERIOR - Rapid Rhino Double Balloon - Inflate Green Cuff 5-20 ml AIR

POST-TONSILLECTOMY - Lateral Pressure Magill's + Adrenaline/TXA Soaked Gauze,
- consider **nebulised TXA 500mg-1g** (adult and kids ≥ 25kg) or **250 mg** (< 25 kg)

TRAUMA

PENETRATING JUNCTIONAL - Paed Foley Into Wound, Saline In Balloon, Clamp, Suture

PELVIS / LIMB FRACTURES: Pelvic Binder, CT-6 Traction Splint

ARTERIAL LIMB BLEEDING - Direct pressure, elevation, SOF-T Tourniquet if still bleeding

MAX-FAC #s - Reduce Midface, RSI (Double Suction), Epistats, Bite Blocks, Collar

MEDICAL

HAEMOPTYSIS - **Neb TXA 1g**, Imaging to Localise, Bronch/ IR, ?Selective Intubation

HAEMATEMESIS - Urgent OGD. If Variceal - **TERLIPRESSIN 1.7mg**, Balloon Tamponade

INTRACRANIAL - SAH aim SBP < 140, ICH aim SBP < 160, Reverse Anticoagulation
- For Above BP Targets Use **LABETALOL 20mg (4ml)** Slow IV Over 2 Mins
- Then **40 - 80mg** At 10 Minute Intervals, Up To Total **300mg**

OBSTETRIC

1st TRIMESTER - FAST, USS for ectopic, consider Cervical Shock

ANTEPARTUM - Call O&G, USS for Placenta Previa & Fetal Heart Rate

POSTPARTUM - Consider **TONE** (Uterine Atony 70%) - **TISSUE** (Retained Placenta (20%)
- Genital Tract **TRAUMA** (1%) - **THROMBIN** (Coagulopathy - 1%)

- Massage Uterus, **SYNTOCINON** Slow IV Bolus **5 IU** then **40 IU** in **1l NS** / 4 hrs (250 ml/hr)
- Consider Manual Aortic Compression
- Uterine Balloon Tamponade with **Bakri Balloon**
- Theatre / Interventional Radiology

PAEDIATRIC

PACKED RED BLOOD CELLS 10 -20 ml/kg

PLATELETS 10ml/kg

TXA iv 15 mg/kg

FRESH FROZEN PLASMA 10-20 ml/kg

CRYOPRECIPITATE 5-10 ml/kg

CALCIUM GLUCONATE 10% 0.3 ml/kg

EMERGENCY MEDICINE KENYA FOUNDATION
emergencymedicinekenya.org

Trauma Team Activation Criteria

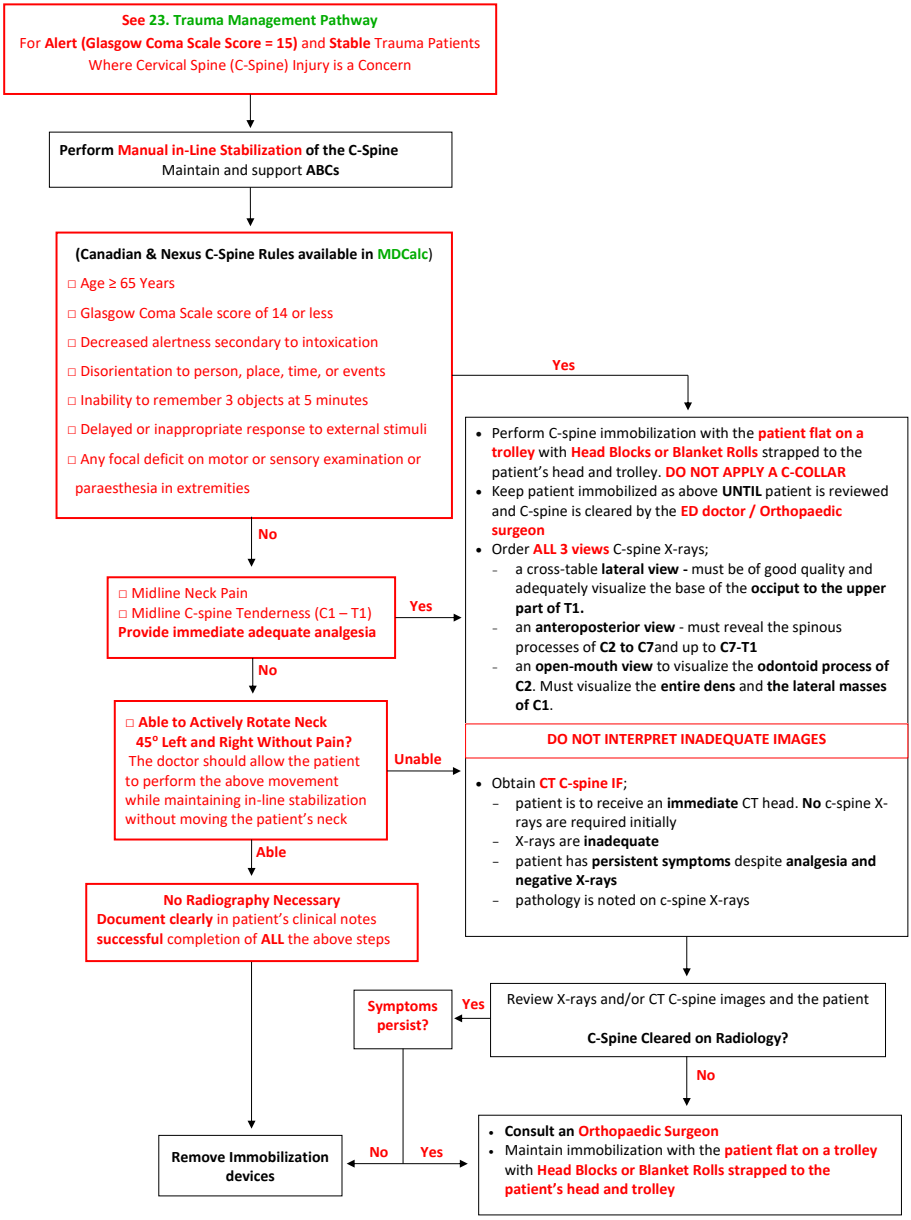
The **Trauma team** comprises a group of emergency department doctors/clinical officers and nurses, surgeons, anaesthetists and theatre staff, radiographers and other support personnel, who work together as a **team** to assess and manage the **trauma** patient. Their actions are coordinated by a **team leader** who should not touch the patient. The aim of the trauma team is to provide a safe and efficient evaluation of the patient. Identify all injuries and instigate the definitive management of such injuries. Most trauma teams will have about 30 minutes to accomplish this and should work towards achieving this goal.

The Trauma Team should be activated immediately a patient who meets ANY of the criteria below arrives:

- □ Systolic BP < 90 mmHg
- □ Respiratory rate < 10 breaths/min or > 30 breaths/min
- □ GCS < 12 with torso or extremity trauma
- □ Pregnant patient (> 20 weeks) with foetal heart rate < 120 bpm or >160 bpm
- □ Amputation proximal to elbows or knees
- □ 2 or more proximal long bone fractures
- □ Suspected spinal cord injury
- □ Severe maxillofacial injury with airway compromise
- □ Burns > 15% TBSA
- □ Pregnant patient with penetrating injury or significant blunt injury
- □ Gunshot wound proximal to knee or elbow
- □ Significant penetrating wound to head, neck, chest, abdomen or groin
- □ Ejection from vehicle
- □ Pedestrian thrown (hit by a car) or rolled over
- □ Fall from a height > 6 metres (20 feet)
- □ Simultaneous arrival of 3 or more multi-trauma patients
- □ Emergency Doctor feels trauma team is necessary for an injured patient

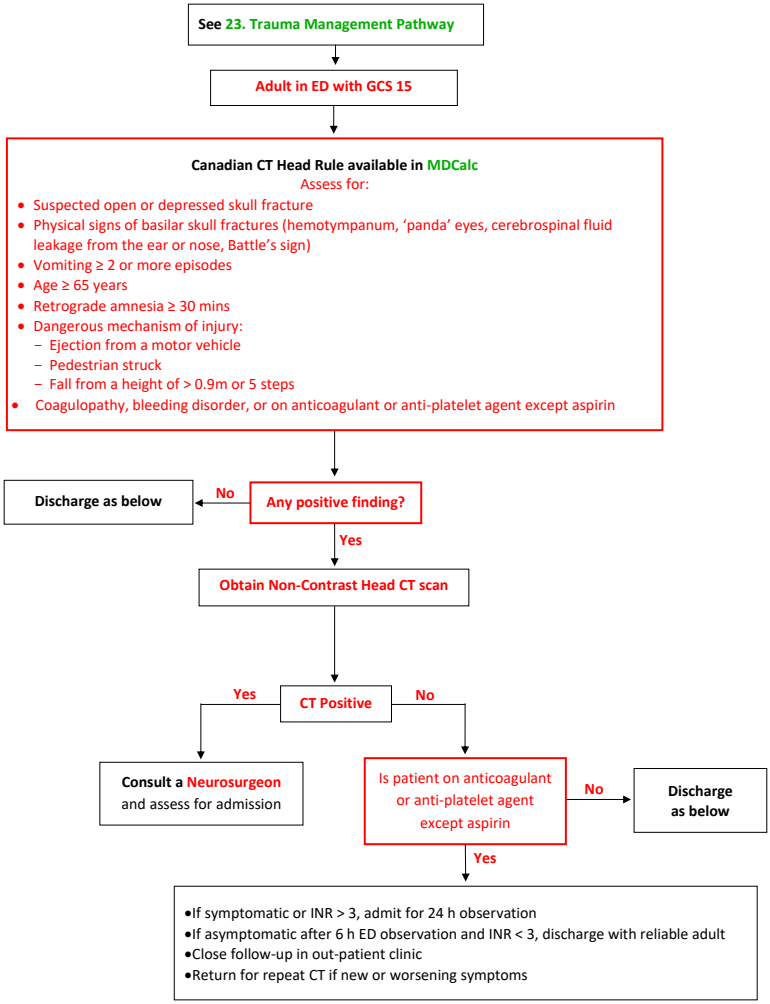
24. C-Spine Clearance Algorithm

This clinical pathway is intended to supplement, rather than substitute for, professional judgment and may be changed depending upon a patient's individual needs. Failure to comply with this pathway does not represent a breach of the standard of care.



25. Mild Traumatic Brain Injury Algorithm

This clinical pathway is intended to supplement, rather than substitute for, professional judgment and may be changed depending upon a patient's individual needs. Failure to comply with this pathway does not represent a breach of the standard of care.



Discharge

A CT interpreted as normal by the Radiologist in a neurologically intact person with a normal mental status allows for safe discharge with appropriate instructions and avoids prolonged ER observation or hospital admission. WRITTEN and VERBAL Discharge Instructions (see **MINOR HEAD INJURY DISCHARGE ADVICE**) must be provided and should include symptoms to expect after a mild TBI, the time course, the overall positive prognosis, activity limitations, and the point at which a patient return to the ED for further testing.

Minor Head Injury Discharge Advice

On returning home it is important that, if possible, you are accompanied by a responsible adult. While unlikely, there is a small risk of developing complications, so if you experience any of the following symptoms in the next few days you should return to ED as soon as possible.

- Loss of consciousness
- New deafness in one or both ears
- Loss of balance or problems walking
- Any weakness in one or both arms or legs
- Any vomiting
- Clear fluid coming out of your ears or nose
- Drowsiness when you would normally be wide awake
- Increasing disorientation
- Problems understanding or speaking
- Blurred or double vision
- Severe headache not relieved by painkillers such as paracetamol
- Bleeding from one or both ears
- Any fits (collapsing or passing out suddenly)
- Inability to be woken

Dos and Don'ts

DO make sure you stay within reach of a telephone and medical help in the next few days
DO have plenty of rest and avoid stressful situations
DO show this factsheet to a friend or family member who can keep an eye on your condition
DO take painkillers such as paracetamol for headaches
DON'T stay at home alone for 48 hours after leaving the hospital
DON'T drink alcohol until you feel better
DON'T take aspirin or sleeping tablets without consulting a doctor
DON'T return to work until you feel ready
DON'T play any contact sport for at least three weeks without consulting your doctor
DON'T return to driving until you feel you have recovered. If in doubt consult your doctor.

While most people recover quickly you may experience some of the following symptoms over the next few days and weeks, which don't require a return to hospital:

- Headaches
- Feelings of dizziness
- Nausea
- Sensitivity to light or noise
- Sexual difficulties
- Sleep disturbance
- Memory problems
- Thinking and problem-solving
- Irritability
- Restlessness
- Impulsivity and self-control problems
- Difficulties with concentration
- Feeling depressed, tearful or anxious
- Fatigue
- Difficulties

In most cases, these symptoms will resolve themselves within two weeks. However, in some cases, they may persist much longer. Try not to rush back into normal activities, as this may delay recovery. If you still have any symptoms after two weeks we suggest you come back to the ED and take this factsheet with you. It may be possible to seek a referral to a head injury specialist such as a neurologist or neuropsychologist.

For medical advice, contact the Emergency Department on: _____

26. Bites (Animal & Human), Tetanus & Rabies

This clinical pathway is intended to supplement, rather than substitute for, professional judgment and may be changed depending upon a patient's individual needs. Failure to comply with this pathway does not represent a breach of the standard of care.

Animal Bites

If rabies is a concern, **scrub the wound with soap and water for at least 15 minutes**, then rinse and apply a disinfectant (e.g. iodopovidone) as soon as possible after exposure. The use of antibiotics in patients with **animal bites** is **controversial,** and some studies have shown **little benefit.** However, pre-emptive early antimicrobial therapy for **3–5 days** is recommended for patients who;

- are immunocompromised;
- are asplenic;
- have advanced liver disease;
- have pre-existing or resultant oedema of the affected area;
- have moderate to severe injuries, especially to the hand or face; or
- have injuries that may have penetrated the periosteum or joint capsule

ALL Human bites should receive;

- **prophylactic antibiotics**
- **consider post-exposure prophylaxis for HIV within 72hrs.** The **risk** associated with bite injuries has **not been quantified.** The victim is usually at low risk **unless the biter's saliva is contaminated with blood.** The risk is greater to the biter if blood is drawn from the victim's wound because of exposure to mucous membranes.
- **Hepatitis B vaccine** preferably ≤ 24 hours if not previously immunized

Treatment:

DO NOT SUTURE ANIMAL AND HUMAN BITES. The above wounds should be irrigated copiously, dressed, left open to drain, and examined daily to detect signs of infection. During the first few days after injury, elevation of the injured body part, especially if swollen, accelerates healing. This should be accomplished using a passive method (a sling for outpatients or a tubular stockinet and an intravenous pole for inpatients). **ALL infected wounds should be treated.** If no signs of infection, delayed primary closure may be done **72 hours after the injury.**

Antibiotics

Amoxicillin/Clavulanate 1gm BD x 5-7 days

In Penicillin Allergic Patients:

Clindamycin 300 mg PO QID/600 mg IV TDS **OR** Azithromycin 500mg PO OD for 3 days

PLUS

Tetanus Toxoid 0.5mg IM

Previous doses of Adsorbed Tetanus Toxoid	Clean and minor wounds		All other wounds	
	Tetanus toxoid	TIG	Tetanus toxoid	TIG
< 3 doses or unknown	Yes	No	Yes	Yes
≥ 3 doses	Only if last dose given ≥10 yrs ago	No	Only if last dose given ≥5 yrs ago	No

Rabies Post-Exposure Prophylaxis

The WHO rabies exposure categories are:

Category I	Touching or feeding animals, licks on intact skin
Category II	Nibbling of uncovered skin, minor scratches or abrasions without bleeding
Category III	Single or multiple transdermal bites or broken skin with saliva from animal licks, exposure due to direct contact with bats.

Rabies Post-Exposure Prophylaxis is recommended for WHO Category II and III

Rabies Immunoglobulin (RIG)	No Pre-EP	Pre-EP
RIG provides passive immunization and is administered in the wound site only once, as soon as possible after the initiation of PEP and not beyond day 7 after the first dose of vaccine	Human Ig - 20U/Kg **OR** Equine Ig - 40U/Kg	None
Rabies Vaccine	**No Pre-EP**	**Pre-EP**
Intradermal (ID) **Dose: 0.1ml** **Recommended sites: left and right deltoids, thigh or suprascapular areas**	**Days 0, 3, and 7** (2–2–2): injections of two 0.1 ml doses of vaccine at different intradermal sites	One Booster dose (intramuscular or intradermal) at one site on both **Days 0 and 3**. **OR** One Booster intradermal dose at four sites in one visit. This consists of four injections of 0.1 ml equally distributed over the left and right deltoids, thigh, or suprascapular areas at a single visit
Intramuscular (IM) **Dose: 1 vial** **Recommended sites:** Deltoids, lateral thighs or suprascapular areas that drain into regional lymph glands **Recommended sites for children aged <2 years:** the anterolateral thigh Rabies vaccine should not be administered in the gluteal area, as induction of an adequate immune response is less reliable.	Reduced 'Essen' vaccine schedule (1–1–1–1) on **Days 0, 3, 7, and 14** in healthy patients. A fifth dose is recommended for immunocompromised persons, between days 21 and 28. Zagreb Regimen (2–0–1–0–1) on **Days 0, 7, and 21**. On day 0, two doses of vaccines are to be injected into two of the deltoid or thigh sites.	

Patients bitten by **healthy appearing domestic animals may delay rabies post exposure prophylaxis** if the animal is **quarantined**. These animals should be **observed for 10 days**, and if they show **no sign of infection** during the observation period they may be released, and the **patient does not need to be vaccinated**. Signs of infection in an animal include excessive salivation, aggression, paralysis, daytime activity in nocturnal animals, and impaired movement. If the animal shows any signs of infection, the patient should start the vaccination schedule and continue until the animal has been tested at an approved facility.

Common Venomous Snakes of Kenya

Snake Bites

(BIO-KEN SNAKE FARM, +254 718 290 324 for information on correct antivenom. http://www.bio-ken.com/)

Syndrome	Cytotoxicity (Painful progressive swelling)	Neurotoxicity (Progressive weakness)	Haematotoxicity (Bleeding)
Important snakes	Puff adder, Gabon viper, Kenya Horned Viper, Rhinoceros Viper, Red Carpet Viper, Ashe's Spitting Cobra, Black-necked Spitting Cobra, Red Spitting Cobra	Eastern Green Mamba, Jameson's Mamba, Black Mamba, Egyptian Cobra, Eastern Forest Cobra, Gold's Tree Cobra	Coastal Boomslang, North East-African Carpet Viper (Echis), Vine Snake, Blanding's Tree Snake
Clinical Picture	**Mild:** slow progressive painful swelling **Severe:** rapidly progressive swelling and severe pain, ecchymosis, blisters, severe tissue necrosis, abscess formation, pseudo- and true compartment syndrome, nausea and vomiting, hypotension, bleeding tendency, shock, rhabdomyolysis, renal failure	Ptosis, diplopia, dilated pupils, difficulties in swallowing, salivation, progressive difficulty breathing, hypoxia	Bleeding from puncture sites, Minor lacerations, development of disseminated intravascular coagulopathy over time
Management	- Establish IV access - Give analgesia - Position the limb at the level of the heart - Give IV fluid for shock and renal failure - Treat local complication appropriately	- Establish IV access - Monitor oxygenation and ventilation closely (HDU) - Intubation and mechanical ventilation may be necessary	- Establish IV access - Give blood/blood component therapy if indicated - Heparin, antifibrinolytics, thrombolytics are of **no value** and may be dangerous
Indications for Antivenom **Antivenom is NOT INDICATED if the patient is ASYMPTOMATIC**	**Polyvalent antivenom** - Swelling progressive at **≥15cm/hr** - Swelling to a **knee or elbow** from a foot or hand bite **within 4 hours** - Swelling of a **whole limb** by **8 hours** - Swelling threatening the airway - An associated coagulopathy - Unexplained dyspnoea - Consider antivenom if snake is unknown but envenomation is severe.	**Polyvalent antivenom** - **Triad** of (either) 1. paraesthesia, 2. excessive salivation/metallic taste and sweating 3. dyspnoea in the absence of painful progressive swelling (mambas) - **Paresis** in the presence of **significant swelling (non-spitting cobras)**	**Monovalent antivenom** - Active bleeding - Positive 20 MINUTE WHOLE BLOOD CLOTTING TEST (20WBCT) • Take 2 ml of blood from the patient and pour it into a new, clean, dry glass test tube. • The test tube must be made of glass and NOT plastic. The tube MUST be new. Avoid old tubes that have been washed in detergent/soap. • Leave the test tube undisturbed at ambient temperatures for 20 min. • After waiting for 20 min gently tilt the test tube. • If the blood is all liquid (no clots) then the patient has incoagulable blood. - Laboratory evidence of coagulopathy

Administration of Antivenom:

- Give the first dose (**10ml**) of antivenom intravenously at the slow rate of **1-2 ml per minute**. Subsequent doses may be injected into a bag of saline drip, **no more than 20 ml per 500ml bag to run in 30 mins**. **Repeat until symptoms resolve.** Monitor breathing and other vital signs continuously. **Remember not to have the drip running direct into the wounded limb** which is already in danger from the pressure of swelling and should be kept elevated and well protected.
- Remember to have adrenaline (1:1,000) at the bedside in case of anaphylaxis. If the patient has known allergies (asthma etc.), draw up the adrenaline (0.3 - 0.5 ml for adults and 0.1 - 0.3 for children) and have antihistamine available in case allergic symptoms are overwhelming. Antihistamine is **NOT recommended as routine treatment** for snakebite.
- Monitor breathing and other vital signs continuously.
- **DO NOT** infiltrate the bite area with antivenom.

27. Burns Resuscitation Pathway (Assessment)

This clinical pathway is intended to supplement, rather than substitute for, professional judgment and may be changed depending upon a patient's individual needs. Failure to comply with this pathway does not represent a breach of the standard of care.

SAMPLE HISTORY

Signs and **S**ymptoms
Allergies
Medication
Past Medical History/**P**regnancy
Last meal
Events preceding presentation

ACTIVATE THE TRAUMA TEAM (see Trauma Team Activation Criteria)

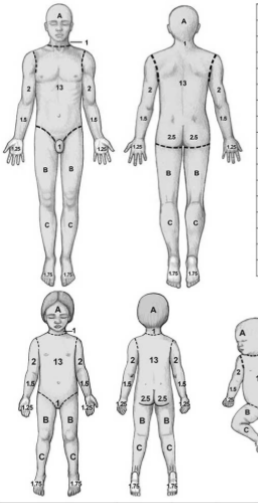
Primary Survey (C-ABCDE)

- **C**-Spine – If suspected trauma, Cleared Clinically (**see 24. C-Spine Clearance Algorithm**)? Perform **Manual In-Line Stabilization (MILS)** then apply **Head Blocks** or **Blanket Rolls** taped to the patient's head and trolley. **DO NOT APPLY A C-COLLAR**
- **A**irway – Open? Maintainable? Intubate? Indications for intubation include presence of pharyngeal burns, air hunger, stridor, carbonaceous sputum and hoarseness, unconscious patients, hypoxic patients with severe smoke inhalation, or patients with flame or flash burns involving the face and neck.
- **B**reathing – Rate? SPO_2? Air entry bilaterally?
- **C**irculation – Active Bleeding Control? Pulse? CPR? BP? Signs of Shock? ECG for electrical burns?
- **D**isability – GCS? Pupils? **RBS?**
- **E**xpose patient

1st Degree Burns	• Epidermis only • Commonly caused by UV light or very short flash or flame exposure • Skin is red, dry & hypersensitive • No treatment except analgesia • Leaves no scarring on healing
2nd Degree Burns	**Superficial;** • Epidermis + **Upper ⅓** of Dermis • Commonly caused by scald (spill or splash) • **Red, moist, weeping,** cob blisters that **blanche** with pressure • Painful - due to nerve exposure, & heals from 7-14days • Leaves no scarring on healing but there is potential pigmentary changes
	Deep; • Epidermis + **Upper ⅔** of Dermis • Commonly caused by scald, flame, chemicals, oil & grease • **Cheesy white, wet or waxy dry; Do not blanche** with pressure • Healing takes > 21days • Severe scarring & risk of contractures
3rd Degree Burns (Full Thickness Burns)	• Full Epidermis + Dermis are destroyed leaving no cells to heal • Commonly caused by scald, steam, flame, chemicals, oil, grease & high voltage electricity • Grey to charred & black, **insensate**, contracted, pale, leathery tissue • Severe scarring & high risk of contractures
4th Degree Burns	• Muscle involvement
5th Degree Burns	• Bone involvement - Especially in epileptics who convulse during burning

Total Body Surface Area (TBSA)
Burns Estimation

Lund and Browder Charts for area of body burnt



Burnt area	%
Head	
Neck	
Trunk (front)	
Trunk (back	
Arm (right)	
Arm (left)	
Hand (right)	
Hand (left)	
Buttock (right)	
Buttock (left)	
Genitals	
Leg (right)	
Leg (left)	
Feet (right)	
Feet (left)	
Total burn area	

Age (years)	Under 1	2–4	5–9	10–14	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 leg	2½	2½	2¾	3	3¼	3

Do not include first degree burns in the calculation of % TBSA. The surface area of a **patient's palm (including fingers)** is roughly **1% of TBSA**. Palmar surface can be used to estimate relatively small burns (**< 15%** of total surface area) or very large burns (**> 85%**, when unburnt skin is counted). For **medium-sized burns**, it is **inaccurate**.

Burns Resuscitation Pathway (Resuscitation)

Resuscitation (C-ABCDE)

CONSULT A SURGEON IMMEDIATELY AS YOU BEGIN RESUSCITATION OF ANY BURNS PATIENT WITH 3RD OR 4TH DEGREE BURNS AND CIRCUMFERENTIAL BURNS (also see Trauma Team Activation Criteria)

C – If suspected C-Spine trauma and **NOT** cleared clinically, **Head Blocks** or **Blanket Rolls** strapped to the patient's head and trolley?

A

- Rapid Sequence Intubation? **Avoid succinylcholine in patients with burns > 24hrs** due to risk of hyperkalaemia. Indications for intubation include presence of pharyngeal burns, air hunger, stridor, carbonaceous sputum and hoarseness, unconscious patients, hypoxic patients with severe smoke inhalation, or patients with flame or flash burns involving the face and neck.

B

- Supplementary Oxygenation? If suspected **carbon monoxide poisoning** (restlessness, headache, nausea, poor co-ordination, memory impairment, disorientation, or coma), give **100% oxygen via a Non-Rebreather mask at 15L/min for 24 hrs**

C

- Control Active Bleeding
- **Do not include first degree burns in the calculation of % TBSA**
- Patients with **< 10% TBSA** burns can be resuscitated orally (unless the patient has an electrical injury or associated trauma). This needs on-going evaluation and the patient may still require an IV line.
- Patients with burns involving ≥ **20% of TBSA** will require intravenous fluid resuscitation. Insert 2 large bore IV/IO lines and give appropriate fluid resuscitation (RL/NS/whole blood). **Parkland Formula** (available in **MDCalc**) **– Total fluids over 24hrs = Adults - 2-4mL/Kg/%TBSA, Paeds - 3mL/Kg/%TBSA.** Give ½ of this volume within the **first 8hrs** of the burns then the next ½ over the **next 16hrs** + maintenance fluid for children < 30 kg. Aim for a urine output of **1 mL/kg/hour in children younger than 2 years** (or who weigh < 30 kg) and **0.5 mL/kg/hour in adults and older children.** If urine output is not adequate, increase fluids for the **next hour to 150%** of calculated volume until urine output is adequate.

> **High-voltage electrical injury** causes significant muscle injury, so formulas for fluid resuscitation based on percentage of body surface area burned are not applicable. Aggressive fluid resuscitation to maintain adequate **urine output (1.0-1.5 mL/kg per hour)** should be initiated **until the urine is clear of myoglobin** (urinary dipstick positive for blood with no red cells in the sediment). Acute myoglobinuric renal failure with life-threatening consequences can occur if fluid resuscitation is delayed.

- GXM and request adequate supplementary blood and blood products if necessary

D

- Correct Hypoglycaemia – 50mls 50% Dextrose IV
- **Give appropriate analgesia e.g. Fentanyl 1µg/kg IV (see Analgesia Chart);** Consider procedural sedation with Ketamine for wound dressing **(see 45. Procedural Sedation and Analgesia (PSA))**

E

- Check temperature and provide warmth to the patient
- Cool any burns < 3 hours old with **cold tap water for at least 30 minutes** and then dry the patient. In patients undergoing external cooling who have burns covering ≥ 10% of TBSA, monitor body temperature for hypothermia.
- Remove all clothes, jewellery, necrotic tissue & debris
- Wash wound with mild soap and tap water
- **DO NOT BURST BLISTERS.** Blisters left intact heal faster and become infected less often.

Secondary Survey (Head-to-Toe Survey) and Other Considerations

- In neck burns, a pillow is placed under the patient's head to hyperextend the neck at the shoulders to prevent contractures
- Chest wall burns - Do a checker-box release - **consult a Surgeon**
- Upper limb burns should be nursed elevated at 45°
- Evaluate 3rd & 4th Degree Burns and circumferential burns for possible escharotomy, **consult a Surgeon**
- Give **Tetanus Toxoid**.
- **Topical antimicrobial agents** or bioengineered substitutes should be applied to **all clean, debrided wounds except superficial burns**. Prophylaxis with **systemic antibiotics** is currently **NOT RECOMMENDED** for patients with severe burns other than perioperatively.

Disposition

Minimum criteria for transfer to a burns centre (Modified from the Australian and New Zealand Burn Association (ANZBA) protocol)

Burn injury patients who should be referred to a burn unit include the following:

- All burn patients less than 1 year of age
- All burn patients from 1-2 years of age with burns > 5% total body surface area (TBSA)
- Patients in any age group with third-degree burns of any size
- Patients older than 2 years with partial thickness burns greater than 10% TBSA
- Patients with burns of special areas – face, hands, feet, genitalia, perineum or major joints
- Patients with electrical burns, including lightning burns. Admit patients with history of loss of consciousness, documented arrhythmias either before or after arrival to the ED (including cardiac arrest), ECG evidence of ischemia, or high-voltage electrical injury
- Chemical burn patients
- Patients with inhalation injury resulting from fire or scald burns
- Patients with circumferential burns of the limbs or chest
- Burn injury patients with pre-existing medical disorders that could complicate management, prolong recovery or affect mortality
- Any patient with burns and concomitant trauma
- Paediatric burn cases where child abuse is suspected
- Burn patients with treatment requirements exceeding the capabilities of the referring centre
- Septic burn wound cases

28. Post Rape Care (PRC) Algorithm

This clinical pathway is intended to supplement, rather than substitute for, professional judgment and may be changed depending upon a patient's individual needs. Failure to comply with this pathway does not represent a breach of the standard of care.

This algorithm should be used with reference to the documents in the latest
National Guidelines on Management of Sexual Violence in Kenya available at **www.emergencymedicinekenya.org/rape**

RAPE SURVIVOR

< 72 hours

- Assess, monitor and support ABCs. Monitor vital signs. Get same sex chaperone.
- Fill **PRC Consent** form.
- Fill **PART A of PRC form** in triplicate.
- As you examine the patient, collect specimens as detailed below and store them in a secure locked cupboard.
- Put all clothes in **BROWN PAPER BAGS (NOT PLASTIC)** and label with patient details.
- **Give STAT PEP within 72hours**.
  - TDF/3TC (300/300mg) 1tab OD + ATV/r (300/100mg)
  - AZT (300mg) can be used when TDF cannot be used Do NOT delay PEP administration by awaiting lab results.
- Order investigations as **PART A** of PRC form and fill in results: HIV (do pre-test counselling).

Treatment

2. **PEP within 72hours (ONLY IF ACCEPTS HIV TESTING)**
   - TDF/3TC (300mg/300mg) 1tab OD + ATV/r (300/100mg)-with food 1-tab OD for 28 days.
   - AZT (300mg) can be used when TDF cannot be used Do NOT delay PEP administration awaiting lab results.
3. **Emergency Contraception within 120 hours** (females 15-49 years)
   - Levonorgestrel 0.75mg - 2 tabs stat
4. **STI Prevention:**
   - I.M Ceftriaxone 250mg stat or PO Cefixime 400mg stat + PO Azithromycin 1g stat + PO Tinidazole/Metronidazole 2g stat. Tinidazole/Metronidazole can be deferred to be taken at home if alcohol ingested or given emergency contraceptives.

   OR
   - PO Doxycycline 100mg BD for 14 days + Ciprofloxacin 500mg stat + Tinidazole 2g stat.
5. **Hepatitis B Vaccination** (If not previously vaccinated and not known HBV positive) should be offered **within 14 days**.
   - I.M 1.0 mls Hepatitis B vaccine at 0, 1 & 6 months.
6. **Tetanus Prophylaxis** (Do not give TT if the survivor has received 3 or more doses previously and the last dose is within 5 years)
   - I.M 0.5 mls of T.T stat
7. **HPV vaccine** females 9-26 years and males 9-21 years.
   - I.M Cervarix 0.5 mls at 0, 1 & 6 months

   OR
   - Gardasil®9 at 0, 2 & 6 months
8. Complete **PART B** of PRC form and refer for **IMMEDIATE VOLUNTARY COUNSELLING BEFORE DISCHARGE**

On discharge:
- **Confirm PART A & B** of PRC form are filled. Attach **blue copy** to **patient's file** and give **white copy** to **patient**. Leave the **green copy** in the PRC booklet.
- Confirm patient understands drug regimen
- Give patient belongings in well-labelled brown bag
- Nearest Gender Based Violence Recovery Centre (GBVRC) booking in one week
- Give patient discharge summary with all the follow-up dates as listed above
- **Confirm Complete Documentation: 1**. Informed consent form **2**. PRC form **3**. Police surgeon form **4**. PRC register **5**. Rape trauma counselling form **6.** PRC psychological assessment form

Follow-up
- Counselling. Trauma counselling in 2, 4, 6 and 12 weeks + Adherence counselling
- Gender Based Violence Recovery Centre (GBVRC) for PEP follow-up at 7, 14 and 28 days. Repeat CBC, ALT, CR in 2 weeks, PDT in 4 weeks, HIV test in 4, 12 & 24 weeks
- HIV care clinic if HIV positive

> 72 hours

- Assess, monitor and support ABCs. Monitor vital signs. Get same sex chaperone.
- Fill **PRC Consent** form.
- Fill **PART A of PRC form** in triplicate.
- Put all clothes in **BROWN PAPER BAGS (NOT PLASTIC)** and label with patient details.
- Order investigations as **PART A** of PRC form and fill in results: HIV (do pre-test counselling).

Treatment

1. **Emergency Contraception within 120 hours** (females 15-49 years)
   - Levonorgestrel 0.75mg) -2 tabs stat
2. **STI Prevention:**
   - I.M Ceftriaxone 250mg stat or PO Cefixime 400mg stat + PO Azithromycin 1g stat + PO Tinidazole/Metronidazole 2g stat. Tinidazole/Metronidazole can be deferred to be taken at home if alcohol ingested or given emergency contraceptives.

   OR
   - PO Doxycycline 100mg BD for 14 days + Ciprofloxacin 500mg stat + Tinidazole 2g stat.
3. **Hepatitis B Vaccination** (If not previously vaccinated and not known HBV positive) should be offered **within 14 days**.
   - I.M 1.0 mls Hepatitis B vaccine at 0, 1 & 6 months.
4. **Tetanus Prophylaxis** (Do not give TT if the survivor has received 3 or more doses previously and the last dose is within 5 years)
   - I.M 0.5 mls of T.T stat
5. **HPV vaccine** females 9-26 years and males 9-21 years.
   - I.M Cervarix 0.5 mls at 0, 1 & 6 months

   OR
   - Gardasil®9 at 0, 2 & 6 months
6. Complete **PART B** of PRC form and refer for **IMMEDIATE VOLUNTARY COUNSELLING BEFORE DISCHARGE**

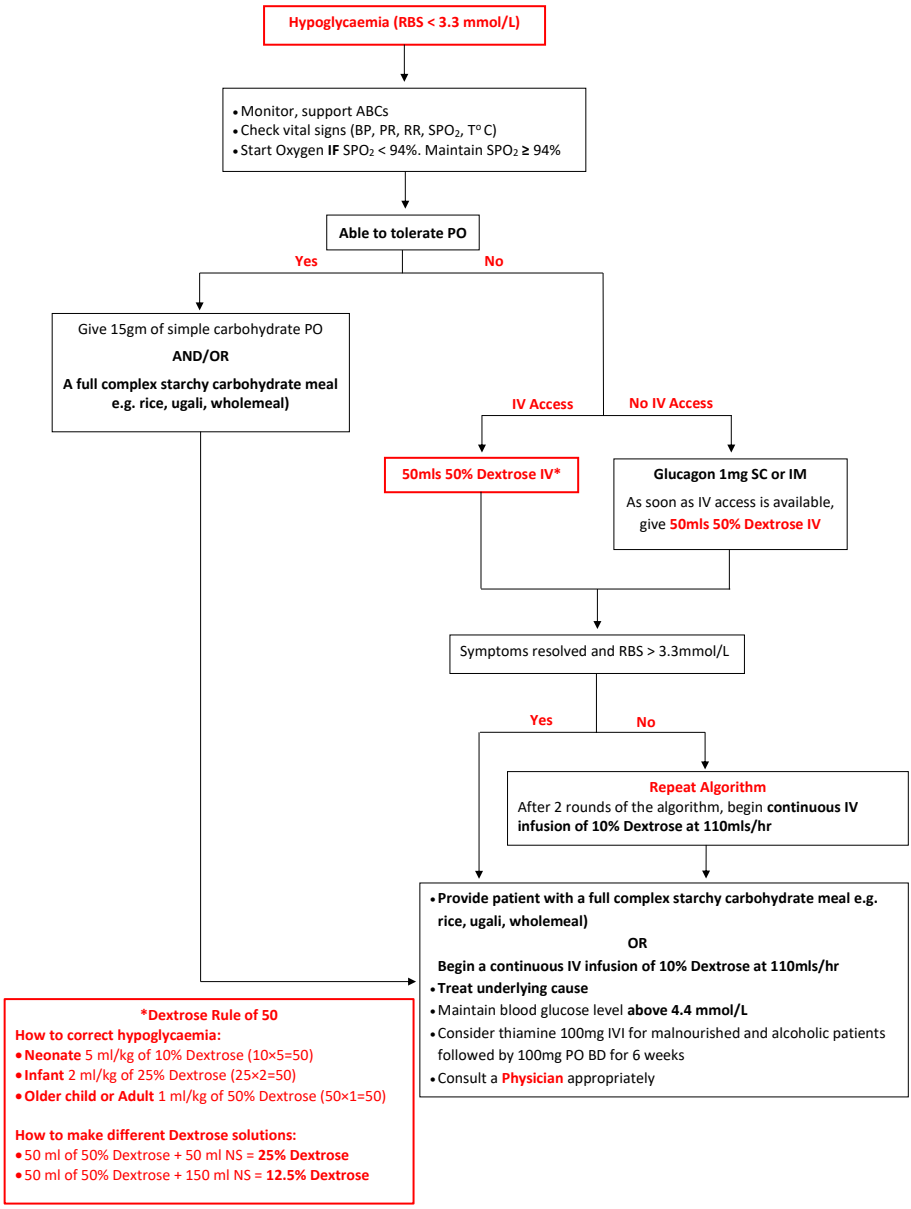
On discharge:
- Confirm **PART A & B** of PRC form are filled. Attach **blue copy** to **patient's file** and give **white copy** to **patient.** Leave the **green copy** in the PRC booklet.
- Confirm patient understands drug regimen
- Give patient belongings in well-labelled brown bag
- Nearest Gender Based Violence Recovery Centre (GBVRC) booking in one week
- Give patient discharge summary with all the follow-up dates as listed above
- **Confirm Complete Documentation: 1**. Informed consent form **2**. PRC form **3**. Police surgeon form **4**. PRC register **5**. Rape trauma counselling form **6.** PRC psychological assessment form

Follow-up
- Counselling. Trauma counselling in 2, 4, 6 and 12 weeks
- Gender Based Violence Recovery Centre (GBVRC) for follow-up. PDT in 4 weeks, HIV test in 4, 12 & 24 weeks
- HIV care clinic if HIV positive

CONTACT THE KENYA POLICE TO COLLECT ALL SPECIMENS & CLOTHES (MUST BE IN LABELLED BROWN PAPER BAGS (NOT PLASTIC))

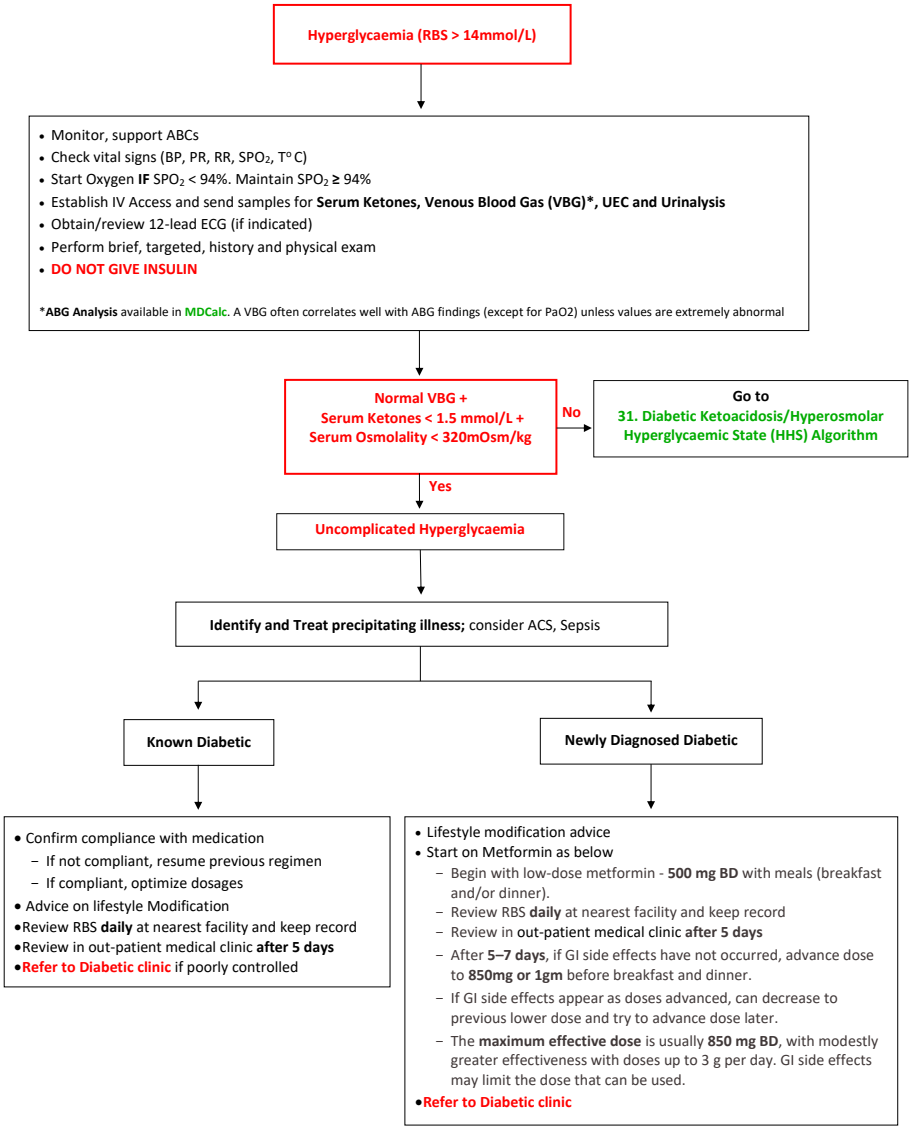
29. Hypoglycaemia Algorithm

This clinical pathway is intended to supplement, rather than substitute for, professional judgment and may be changed depending upon a patient's individual needs. Failure to comply with this pathway does not represent a breach of the standard of care.



30. Hyperglycaemia Algorithm

This clinical pathway is intended to supplement, rather than substitute for, professional judgment and may be changed depending upon a patient's individual needs. Failure to comply with this pathway does not represent a breach of the standard of care.



31. Diabetic Ketoacidosis (DKA) / Hyperosmolar Hyperglycaemic State (HHS) Algorithm

This clinical pathway is intended to supplement, rather than substitute for, professional judgment and may be changed depending upon a patient's individual needs. Failure to comply with this pathway does not represent a breach of the standard of care.

Begin 30. Hyperglycaemia Algorithm

Serum Ketones >1.5 mmol/L
+
(pH < 7.3 OR HCO_3^- < 18mmol/L)
Diabetes Ketoacidosis

RBS > 33.3mmol/L
+
Serum Osmolality > 320mOsm/kg
+
pH > 7.3
Hyperosmolar Hyperglycaemic State (HHS)

Normal VBG
+
Serum Ketones < 1.5mmol/L
+
Serum Osmolality < 320mOsm/kg
Uncomplicated Hyperglycaemia

- **Identify and Treat precipitating illness;** consider ACS, Sepsis
- **Consult a Physician and continue with the Algorithm**

Go to
30. Hyperglycaemia Algorithm

1. Fluid Protocol

(Ringer's Lactate)

If **Hypovolaemic Shock**, give fluid boluses at 15 to 20mL/kg; Repeat until BP stable. Consider inotropes if no response to fluid resuscitation.

If **Hypovolaemic but No Shock**; Give **15 - 20 mL/Kg/hr** Ringer's Lactate

DO NOT give > 50 mL/kg of isotonic solution in the **first 4 hours** of treatment because of the risk of **cerebral oedema.**

If **CORRECTED** serum sodium is **< 135 mmol/L**, continue treatment with Ringer's Lactate at **250-500 mL/hour**

If **CORRECTED** serum sodium is **≥ 135 mmol/L**, continue treatment with **0.45% NaCl** instead of Ringer's Lactate at **250-500 mL/hour**

Success in fluid therapy is reflected by an improvement in hemodynamic and hydration status and pH values, a satisfactory urine output of **1 to 2 mL/kg/hour**, and clinical progress.

2. Potassium Protocol

DO NOT give potassium if patient is **anuric** or **serum K^+ > 5.3mmol/L**

Serum K^+ (mmol/L)	Action
> 5.3	**DO NOT** give K^+, **but** check potassium levels hourly and start replacement when **K^+ < 5.3mmol/L**
3.3 to 5.3	Add 20-30 mmol K^+/1L fluid/hour to IV fluids until **K^+ > 4.0-5.0mmol/L** range
< 3.3	**Hold** insulin. Add 20-30 mmol K^+/1L fluid/hour. Continuous cardiac monitoring until **K^+ > 3.3mmol/L**

3. Insulin Protocol

DO NOT give insulin until you have K^+ levels > 3.3mmol/L

Give **0.14u/kg/hr IV Infusion**

- Hourly RBS monitoring
- Target RBS drop **3-4mmol/L/hr**
- If the RBS does not fall by 3-4 mmol/L/hr, give a bolus of **0.14u/kg IV** and continue with the infusion

Venous Glucose reaches
< 11.1 mmol/L (DKA)
< 16.7 (HHS)

- Change IV fluid infusion to **5 % Dextrose with 0.45% NaCl** at **150-250mL/hr**
- **Decrease** insulin to **0.02-0.05u/kg/hr IV Infusion**
- Maintain glucose between **8.3 – 11.1mmol/L (DKA)/ 13.9 - 16.7mmol/L (HHS)** and continue insulin infusion and fluid hydration **until ketosis or hyper osmolality resolves**

Useful formulas in DKA (available in **MDCalc**)

Anion gap = $Na^+ - [(Cl^- + HCO_3^-)]$

Serum sodium correction = $Na^+_{measured} + \frac{1.6 * \{Glucose - 5.6\}}{5.6}$ (all values in mmol/l)

Serum potassium correction during acidaemia = [K+] - (0.6 mmol/L X (7.4 - measured pH) X 10)

Serum osmolality (mOsm/L) = 2 [Na^+ + K+] (mmol/L) + Glucose (mmol/L) + BUN (mmol/L)

Total body water deficit (L) = $0.6_{men/children}$ or 0.5_{women} x body weight (kg) X [serum Na^+ /140 - 1]

32. Electrolyte Abnormalities Algorithm

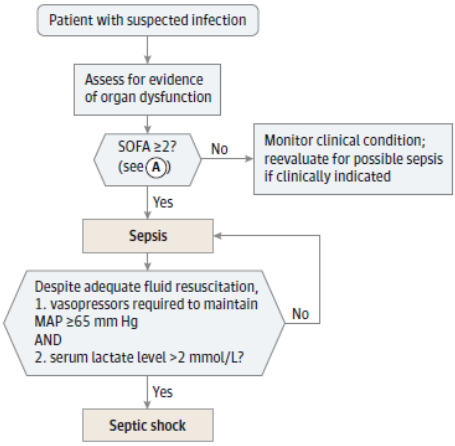
This clinical pathway is intended to supplement, rather than substitute for, professional judgment and may be changed depending upon a patient's individual needs. Failure to comply with this pathway does not represent a breach of the standard of care.

- Monitor, support ABCs
- Check vital signs (BP, PR, RR, SPO_2, T^oC, **RBS**)
- Start Oxygen **IF** SPO_2 < 94%. Maintain SPO_2 ≥ 94%
- Establish IV Access and send blood samples for **FBC, UEC**
- Obtain/review 12-lead ECG for K^+ abnormalities
- Perform brief, targeted history, physical exam

Hyponatraemia (< 130 mmol/L)	Hypernatremia (> 150 mmol/L)	Hypokalaemia (< 3 mmol/L)	Hyperkalaemia (> 5.5 mmol/l.)
For hypotensive patients, give NS 20 mL/kg bolus and repeat until vital signs are stable **Consult a Physician for ALL Patients** For **patients with severe symptoms (vomiting, cardiorespiratory distress, abnormal or deep somnolence, seizures or coma (GCS ≤ 8)** (usually in the 100 to 110 mmol/L range), regardless of whether hyponatraemia is acute or chronic: Start IV infusion of **150 ml 3% hypertonic saline over 20 min.** Repeat infusion checking the serum sodium concentration **every 20 min until a target of 5 mmol/l increase** in serum sodium concentration is achieved or until the symptoms improve, whichever comes first. Consider using weight-based (2 ml/kg) rather than the fixed 150 ml infusion volumes of 3% hypertonic saline in case of obviously deviant body composition. Keep in mind that if hypokalaemia is present, correction of the hypokalaemia will contribute to an increase in serum sodium concentration. Do not expect patients with severe symptoms to completely recover immediately, as it may take some time for the brain to fully recover.	**For hypotensive patients, give RL 20 mL/kg bolus and repeat until vital signs are stable** **Consult a Physician for ALL Patients** **After the patient is stabilized, change fluids to D5 ½ NS to provide for maintenance requirements and on-going losses.**	**For hypotensive patients, give RL 20 mL/kg bolus and repeat until vital signs are stable** **Mild-Moderate hypokalaemia (2 -3 mmol/L)** Patients who have mild or moderate hypokalaemia may need only oral potassium replacement therapy if nausea or vomiting is not the cause of the hypokalaemia. Giving **40 to 60 mmol** of elemental **potassium orally every 2 to 4 hours** for **3 days**. **Severe hypokalaemia (< 2mmol/l)** Give **40 mmol K^+ in 1L RL** over **1 hour** with continuous ECG monitoring. Additionally, restoration of normokalaemia relies on the establishment of normomagnesemia as both K^+ and Mg^{2+} co-transport in the kidney. Give **2gm magnesium sulphate** along with potassium replacement. **Consult a Physician for ALL Patients**	**For hypotensive patients, give NS 20 mL/kg bolus and repeat until vital signs are stable** **Give calcium** to protect the heart (not bind K^+) Give **10mls 10% $CaCl_2$ (6.8mmol) over 10mins** **OR** **30mls 10% Calcium Gluconate (6.6mmol) over 10mins** 1. **Check RBS.** If RBS < 14mmol/L, give **50mls 50% dextrose IV bolus** 2. Then give **10units soluble insulin IV bolus** Repeat **1** & **2** above if **repeat K+ is > 5.5 mmol/L** **Re-check RBS hourly** **Nebulise Salbutamol 10 to 20 mg in 4 ml of NS** over 10 minutes - 25-40% of patients do not respond secondary to tachyphylaxis. Serum potassium will be lowered approximately **10 to 30 minutes** after the above measures are performed, and the effect will last for **2 to 6 hours.** **Consult a Physician for ALL Patients**

33. Sepsis & Septic Shock Diagnostic Criteria

(SOFA and qSOFA Scores available on **MDCalc**)



(A) Sequential [Sepsis-Related] Organ Failure Assessment Score[a]

	Score				
System	0	1	2	3	4
Respiration					
Pao_2/Fio_2, mm Hg (kPa)	≥400 (53.3)	<400 (53.3)	<300 (40)	<200 (26.7) with respiratory support	<100 (13.3) with respiratory support
Coagulation					
Platelets, $\times 10^3/\mu L$	≥150	<150	<100	<50	<20
Liver					
Bilirubin, mg/dL (μmol/L)	<1.2 (20)	1.2-1.9 (20-32)	2.0-5.9 (33-101)	6.0-11.9 (102-204)	>12.0 (204)
Cardiovascular	MAP ≥70 mm Hg	MAP <70 mm Hg	Dopamine <5 or dobutamine (any dose)[b]	Dopamine 5.1-15 or epinephrine ≤0.1 or norepinephrine ≤0.1[b]	Dopamine >15 or epinephrine >0.1 or norepinephrine >0.1[b]
Central nervous system					
Glasgow Coma Scale score[c]	15	13-14	10-12	6-9	<6
Renal					
Creatinine, mg/dL (μmol/L)	<1.2 (110)	1.2-1.9 (110-170)	2.0-3.4 (171-299)	3.5-4.9 (300-440)	>5.0 (440)
Urine output, mL/d				<500	<200

Abbreviations: Fio_2, fraction of inspired oxygen; MAP, mean arterial pressure; Pao_2, partial pressure of oxygen.

[a] Adapted from Vincent et al.[27]

[b] Catecholamine doses are given as μg/kg/min for at least 1 hour.

[c] Glasgow Coma Scale scores range from 3-15; higher score indicates better neurological function.

The baseline Sequential [Sepsis-related] Organ Failure Assessment (SOFA) score should be assumed to be zero unless the patient is known to have preexisting (acute or chronic) organ dysfunction before the onset of infection. qSOFA indicates quick SOFA; MAP, mean arterial pressure.

Sepsis & Septic Shock Algorithm

This clinical pathway is intended to supplement, rather than substitute for, professional judgment and may be changed depending upon a patient's individual needs. Failure to comply with this pathway does not represent a breach of the standard of care.

See 33. Sepsis & Septic Shock Diagnostic Criteria

TO BE COMPLETED WITHIN 3 HOURS OF IDENTIFICATION OF SEPSIS/SEPTIC SHOCK

- Monitor, support ABCs
- Check vital signs (BP, PR, RR, SPO_2, T°C, **RBS**)
- Start Oxygen **IF** SPO_2 < 94%. Maintain SPO_2 ≥ 94%
- Establish IV Access and send samples for **FBC, MPS, LFTs, UEC, VBG, Serum lactate**
- Perform brief, targeted history, physical exam
- Obtaining appropriate cultures before antimicrobial therapy is initiated if such cultures do not cause significant delay in the start of antimicrobial(s). Draw **2 sets** of **blood cultures 10mL each** (both **aerobic and anaerobic** bottles) from **different sites**.
- **Administer at least 30ml/kg NS or RL for Hypotension or Lactate ≥ 2 mmol/L**
- **Give ANTIBIOTICS** within **1-hour of recognition of sepsis/septic shock**
  - **Ceftriaxone 2gm IV stat**
  - For probable **Neutropenic** patients or if patient has been **admitted in hospital** in the **last 3 months** (Hospital Acquired Infection)
    - Imipenem 500 mg IV infusion over 3 hrs then QID for **general sepsis**

      OR
    - Meropenem 1gm IV infusion over 3 hrs then TDS for possible **CNS infections**
- Give antipyretic if indicated (Paracetamol 1gm IV)
- CXR; Urinalysis + MCS; ? Stool MCS; ? CSF MCS
- **Monitor urine output hourly**

Repeat vital signs (BP, MAP, PR, RR, SPO_2, T°C, Serum lactate) after 1 hour

Features of **SHOCK despite adequate fluid resuscitation (> 30ml/kg)**?
- ☐ MAP < 65mmHg
- ☐ Signs of Shock (tachypnoea, cool clammy skin, cool peripheries, hypotensive, tachycardia)
- ☐ Urine output < 0.5mL/kg/hour
- ☐ Hyperlactatemia (> 2 mmol/L)

Yes

SEPTIC SHOCK
- **Consult a Physician and continue with the algorithm**
- **Start peripheral vasopressors** if **MAP < 65mmHg** in the face of life-threatening hypotension, even when hypovolemia has not yet been resolved - **Norepinephrine (0.1–1.3 µg/kg/min) and/or Adrenaline (0.05-0.3µg/kg/min)**. Titrate vasopressors to a **MAP ≥ 65 mmHg** to preserve tissue perfusion.

No

Consult a Physician
Consider Admission

Hemodynamic stability achieved with **adequate fluid resuscitation (> 30ml/kg) and vasopressor therapy**?
- ☐ MAP < 65mmHg
- ☐ Signs of shock as above
- ☐ Urine output < 0.5mL/kg/hour
- ☐ Hyperlactatemia (> 2 mmol/L)

Yes → **Admit HDU/ICU**

No

Give **Hydrocortisone 200mg IV bolus**

Evidence of tissue hypo perfusion persists **despite adequate intravascular volume and adequate MAP?**
- ☐ Hyperlactatemia (> 2 mmol/L)
- ☐ Decreased capillary refill or mottling

Yes

- Give **Dobutamine infusion** up to **20 µg/kg/min**
  (+ vasopressor if in use) in the presence of;
  a) myocardial dysfunction as suggested by elevated cardiac filling pressures and low cardiac output, or
  b) ongoing signs of hypo perfusion, despite achieving adequate intravascular volume and adequate MAP
- **Admit HDU/ICU**

34. Antimicrobial Guide

This clinical pathway is intended to supplement, rather than substitute for, professional judgment and may be changed depending upon a patient's individual needs. Failure to comply with this pathway does not represent a breach of the standard of care.

For detailed guidelines and other conditions not listed below, refer to your hospital's guidelines for antimicrobial use

Condition	Comments/Caveats	Recommended Therapy
URTI/Sinusitis AVOID PRESCRIBING ANTIBIOTICS FOR UPPER RESPIRATORY TRACT INFECTIONS SINCE MOST ARE VIRAL.	The most common cause of URTIs is viral and thus **no antibiotics are necessary** A clinician should diagnose **Acute Bacterial Rhinosinusitis (ABRS)** when a) symptoms or signs of Acute Rhinosinusitis (ARS) (purulent nasal drainage accompanied by nasal obstruction, facial pain/pressure/fullness, or both) persist without evidence of **improvement for at least 10 days** beyond the onset of upper respiratory symptoms or b) symptoms or signs of ARS worsen within 10 days after initial improvement **(double worsening)**. **DO NOT ORDER A CT SCAN TO DIAGNOSE SINUSITIS**	**Amoxicillin/Clavulanate 1gm PO BD x 5-10 days** is the **first-line therapy** for most adults **who meet the criteria for ABRS** **In Penicillin-Allergic Patients:** Azithromycin 500mg PO OD x 3 days **Supportive therapy;** • **Decongestants (α-adrenergic) -** xylometazoline hydrochloride for **3 days**. • **Saline irrigation -** Nasal saline irrigation, alone or in conjunction with other adjunctive measures, may improve quality of life, decrease symptoms, and decrease medication use for ABRS, particularly in patients with frequent sinusitis. • **Mucolytics** • **Antihistamines** have **no role** in the symptomatic relief of ABRS in non-atopic patients.
Pharyngitis/Tonsillitis AVOID PRESCRIBING ANTIBIOTICS FOR UPPER RESPIRATORY TRACT INFECTIONS SINCE MOST ARE VIRAL.	The most predictable clinical parameter for GABHS pharyngitis is reported to be the **Centor Score** (available on **MDCalc**) a) Age < 15 years (+1) or ≥ 45 years (-1) b) History of fever > 38°C c) Absence of cough, d) Swollen and tender anterior cervical lymph nodes e) Tonsillar exudates or swelling	Adult patients with acute exudative adult pharyngitis who report **≥ 4 Centor Score ONLY** Benzathine penicillin G 1.2MU IM stat **OR** Amoxicillin/Clavulanate 1gm PO BD x 5-10 days Consider - **Single-dose Prednisone 60 mg PO** or **Dexamethasone 8 mg IM** therapy added to the standard treatment has a **more rapid improvement of pain** in adult patients with acute exudative adult pharyngitis who report **≥ 4 Centor Score** **Patients who are allergic to Penicillin** Azithromycin: 500 mg PO on day 1 followed by 250 mg PO OD for 4 days
Laryngitis	Mostly viral	**No Antibiotics necessary**
Acute Gastroenteritis AVOID PRESCRIBING ANTIBIOTICS FOR ACUTE GASTROENTERITIS **WITHOUT** SYSTEMIC DISEASE OR DYSENTERY	Any diarrhoeal illness lasting **> 1 day**, especially if accompanied by the following features should prompt evaluation of a faecal specimen; • bloody diarrhoea • moderate-severe disease (systemically ill/toxic appearing patients) • symptoms lasting >7 days • immunocompromised patients • recent use of antibiotics A **Stool Culture** is **NOT NECESSARY OR COST-EFFECTIVE** in most cases of diarrhoea without systemic disease or dysentery unless an unusual bacterial cause is suspected **Typhoid** - **Bone marrow culture** is the **most sensitive** routinely available diagnostic tool. Stool culture is positive only in up to 30-40% of cases but is often negative by the time that systemic symptoms bring patients to hospital. Blood cultures are positive in 40-80% of patients. Serologic tests e.g. the Widal test are of **limited clinical utility** because positive results may represent a previous infection.	**Food-borne toxigenic diarrhoea** usually requires only supportive treatment, **not antibiotics.** Treatment of salmonellosis with antibiotics (including quinolones) can prolong the carrier state and lead to a higher clinical relapse rate. **Treat ONLY** patients with; • bloody diarrhoea • moderate-severe disease (systemically ill/toxic appearing patients) • symptoms lasting >7 days • immunocompromised patients • recent use of antibiotics **Ciprofloxacin 500 mg PO BD x 3 days.** The duration of treatment may be extended by 2-3 days for moderate-to-severe cases. The antimotility agent **loperamide (Imodium)** may reduce the duration of diarrhoea when given with antibiotics for traveller's diarrhoea. A loperamide/simethicone combination has demonstrated faster and more complete relief. Loperamide may cause dangerous prolongation of illness in patients with some forms of bloody or inflammatory diarrhoea and, therefore**, should be restricted to patients with non-bloody stool.**

Condition	Comments/Caveats	Recommended Therapy
Urinary Tract Infection (UTI)	Cloudiness of the urine is most often due to protein or crystal presence, and malodorous urine may be due to diet or medication use. A urinalysis with quantitative urine **WBC counts should NOT be used alone to support a diagnosis of UTI or start antimicrobial therapy in any patient population.** A **negative Leukocyte Esterase AND a negative urine Nitrate** largely **rule out infection** in pregnant women, elderly patients, family medicine, and urology patients. The combination of a negative leukocyte esterase and negative nitrite test demonstrated a UTI **negative predictive value of 88% (95% confidence interval [CI] 84–92%).** Pyuria in a urine specimen, in the absence of symptoms (**Asymptomatic Bacteriuria**), is **NOT AN INDICATION** for antimicrobial therapy. **Urine cultures** are **NOT RECOMMENDED** in most cases of **Uncomplicated UTIs** - **Lower UTI in a healthy young non-pregnant adult woman.** **Urine Cultures ONLY for;** •In patients suspected of having **pyelonephritis**, a urine culture and susceptibility test should always be performed, and initial empiric therapy should be tailored appropriately based on the likely infecting uropathogen. •A urine specimen should be obtained for culture and susceptibility testing before initial antimicrobial therapy for **complicated UTIs.** **Complicated UTI** • Male gender • Structural or functional anatomic abnormalities • Renal stones • Indwelling catheters • Renal transplant • Neurogenic bladder • Recent urologic procedure **Inpatient therapy** • Sepsis • Pregnancy • Urinary tract obstruction • Persistent vomiting • Poor outpatient follow-up	**Uncomplicated Cystitis** Ciprofloxacin 500 mg PO BD x 3 days **OR** Nitrofurantoin 100mg TDS x 3 days **Uncomplicated Pyelonephritis, Outpatient Therapy** Ceftriaxone 1 g IV stat **PLUS** Ciprofloxacin 500 mg PO BD x 7 days **UTI during Pregnancy, Outpatient Therapy** Cefuroxime 500 mg PO BD for 7 days **OR** Nitrofurantoin 100mg TDS x 3 days **Complicated UTI** Ciprofloxacin 500 mg PO BD x 14 days **Uncomplicated Pyelonephritis, Inpatient Therapy** Ceftriaxone 1g IV OD 10-14 days **OR** Ciprofloxacin 400 mg IV BD x 10-14 days **UTI during Pregnancy, Inpatient Therapy** Ceftriaxone 1-2 g IV OD
Sepsis & Septic Shock	**See Sepsis & Septic Shock Algorithm**	**Give ANTIBIOTICS as an EMERGENCY (within the FIRST HOUR of recognition of Sepsis/Septic Shock)** • **Ceftriaxone 2gm IV stat** For probable **Neutropenic** patients or if patient has been **admitted in hospital** in the **last 3 months** (Hospital Acquired Infection) ▪ **Imipenem 500 mg** IV infusion over 3 hrs then QID for **General sepsis** **OR** ▪ **Meropenem 1 gm** IV infusion over 3 hrs then TDS for possible **CNS infections**

<table>
<tr><th>Condition</th><th>Comments/Caveats</th><th>Recommended Therapy</th></tr>
<tr>
<td>Community-Acquired Pneumonia</td>
<td>In addition to a constellation of suggestive clinical features, a demonstrable infiltrate by chest radiograph or other imaging technique, with or without supporting microbiological data, is required for the diagnosis of pneumonia.

The strongest indications for blood cultures are severe CAP and in immunocompromised patients or those with significant co morbidities, as these patients are more likely to be infected with pathogens other than S pneumoniae.

Co morbidities:
• Chronic heart, lung or renal disease
• Diabetes mellitus
• Alcoholism
• Malignancy
• Asplenia
• Immunosuppressant condition or drugs

Inpatient Therapy
• CURB65 ≥ 2 (available in MDCalc)
• Patient factors requiring hospitalization

HCAP risk factors?
• Hospitalization for 2 or more days of the past 90 days
• Resides in nursing home or long-term care facility
• Received chemotherapy, IV antibiotics, or wound care within the prior 30 days
• Attended a hospital or haemodialysis clinic in the last 30 days</td>
<td>Outpatient Treatment
Amoxicillin/Clavulanate 1gm PO BD x 7 - 10 days

In Penicillin-Allergic Patients:
Azithromycin: 500 mg PO on day 1 followed by 250 mg PO OD for 4 days

Inpatient Treatment
Amoxicillin/Clavulanate 1.2gm IV T x 7 - 10 days
PLUS
Azithromycin 500mg IV OD x 7 - 10 days

Healthcare Associated Pneumonia (HCAP)
Antipseudomonal beta-lactam
Imipenem 500mg IV infusion over 3 hours QID</td>
</tr>
<tr>
<td>Malaria</td>
<td colspan="2">
<table>
<tr><th>Defining Criteria for Severe Malaria</th><th>Finding</th></tr>
<tr><td>Impaired consciousness (cerebral malaria)</td><td>A Glasgow coma score < 11 in adults or a Blantyre coma score < 3 in children</td></tr>
<tr><td>Prostration</td><td>Generalized weakness so that the person is unable to sit, stand or walk without assistance</td></tr>
<tr><td>Multiple convulsions</td><td>> 2 episodes within 24 h</td></tr>
<tr><td>Acidosis</td><td>A base deficit of > 8 mEq/L or, if not available, a plasma bicarbonate level of < 15 mmol/L or venous plasma lactate ≥ 5 mmol/L. Severe acidosis manifests clinically as respiratory distress (rapid, deep, laboured breathing).</td></tr>
<tr><td>Hypoglycaemia</td><td>Blood or plasma glucose < 2.2 mmol/L (< 40 mg/dL)</td></tr>
<tr><td>Severe malarial anaemia</td><td>Haemoglobin concentration ≤ 5 g/dL or a haematocrit of ≤ 15% in children < 12 years of age (< 7 g/dL and < 20%, respectively, in adults) with a parasite count > 10 000/µL</td></tr>
<tr><td>Renal impairment</td><td>Plasma or serum creatinine > 265 µmol/L (3 mg/dL) or blood urea > 20 mmol/L</td></tr>
<tr><td>Jaundice</td><td>Plasma or serum bilirubin > 50 µmol/L (3 mg/dL) with a parasite count > 100 000/ µL</td></tr>
</table>
</td>
<td>Uncomplicated Malaria
Artemether + Lumefantrine - Coartem® 80/480 1 tablet at 0, 8, 24, 36, 48 and 60 hours (six doses).

<table>
<tr><th>Body weight (kg)</th><th>Dose (mg) of artemether + lumefantrine given twice daily for 3 days</th></tr>
<tr><td>5 to < 15</td><td>20 + 120</td></tr>
<tr><td>15 to < 25</td><td>40 + 240</td></tr>
<tr><td>25 to < 35</td><td>60 + 360</td></tr>
<tr><td>≥ 35</td><td>80 + 480</td></tr>
</table>

Severe Malaria
IV Artesunate 2.4mg/kg at 0, 12 and 24 hours and daily until patient can take oral. Children weighing < 20 kg should receive a higher dose of artesunate (3 mg/kg bw per dose) to ensure equivalent exposure to the drug.</td>
</tr>
</table>

<table>
<tr><th>Condition</th><th>Comments/Caveats</th><th>Recommended Therapy</th></tr>
<tr><td>Malaria cont…</td><td>
<table>
<tr><th>Defining Criteria for Severe Malaria</th><th>Finding</th></tr>
<tr><td>Pulmonary oedema</td><td>Radiologically confirmed or oxygen saturation < 92% on room air with a respiratory rate > 30/min, often with chest in-drawing and crepitations on auscultation</td></tr>
<tr><td>Significant bleeding</td><td>Including recurrent or prolonged bleeding from the nose, gums or venepuncture sites; haematemesis or melena</td></tr>
<tr><td>Shock</td><td>Compensated shock is defined as capillary refill ≥ 3 s or temperature gradient on the leg (mid to proximal limb), but no hypotension. Decompensated shock is defined as systolic blood pressure < 70 mm Hg in children or < 80 mm Hg in adults, with evidence of impaired perfusion (cool peripheries or prolonged capillary refill).</td></tr>
<tr><td>Hyperparasitemia</td><td>P. falciparum parasitaemia > 10%</td></tr>
</table>
</td><td>Uncomplicated Malaria
Artemether + Lumefantrine - Coartem® 80/480 1 tablet at 0, 8, 24, 36, 48 and 60 hours (six doses).
<table>
<tr><th>Body weight (kg)</th><th>Dose (mg) of artemether + lumefantrine given twice daily for 3 days</th></tr>
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Severe Malaria
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<tr><td>Community-Acquired Severe Intra-Abdominal Infection, Biliary, and Extra-Biliary Infections</td><td>Empiric coverage of Enterococcus is recommended</td><td>Piperacillin-Tazobactam 4.5gm IV QID</td></tr>
<tr><td>Cellulitis/ Abscesses/ Folliculitis/ Carbuncle/ Furuncle</td><td>Most abscesses are Staph aureus. Most cellulitis is Group A beta-haemolytic streptococcus (although some are Staph aureus)

Empiric therapy for Streptococcus pyogenes (beta-haemolytic streptococcus) is recommended

Clindamycin is bacteriostatic, potential for cross-resistance and emergence of resistance in erythromycin-resistant strains; inducible resistance in MRSA

Effective treatment of abscesses entails incision, thorough evacuation of the pus, and probing the cavity to break up ovulations. Gram stain, culture, and systemic antibiotics are rarely indicated unless there is extensive surrounding cellulitis, fever, multiple lesions, severely impaired host defences, or cutaneous gangrene.</td><td>Oral Therapy

Beta-haemolytic Streptococcus coverage:
Amoxicillin/Clavulanate 1gm PO BD x 7 days

OR

Clindamycin 450 mg PO QID x 7-10 days

Parenteral Therapy (Inpatient)

Beta-haemolytic Streptococcus and MSSA Coverage

Cefazolin 1gm IV q8 hours for 7-10 days

OR

Clindamycin 600 mg IV q8 hours for 7-10 days</td></tr>
<tr><td>Necrotizing skin & soft tissue infections</td><td>Surgical intervention is the major therapeutic modality in cases of necrotizing fasciitis.

Necrotizing fasciitis falls into two groups;
• The spontaneous extremity cellulitis is usually Group A Streptococcus and sometime Staph aureus.
• The second group includes head and neck, abdominal/groin and is frequently polymicrobial.</td><td>Consult a Surgeon</td></tr>
</table>

Condition	Comments/Caveats	Recommended Therapy
STI – Urethritis, Epididymitis, Orchitis, Proctitis, Cervicitis	**Minimum criteria** for clinical diagnosis of PID (**all 3 should be present**): a) Bilateral lower abdominal (uterine) tenderness (sometimes radiating to the legs) b) Cervical motion tenderness - Positive cervical motion tenderness is defined as increased discomfort from a normal pelvic examination, as stated by the patient. Of note, **cervical motion tenderness** is **neither sensitive nor specific for gynaecologic pathology**, is a **sign of nonspecific peritoneal inflammation**, c) Bilateral adnexal tenderness (with or without a palpable mass) One or more of the following additional criteria can be used to enhance the specificity of the minimum criteria and support a diagnosis of PID: • oral temperature >38.3° C; • abnormal cervical or vaginal mucopurulent discharge; • presence of abundant numbers of WBC on saline microscopy of vaginal fluid; and • laboratory documentation of cervical infection with N. gonorrhoea or C. trachomatis.	**STI – Urethritis, Epididymitis, Orchitis, Proctitis, Cervicitis** Ceftriaxone 500mg IM stat **PLUS** Azithromycin 1gm PO stat **PID** **Mild-Moderate disease** Ceftriaxone 500mg IM stat **PLUS** Doxycycline 100mg PO BD x 14 days **PLUS** Metronidazole 500mg PO BD x 14 days **Severe disease/In-patient therapy -** Suggested criteria: • surgical emergencies (e.g., appendicitis) cannot be excluded; • the patient is pregnant; • the patient does not respond clinically to oral antimicrobial therapy; • the patient is unable to follow or tolerate an outpatient oral regimen; • the patient has severe illness, nausea and vomiting, or high fever; or • the patient has a tubo-ovarian abscess. Ceftriaxone 1gm IV OD x 14days **PLUS** Doxycycline 100mg IV/PO BD x 14days **PLUS** Metronidazole 500mg PO BD x 14 days

<table>
<tr><th>Condition</th><th>Comments/Caveats</th><th>Recommended Therapy</th></tr>
<tr>
<td>HIV Post Exposure Prophylaxis (PEP)</td>
<td>

Exposed individual must be HIV negative at baseline
Exposure must have occurred within the past 72 hours
Exposure must be high-risk. Faeces, nasal secretions, saliva, sputum, sweat, tears, urine, and vomitus are not considered to be infectious unless they are visibly bloody.

Estimated per-unprotected act risk for acquisition of HIV by exposure route
<table>
<tr><th>Exposure route</th><th>% Risk</th></tr>
<tr><td>Blood transfusion</td><td>90%</td></tr>
<tr><td>Needle-sharing injection-drug use</td><td>0.67%</td></tr>
<tr><td>Receptive anal intercourse</td><td>0.5%</td></tr>
<tr><td>Percutaneous needle stick</td><td>0.3%</td></tr>
<tr><td>Receptive penile-vaginal intercourse</td><td>0.1%</td></tr>
<tr><td>Insertive anal intercourse</td><td>0.06%</td></tr>
<tr><td>Insertive penile-vaginal intercourse</td><td>0.1%</td></tr>
<tr><td>Receptive oral intercourse</td><td>0.01%</td></tr>
<tr><td>Insertive oral intercourse</td><td>0.005%</td></tr>
</table>
The overall rate of HIV transmission through percutaneous inoculation is reported to be 0.3% (95% confidence interval [CI] 0.2–0.5); the risk of acquiring an HIV infection is greater for percutaneous injuries that involve;

hollow-bore needles that have been in contact with an artery or vein,
when blood is visible on the device,
a deep needle stick, and
when the source patient has advanced HIV disease.

Splashes or infectious material to mucous membranes or broken skin may also transmit HIV infection (estimated risk per exposure, 0.09%; 95% CI 0.006–0.5). Exposure of intact skin to contaminated blood has not been identified as a risk for HIV transmission.

Counsel on risks and benefits of PEP and obtain verbal consent for testing (HIV, FHG, UEC, LFTs, HBV and HCV)
Voluntary HIV testing for source individuals
Offer PEP as soon as high-risk exposure is established and exposed individual tests HIV negative at baseline (if HIV testing not available, can provide 1-2 days of PEP to cover until HIV test performed)
Pregnancy testing
Cr (if TDF-containing regimen) and Hb (if AZT-containing regimen), however PEP should be offered even when lab tests are not available. Do not delay administration of PEP while waiting for lab results
Hepatitis B vaccination (if not previously immunized & not known HBV positive)

</td>
<td>
PEP should be initiated as soon as possible after exposure, but no later than after 72 hours.

Consult local guidelines for the recommended regimens
<table>
<tr><th>Regimen</th><th>Dose</th><th>Comments</th></tr>
<tr><td colspan="3">ADULTS (≥ 15 years or ≥ 35 kg body weight)</td></tr>
<tr><td>Tenofovir/Lamivudine /Dolutegravir
TDF/3TC/DTG
(300/300/50mg)</td><td>1 tablet OD</td><td>Atazanavir/Ritonavir (ATV/r)
(300/100mg)
is used instead of DTG in women and adolescent girls of childbearing potential</td></tr>
<tr><td colspan="3">CHILDREN (0-14 years or < 35 kg body weight)</td></tr>
<tr><td>Abacavir/Lamivudine
ABC/3TC

PLUS

Lopinavir/Ritonavir
LPV/r</td><td>Consult local guidelines for the weight-based dosages</td><td>For children who cannot tolerate LPV/r, RAL or DRV/r can be used instead</td></tr>
</table>
PEP should be continued for 28 days (dispense all 28 days of treatment at the first visit)

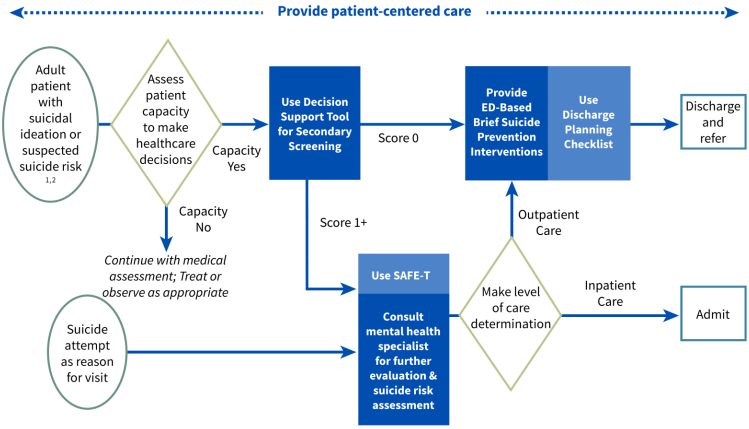
Follow up client at 7 days, 14 days, and 28 days after starting PEP
Follow up HIV antibody testing at 3 months, if negative, test again at 6 months after which annual testing applies
Assess for and manage side effects due to PEP
Follow up with gastroenterologist if positive HBV, HCV and/or abnormal LFTs

</td>
</tr>
</table>

35. Suicidal & Homicidal Evaluation

This clinical pathway is intended to supplement, rather than substitute for, professional judgment and may be changed depending upon a patient's individual needs. Failure to comply with this pathway does not represent a breach of the standard of care.

Process for Care and Discharge of Patients with Suicide Risk from EDs



[1] Identification of individuals at risk may occur as a result of (1) patient disclosure; (2) reports by family, friends, or other collaterals; (3) individual indicators such as depression, substance use or debilitating illness; or (4) primary screening.
[2] Consult your ED's policies to determine how medical clearance applies to this diagram.

Decision Support Tool for Secondary Screening

(A "yes" response is equal to 1)

	TRANSITION QUESTION: CONFIRM SUICIDAL IDEATION Have you had recent thoughts of killing yourself? Is there other evidence of suicidal thoughts, such as reports from family or friends? **(NOTE: Not part of scoring.)**	Y	
1	**THOUGHTS OF CARRYING OUT A PLAN** Recently, have you been thinking about how you might kill yourself? **If yes, consider the immediate safety needs of the patient.**	Y	N
2	**SUICIDE INTENT** Do you have any intention of killing yourself?	Y	N
3	**PAST SUICIDE ATTEMPT** Have you ever tried to kill yourself?	Y	N
4	**SIGNIFICANT MENTAL HEALTH CONDITION** Have you had treatment for mental health problems? Do you have a mental health issue that affects your ability to do things in life?	Y	N
5	**SUBSTANCE USE DISORDER** Have you had four or more (female) or five or more (male) drinks on one occasion in the past month or have you used drugs or medication for non-medical reasons in the past month? Has drinking or drug use been a problem for you?	Y	N
6	**IRRITABILITY/AGITATION/AGGRESSION** Recently, have you been feeling very anxious or agitated? Have you been having conflicts or getting into fights? Is there direct evidence of irritability, agitation, or aggression?	Y	N

Suicide Assessment Five-step Evaluation and Triage (SAFE-T)

Suicide assessments should be conducted at first contact, with any subsequent suicidal behaviour, increased ideation, or pertinent clinical change; for inpatients, prior to increasing privileges and at discharge.

1. **RISK FACTORS**

- **Suicidal behaviour:** history of prior suicide attempts, aborted suicide attempts, or self-injurious behaviour
- **Current/past psychiatric disorders:** especially mood disorders, psychotic disorders, alcohol/substance abuse, ADHD, TBI, PTSD, Cluster B personality disorders, conduct disorders (antisocial behaviour, aggression, impulsivity) Co-morbidity and recent onset of illness increase risk
- **Key symptoms:** anhedonia, impulsivity, hopelessness, anxiety/panic, global insomnia, command hallucinations
- **Family history:** of suicide, attempts, or Axis 1 psychiatric disorders requiring hospitalization
- **Precipitants/stressors/Interpersonal:** triggering events leading to humiliation, shame, or despair (e.g., loss of relationship, financial or health status—real or anticipated). Ongoing medical illness (esp. CNS disorders, pain). Intoxication. Family turmoil/chaos. History of physical or sexual abuse. Social isolation
- **Change in treatment:** discharge from psychiatric hospital, provider or treatment change
- **Access to firearms**

2. **PROTECTIVE FACTORS** *Protective factors, even if present, may not counteract significant acute risk*

- **Internal:** ability to cope with stress, religious beliefs, frustration tolerance
- **External:** responsibility to children or beloved pets, positive therapeutic relationships, social supports

3. **SUICIDE INQUIRY** *Specific questioning about thoughts, plans, behaviours, intent*

- **Ideation:** frequency, intensity, duration—in last 48 hours, past month, and worst ever
- **Plan:** timing, location, lethality, availability, preparatory acts
- **Behaviours:** past attempts, aborted attempts, rehearsals (tying noose, loading gun) vs. non-suicidal self-injurious actions
- **Intent:** extent to which the patient (1) expects to carry out the plan and (2) believes the plan/act to be lethal vs. self-injurious. Explore ambivalence: reasons to die vs. reasons to live

* For Youths: ask parent/guardian about evidence of suicidal thoughts, plans, or behaviours, and changes in mood, behaviours, or disposition

* Homicide Inquiry: when indicated, esp. in character disordered or paranoid males dealing with loss or humiliation. Inquire in four areas listed above

4. **RISK LEVEL/INTERVENTION**

- Assessment of risk level is based on clinical judgment, after completing steps 1–3
- Reassess as patient or environmental circumstances change

RISK LEVEL	RISK/PROTECTIVE FACTOR	SUICIDALITY	POSSIBLE INTERVENTIONS
High	Psychiatric diagnoses with severe symptoms or acute precipitating event; protective factors not relevant	Potentially lethal suicide attempt or persistent ideation with strong intent or suicide rehearsal	Admission generally indicated unless a significant change reduces risk. Suicide precautions
Moderate	Multiple risk factors, few protective factors	Suicidal ideation with plan, but no intent or behaviour	Admission may be necessary depending on risk factors. Develop crisis plan. Give emergency/crisis numbers
Low	Modifiable risk factors, strong protective factors	Thoughts of death, no plan, intent, or behaviour	Outpatient referral, symptom reduction. Give emergency/crisis numbers

(This chart is intended to represent a range of risk levels and interventions, not actual determinations.)

5. **DOCUMENT**

Risk level and rationale; treatment plan to address/reduce current risk (e.g., medication, setting, psychotherapy, E.C.T., contact with significant others, consultation); firearms instructions, if relevant; follow-up plan. For youths, treatment plan should include roles for parent/guardian.

Brief Suicide Prevention Interventions

For all patients with suicidal ideation who are being discharged:

1. Provide at least one of the following brief suicide prevention interventions prior to discharge.
2. Include crisis center/hotline information with every brief intervention provided.
3. Involve significant other(s) in the intervention if present.

- **Brief Patient Education:** Discuss the condition, risk and protective factors, type of treatment and treatment options, medication instructions, home care, lethal means restriction, follow-up recommendations, and signs of a worsening condition and how to respond. Provide verbal and written information on the nearest crisis hotline.
- **Safety Planning:** Work with the patient to develop a list of coping strategies and resources that he or she can use during or before suicidal crises. Use the Safety Planning resources (paper version or mobile app) provided in the full guide.
- **Lethal Means Counselling:** Assess whether the patient has access to firearms or other lethal means (e.g., prescription medications), and discuss ways to limit access until the patient is no longer feeling suicidal. Follow the Lethal Means Counselling Recommendations for Clinicians sheet available from Means Matter.
- **Rapid Referral:** During the ED visit, schedule an outpatient mental health appointment for the patient within seven days of discharge. If no appointments are available, review additional suggestions in the full guide and/or refer the patient for a follow-up with a primary care provider.
- **Caring Contacts:** Follow up with discharged patients via postcards, letters, e-mail or text messages, or phone calls. These communications can be automated.

Discharge Planning Checklist

Involve the patient in the decision-making process. Shared decision-making lowers patient stress, gives patients a sense of control, and leads to better outcomes. Patients with suicide risk report higher satisfaction when they are involved in decisions about their care.

- Patient involved in planning
- Follow-up appointment scheduled for a date within one week of discharge
- Discharge plan reviewed verbally and understood by patient
- Barriers and solutions discussed
- Crisis center phone number provided
- Access to lethal means reviewed and discussed
- Written instructions and education materials provided, **including what to do if the patient's condition worsens and when to return to the ED**
- Patient confirms his or her understanding of the patient care plan
- Relevant health information transmitted to referral providers
- Patient senses the provider's care and concern

36. Management of the severely agitated or violent patient

This clinical pathway is intended to supplement, rather than substitute for, professional judgment and may be changed depending upon a patient's individual needs. Failure to comply with this pathway does not represent a breach of the standard of care.

- **Ensure staff safety**
- **Attempt to calm patient using verbal techniques**
- **Place physical restraints if necessary**
- Monitor, support ABCs.
- Establish IV/O_2 monitor if possible. Check vital signs (BP, PR, RR, SPO_2, T°C, RBS) if possible.

→ **Call for security or police for any concern about violence or potential violence**

Is rapid sedation needed?

No → Establish IV/O_2 monitor if not already in place. Check vital signs (BP, PR, RR, SPO_2, T°C, RBS)

Yes → **Chemical restraint**

Severely violent patient	Intoxication with CNS stimulant or undifferentiated patient	Intoxication with CNS depressant (e.g. ethanol)	Known psychotic/psychiatric disorder	Cooperative patient
Ketamine 2mg/kg- 5mg/kg IM **OR** Midazolam 5mg to 10mg IV/IM **PLUS** Haloperidol 5mg to 10mg IV/IM	Midazolam 5mg to 10mg IV/IM **OR** Midazolam 5mg IV/IM **PLUS** Haloperidol 5mg IV/IM	Haloperidol 5mg to 10mg IV/IM	Haloperidol 5mg to 10mg IV/IM **OR** Haloperidol 5mg to 10mg IV/IM **PLUS** Midazolam 5mg to 10mg IV/IM	Midazolam 5mg to 10mg PO

In **elderly and critically ill patients**, reduce the dose of any antipsychotic by half

Sedation achieved?

Yes → Establish IV/O_2 monitor if not already in place. Check vital signs (BP, PR, RR, SPO_2, T°C, RBS)

No → Titrate chemical restraints to desired effect.

→ Establish IV/O_2 monitor if not already in place. Check vital signs (BP, PR, RR, SPO_2, T°C, RBS)

Assess for medical causes of agitation

- Hypoglycaemia
- Hypoxia
- Drug overdose
- Poisoning
- Infection
- Intracranial lesion
- Others

SEDATION ASSESSMENT TOOL (SAT)

SAT	Responsiveness	Speech
3	combative, violent, out of control	continual loud outbursts
+2	very anxious & agitated	loud outbursts
+1	anxious or restless	normal, talkative
0	awake & calm, cooperative	normal
-1	asleep, rouses to voice	slurring or marked slowing
-2	responds to physical stimulation	few recognisable words
-3	no response to stimulation	nil

GENERAL PRINCIPLES

Select one sedative (benzo) and one antipsychotic agent and titrate these to a targeted SAT
Avoid switching agents/classes as unpredictable
Use longer acting agents where possible, to avoid the roller coaster effect of agitation/over-sedation

If using RAPID TAKEDOWN agents, be prepared to MANAGE THE AIRWAY inc. RSI & CICO

Assessment should occur in a designated safe area of hospital (available exits & duress alarms)
Assess situation and patient including airway, anaesthesia and risk to self and others

Administer medications with patient supine, one staff member to each limb and one to give drugs
AVOID PRONE RESTRAINT

37. Epigastric Pain Algorithm

This clinical pathway is intended to supplement, rather than substitute for, professional judgment and may be changed depending upon a patient's individual needs. Failure to comply with this pathway does not represent a breach of the standard of care.

Adult with Epigastric Pain
- Monitor and support ABCs
- **Provide immediate analgesia – Antacid Gel + See Analgesia Chart**

- Check vital signs (BP, PR, RR, SPO_2, T°C, **RBS**)
- Start Oxygen **IF** SPO_2 < 94%. Maintain SPO_2 ≥ 94%
- Obtain/review **12-lead ECG** if **> 40 years old, diabetic or hypertensive**

Perform a focused history and physical examination, evaluating;
- Duration of symptoms
- Risk factors for potentially serious conditions – **ACS, Pancreatitis, DKA, Cholecystitis, Perforate Ulcer, Pre-eclampsia/Eclampsia, HELLP**

- Send blood samples for **FBC, UEC, Lipase.**
- Additional testing as indicated;
  - **hsTroponin - ? ACS (elderly (>50yrs), diabetics, hypertensives)**
  - **LFTs - ? Cholecystitis, Pre-eclampsia/Eclampsia, HELLP**
  - **Erect CXR - ? Perforated ulcer, Pancreatitis, Pneumonia**
  - **VBG – Hyperglycaemic patients, Pancreatitis**
  - **PDT - ? Ectopic pregnancy**

Other Causes of Epigastric Pain
Treat accordingly

Probable Dyspepsia
- Stool H. Pylori Antigen Test (**see indications**)
- **Antacid Gel PRN + PPI IV**

Indications for Stool H. pylori Antigen testing
1. Active peptic ulcer disease (PUD),
2. History of PUD (unless previous cure of H. pylori infection has been documented),
3. Low-grade gastric mucosa-associated lymphoid tissue (MALT) lymphoma,
4. History of endoscopic resection of early gastric cancer (EGC)
5. Patient with un-investigated dyspepsia under the age of 60 years and without alarm features
6. Patients taking long-term, low-dose aspirin
7. Patients with unexplained iron deficiency anaemia despite an appropriate evaluation
8. Adults with idiopathic thrombocytopenic purpura (ITP)

H. Pylori Positive

Symptomatic Treatment
- Antacid Gel 20-60mins after meals and at bedtime or PRN (for symptom control)
- Paracetamol (**stop ALL NSAID use**)
- Dietary advice

PLUS

Eradication Therapy

Drug	Dosing	Duration
PPI	Standard dose BD*	14 days
Clarithromycin	500 mg BD	
Amoxicillin	1000 mg BD	
Metronidazole	400 mg BD	

*Standard doses are esomeprazole 20 mg, lansoprazole 30 mg, omeprazole 20 mg, pantoprazole 40 mg, and rabeprazole 20 mg

Consider OGD (see indications below)

H. Pylori Negative

Symptomatic Treatment
- Antacid Gel 20-60mins after meals and at bedtime or PRN (for symptom control)
- Paracetamol (**stop ALL NSAID use**)
- Dietary advice

PLUS

Acid Suppression Therapy
- PPI standard dose x 4 weeks

Consider OGD (see indications below)

Indications for Oesophagogastroduodenoscopy (OGD)
- age ≥ **60 years**
- bleeding
- anaemia
- early satiety
- unexplained weight loss (>10% body weight)
- progressive dysphagia
- odynophagia
- persistent vomiting
- a family history of gastrointestinal cancer
- previous oesophagogastric malignancy
- previous documented peptic ulcer
- lymphadenopathy
- an abdominal mass

38. Upper Gastrointestinal Bleeding Algorithm

This clinical pathway is intended to supplement, rather than substitute for, professional judgment and may be changed depending upon a patient's individual needs. Failure to comply with this pathway does not represent a breach of the standard of care.

Upper Gastrointestinal Bleeding can vary in presentation, but most cases present in one or more of four ways as follows:

a) Melena (69%**):** the passage of dark and pitchy stools stained with blood pigments or with altered blood. Melena is caused by the passage of at least **50 mL** of blood in the upper GI tract. Bacteria degrade the blood into haematin or other haemachromes. Melena should **not** be confused with the dark stools that result from ingestion of **iron** or **bismuth**.

b) Haematemesis (30%**):** the vomiting of bright red blood and indicates an upper GI site of bleeding, usually above the ligament of Treitz.

c) Coffee-ground emesis (28%): emesis consisting of dark, altered blood mixed with stomach contents

d) Haematochezia (15%**):** the passage of bloody faeces

SHOCKED (HYPOTENSIVE)

- Monitor, support ABCs in **ER**; Intubate patient if airway is at risk from massive haematemesis
- Check vital signs (BP, PR, RR, SPO_2, T° C, **RBS**)
- Start Oxygen **IF** SPO_2 < 94%. Maintain SPO_2 ≥ 94%
- Establish **2 large bore IV accesses (14-16G).**
- Give rapid fluid boluses at **20mL/Kg** Ringer's Lactate/Hartmann's soln; repeat if necessary.
- Start blood transfusions **ONLY** if **Hb < 7 g/dL**
- Send samples for **FBC, UEC, LFTs, VBG, Coagulation screen. Crossmatch 6 units of packed cell**s.
- Perform brief, targeted history, physical exam including a rectal exam
- Insert NGT **ONLY** if intubated or has recurrent vomiting uncontrolled by anti-emetics

NOT SHOCKED

- Monitor, support ABCs in **ER**; Intubate patient if airway is at risk from massive haematemesis
- Check vital signs (BP, PR, RR, SPO_2, T° C, **RBS**)
- Start Oxygen **IF** SPO_2 < 94%. Maintain SPO_2 ≥ 94%
- Establish a large bore IV access (14-16G).
- Start IV Fluids TKVO – Ringer's Lactate (RL)/Hartmann's soln. Start blood transfusions **ONLY** if **Hb < 7 g/dL**
- Send samples for **FBC, UEC, LFTs, VBG, Coagulation screen, Blood type & screen.**
- Perform brief, targeted history, physical exam including a rectal exam

- **IV omeprazole (80-mg bolus followed by 8 mg/h for 72 h).** Use **pantoprazole** if patient is on Clopidogrel.
- Monitor vital signs every **15 min** until stable, then **hourly.**
- Correct hypotension with repeat fluid boluses/blood transfusion
- Monitor urine output - Aim for **> 0.5mL/Kg/h**

- Consult **Gastroenterologist**
- **Admit HDU/ICU**

39. Poisoning

This clinical pathway is intended to supplement, rather than substitute for, professional judgment and may be changed depending upon a patient's individual needs. Failure to comply with this pathway does not represent a breach of the standard of care.

Decontamination

Activated Charcoal

Indications	Contraindications/Not helpful/Caution	Dosing
Use **ONLY** within **ONE HOUR** of ingestion of a potentially toxic amount of medication. It is **NOT effective** beyond this period unless in multi-dose indications. **Multiple-dose** (**30gm** in 400mls **4-6hrly**) activated charcoal should only be considered if a patient has ingested a life-threatening amount of; **Theophylline, Phenobarbital, Dapsone Carbamazepine, or Quinine.** (Mnemonic - **T**hese **P**eople **D**rink **C**harcoal **Q**uickly)	**P**–**P**esticides, **P**etroleum distillate, un**P**rotected airway; **H**–**H**ydrocarbons, **H**eavy metals, > 1 **H**our; **A**–**A**cids, **A**lkali, **A**lcohols, **A**ltered level of consciousness, **A**spiration risk; **I**–**I**ron, **I**leus, **I**ntestinal obstruction; **L**–**L**ithium, **L**ack of gag reflex; **S**–**S**olvents, **S**eizures. (Mnemonic - **PHAILS**)	The optimal dose of charcoal is unknown. However, the adult dose ranges from 50 to 100 g per dose. Lower doses of **0.5-1gm/kg** is used in children. When drug-induced vomiting is anticipated (for example, with a theophylline overdose), an **IV antiemetic is recommended.** Cathartics such as sorbitol are sometimes added to activated charcoal preparations, but there is **no evidence of any additional clinical benefit**.

DO NOT PERFORM GASTRIC LAVAGE

Clinical studies have failed to show that gastric lavage improves the severity of illness, recovery times, or the ultimate medical outcomes and may be associated with life-threatening complications (aspiration pneumonitis, oesophageal or gastric perforation, fluid and electrolyte imbalances, arrhythmia).

Antidotes

Antidote	Indications	Dose	Comments
N-acetylcysteine (NAC)	If it is likely that the patient has ingested **> 150 mg/kg (or >10 g)** of paracetamol In contrast, NAC is **not recommended** for patients with; an **unknown ingestion time,** • a paracetamol concentration below detectable limits along with normal AST levels.	**150 mg/Kg IV** over **1 hr** then **50mg/Kg** over the next **4 hrs** then **100mg/Kg** over the next **16hrs** IV NAC should be infused as a 3% solution (30 g of NAC in D5W to a total volume of 1 L	Anaphylactoid reaction if given too fast
Atropine	Organophosphate/Carbamate poisoning causing rhinorrhoea, lacrimation, dyspnoea, vomiting, fasciculations, weakness, inability to ambulate, convulsions, respiratory insufficiency, coma. Miosis alone is **not** an indication for atropine administration.	**2mg IV** R2tr0fSR **every 5 minutes** until the therapeutic endpoint is reached i.e. until pulmonary secretions are dried [reflected by improved oxygenation] and ease of breathing [or ease of ventilation].	Excessive doses of atropine can result in delirium, agitation, and tachycardia and hypertension. Tachycardia is **not** a contraindication to atropine administration.
Ethanol	Ethylene Glycol or Methanol poisoning	**PO:** **Loading dose:** 0.8g/kg in a 20% ethanol solution diluted in juice. **Maintenance dose:** 80mg/kg/h; increase to maintain a serum ethanol concentration of 100- 150mg/dL. **IV:** **Loading dose:** 0.6 - 0.8 g/kg in a 10% ethanol solution in D5W (volume/volume). **Maintenance dose:** 80 to 130 mg/kg/h	Higher maintenance doses are used in patients with chronic alcoholism or during haemodialysis.
Flumazenil	Excessive sedation known to be due to the use of benzodiazepines in a patient without known contraindications (e.g., procedural sedation).	**10µ/kg IV over 15 seconds**. Repeat **every 2-3mins** to a maximum of **1mg** (usual range 0.3 to 0.6mg). * Fomepizole dosing available in MDCalc	The administration of flumazenil to patients with undifferentiated coma can precipitate seizures in benzodiazepine-dependent patients and has been associated with seizures, arrhythmia, and hypotension in patients with co-ingestion of certain medications, such as tricyclic antidepressants.
Naloxone	Respiratory depression secondary to an opioid overdose	Dilute one ampoule (0.4mg/ml) into 10ml (0.04mg/ml) and give 1 ml every 1 to 2 minutes. A therapeutic effect is usually seen after 3 to 4 ml	Rapid injection may result in an acute withdrawal syndrome, with severe sympathetic effects such as hypertension, tachycardia and pulmonary oedema - can precipitate a myocardial infarction in patients at risk of IHD.

40. Organophosphate Poisoning Algorithm

This clinical pathway is intended to supplement, rather than substitute for, professional judgment and may be changed depending upon a patient's individual needs. Failure to comply with this pathway does not represent a breach of the standard of care.

DECONTAMINATION AND PERSONAL PROTECTION

- **WEAR PERSONAL PROTECTIVE EQUIPMENT (Gloves, Gowns and Masks)**
- **REMOVE ALL CLOTHING from and gently cleanse the patient with soap and water**. Consider clothing and PPEs as hazardous waste and discard accordingly

The action of acetylcholine released into a synaptic cleft or neuromuscular junction is normally terminated when the enzyme acetylcholinesterase cleaves acetylcholine into choline and acetic acid. Organophosphates bind to the active site of the cholinesterase enzymes causing an increase in the acetylcholine concentration and a marked hyper stimulation of the cholinergic system, which is responsible for the predominant signs of toxicity.

Muscarinic Manifestations

Ophthalmic: *Conjunctival injection,* ***lacrimation, miosis,*** *blurred vision, diminished visual acuity, ocular pain*
Respiratory: *Rhinorrhoea, stridor, wheezing, cough,* ***excessive sputum, chest tightness,*** *dyspnoea, apnoea*
Cardiovascular: ***Bradydysrhythmias,*** *hypotension*
Dermal: *Flushing, diaphoresis, cyanosis*
Gastrointestinal: *Nausea,* ***vomiting, salivation, diarrhoea,*** *abdominal cramping, tenesmus, faecal incontinence*
Genitourinary: ***Frequency,*** *urgency, incontinence*

Nicotinic Manifestations

Cardiovascular: *Tachydysrhytmias, hypertension*
Striated muscle: *Fasciculations, twitching, cramping, weakness, paralysis*

Central Nervous System

Anxiety, restlessness, depression, confusion, ataxia, tremors, convulsions, coma, areflexia, respiratory depression

***Parasympathetic nervous system manifestations (DUMB[3]ELS – Diarrhoea, Urination, Miosis, (Bradycardia, Bronchoconstriction, Bronchorrhea) Emesis, Lacrimation, Salivation)**

- Monitor, support ABCs - The great majority of deaths due to nerve agents occur secondary to respiratory failure. This is due to bronchospasm, bronchorrhoea, paralysis of the muscles of respiration, and central apnoea. **Consider inserting an advanced airway or nursing in recovery position for airway protection. DO NOT USE SUCCINYLCHOLINE FOR RSI.**
- Check vital signs (BP, PR, RR, SPO_2, T°C, **RBS**). Start Oxygen **IF** SPO_2 < 94%. **If abnormal vital signs, START ATROPINE! (see indications below).**
- Send samples for **FBC, UEC, LFTs, VBG, toxicology.** Correct any electrolyte imbalances (**see 32: Electrolyte Abnormalities Algorithm**)
- Perform brief, targeted history, physical exam
- **DO NOT PERFORM GASTRIC LAVAGE.**
- **DO NOT GIVE ACTIVATED CHARCOAL** unless the patient has co-ingested other poisons (**see 39. Poisoning** for indications and contraindications for activated charcoal)

GIVE IV ATROPINE

(2 mg IV for adults or **0.02 mg/kg IV for children Ř2ăötŠŘ every 5 minutes)**

Indications for Atropine treatment (Miosis alone is **NOT** an indication for atropine administration)

Symptoms	Severity
Rhinorrhoea, lacrimation, or mild dyspnoea	Mild
Inability to ambulate, dyspnoea, vomiting, fasciculations, weakness	Moderate
Convulsions†, coma, respiratory insufficiency	Severe

* **Tachycardia** can occur in organophosphate poisoning due to stimulation of the sympathetic ganglia as well as respiratory distress and hypoxia. Tachycardia is **NOT** a contraindication to atropine administration.

Atropine doses should be **doubled every 5 minutes** until the therapeutic endpoint (**Atropinisation**) is reached i.e. **until pulmonary secretions are dried** [reflected by improved oxygenation] and ease of breathing [or ease of ventilation]), a **pulse rate > 80 beats per minute** and **systolic blood pressure > 80mmHg**.
Start atropine **infusion when atropinisation achieved – 0.05mg/kg/hour**. E.g. for a 70kg patient give 3.5 mg of atropine per hour as an infusion. Put 10mg of atropine in 200mLs of fluid run at 40 – 80mLs per hour (2-4mg/hr) depending on response.
Precautions - Excessive doses of atropine can result in deleterious effects including **delirium, agitation, and tachycardia and hypertension**. Atropine will likely **NOT improve miosis** or **skeletal muscle paralysis** (nicotinic receptors)**;** therefore, reversal of these effects is **not a therapeutic endpoint.** Attempting to reverse these findings with atropine can result in administration of excessive doses of atropine.

†Seizure control

(Midazolam 0.1mg/kg or Diazepam 0.1mg/kg)

Benzodiazepines are needed to prevent or treat nerve agent–induced seizures in **moderate to severe toxicity** because anticholinergic treatment is increasingly less effective from 5 – 40 minutes post exposure. Phenytoin does **NOT** affect GABA-A and has been found to be **ineffective** in controlling organophosphate –induced seizures. Benzodiazepines should be infused rapidly to unresponsive patients who have been exposed to organophosphates, because such patients may have non-convulsive seizures due to the onset of paralysis.

Pralidoxime (2-PAM)

WHO recommendation is **> 30-mg/kg IV/IM bolus** followed by **> 8-mg/kg/hour IV infusion**
(**Adults:** 2 g IM or slow IV infusion over 15 to 30 minutes followed by a 500-mg/hour infusion)

Neither atropine nor benzodiazepines will alleviate symptoms affecting the **nicotinic system** (CNS, NMJ, autonomic ganglia). 2-PAM should be given to any patient exposed to an organophosphate nerve agent who is showing any **systemic toxicity** especially **fasciculations** or **weakness**. The initial dose should be given as quickly as possible. **Caution:** Delivering 2-PAM more rapidly than recommended can result in **hypertension.** This is usually self-limited, but in extreme cases, phentolamine 5 mg IV may be effective. **Laryngospasm and rigidity** can also occur with rapid IV administration.

Disposition

- **Consult a Physician**
- **Continue atropine infusion until** the therapeutic endpoint (**Atropinisation**) is reached i.e. **until pulmonary secretions are dried** [reflected by improved oxygenation] and ease of breathing [or ease of ventilation]).
- **Admit ALL symptomatic patients. Severe poising should be admitted to an ICU**

41. Alcohol (Methanol) Poisoning Algorithm

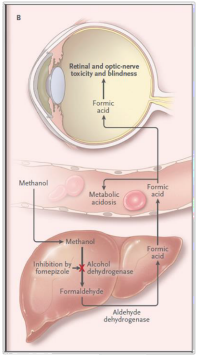
This clinical pathway is intended to supplement, rather than substitute for, professional judgment and may be changed depending upon a patient's individual needs. Failure to comply with this pathway does not represent a breach of the standard of care.

Suspected Methanol Poisoning

Methanol toxicity commonly affects the **neurological, ophthalmological**, and **gastrointestinal** systems

a) Within the **first 24 hours**, **central nervous system (CNS)** depression, euphoria, and inebriation occur.
b) This is followed by a **latent period (**between **6 and 30 hours)** during which methanol is **metabolize to formic acid,** which ultimately leads to systemic effects.
c) **Ophthalmologic symptoms** can range from blurry vision, decreased visual acuity, and photophobia to blindness or the classic "snowstorm" vision. A complaint of **blurred vision with a relatively clear sensorium** should strongly suggest the diagnosis of methanol poisoning. Initially, visual fields are not affected, and patients may have a central scotoma (blind spot). If unrecognized and not appropriately treated, these changes will result in;
   - permanent blindness,
   - absent papillary response, and
   - permanent optic nerve atrophy.
d) Methanol toxicity causes **gastrointestinal symptoms** such as abdominal pain with or without evidence of pancreatitis and/or hepatotoxicity.

In severe cases, the odour of formaldehyde may be present on the **breath** or in the **urine**. Untreated methanol poisoning is associated with a **rate of death** of **28%** and a rate of **visual deficits or blindness** of **30%** in survivors.



- Monitor, support ABCs; **Consider Advanced Airway or nursing in recovery position for airway protection**
- Check vital signs (BP, PR, RR, SPO_2, T°C, **RBS**).
  - Start Oxygen **IF** SPO_2 < 94%. Maintain SPO_2 ≥ 94%
  - If **Hypoglycaemic** (RBS < 3.3 mmol/L), give **50mls 50% dextrose IV** (**see 29. Hypoglycaemia Algorithm**). Also, give **100mg Thiamine IV** followed by 100mg PO BD for 6 weeks.
- Send samples for **FBC, UEC, LFTs, Lipase, VBG, toxicology**. Correct any electrolyte imbalances (**see 32: Electrolyte Abnormalities Algorithm**)
- **Start IV Fluids** – If hypotensive give repeated **NS/RL boluses at 20ml/kg** until perfusion is restored (MAP > 65) and dehydration is corrected. More rapid administration and large amounts of fluid may be needed in some patients. When stable, start **5% dextrose saline** infusion at **3L/24 hrs**
- Perform brief, targeted history, physical exam
- **DO NOT PERFORM GASTRIC LAVAGE.** If the patient's airway is protected, anecdotal evidence supports the use of gastric **aspiration** if large amounts of alcohol have been ingested and the patient can be treated very quickly (within an hour) after the ingestion.
- **DO NOT GIVE ACTIVATED CHARCOAL** unless the patient has co-ingested other poisons (**see 39. Poisoning** for indications and contraindications for activated charcoal)

Give Ethanol (also see 39. Poisoning)

Based on in vitro studies, ethanol's affinity for alcohol dehydrogenase is more than that of methanol by 15-fold and thus competes for the enzyme preventing methanol from being metabolized to the toxic metabolite, formic acid.

Oral Dose:

Vodka, Gin, Whisky, Rum, Tequila (should be **at least 35% ethanol** content)

Loading dose: 1.8mL/Kg diluted in juice.

Maintenance dose: 0.4mL/Kg/hr

Ethanol

Loading dose: 0.8g/Kg in a 20% ethanol solution diluted in juice.

Maintenance dose: 80mg/Kg/hr; increase to maintain a serum ethanol concentration of 100- 150mg/dL.

IV Dose:

Loading dose: 0.6 - 0.8 g/Kg in a 10% ethanol solution in D5W (volume/volume).

Maintenance dose: 80 to 130 mg/Kg/hr

Higher maintenance doses are used in patients with chronic alcoholism or during haemodialysis.

Side effects of ethanol treatment include; hypoglycaemia, CNS depression, intoxication, thrombophlebitis, and hypotension.

- **Consult a Physician**
- Monitor, support **ABCs, Vital signs** (BP, PR, RR, SPO_2, T°C, **RBS**), **UEC and VBG**.
- **Consider haemodialysis** for large methanol ingestions, severe metabolic acidosis (pH < 7.25-7.30), vision abnormalities, renal failure, electrolyte abnormalities not responsive to conventional treatment, haemodynamic instability refractory to intensive care treatment and serum concentration > 50mg/dL
- **Transfer to ICU**

42. Pain Management Algorithm

This clinical pathway is intended to supplement, rather than substitute for, professional judgment and may be changed depending upon a patient's individual needs. Failure to comply with this pathway does not represent a breach of the standard of care.

ACUTE SOMATIC PAIN

EVALUATE: Focused history, detailed pain assessment
Assign SEVERITY SCORE (1-10)

MILD PAIN (1-3/10)

PO Paracetamol or NSAID
+
Adjuvant interventions (Non-Pharmacologic)

Investigate and treat the cause of pain.

NSAIDS are the recommended 1st line therapy for **Sickle Cell Pain Crisis, Renal Calculi** and **Acute Gout.**

Metoclopramide is the recommended 1st line therapy for **Acute Migraine Headaches**

MODERATE PAIN (4-6/10)

As for mild Pain
+
Weak opioids
e.g. PO tramadol, codeine, hydrocodeine

SEVERE PAIN (7-10/10)

As for mild Pain
+
Strong opioids
e.g. morphine, fentanyl
±
non-opioid analgesics

- **See Analgesia Chart**
- **Reassess pain within 15 minutes** to ensure relief, monitor patient appropriately, and document
- Repeat analgesic, titrate to a higher dose, initiate a more potent analgesic or combine analgesics with different mechanisms of action as is appropriate to relieve pain
- Treat the cause of pain as OP/IP, and consult/refer appropriately
- Beware of contraindications, allergies, toxicity, interactions with other meds etc. **Pethidine** (meperidine) has an active metabolite (nor-meperidine) that causes neuro excitation (apprehension, tremors, delirium, and seizures) and may interact with antidepressants (contraindicated with MOI and best avoided with SSRIs), so it is **NOT RECOMMENDED** for repetitive use. It is also highly addictive.
- Use the PO, SC or IV route, except when that is not possible
- Adjuvant interventions include **IMMOBILIZATION, SPLINTAGE, POSITIONING, ELEVATION, ICE** etc.

REGIONAL ANAESTHESIA

Indications

- Acute pain management for wounds, fractures and dislocations
- Alternative to procedural sedation
- Alternative to narcotics in certain patient populations (e.g. head injured patient, patients with concomitant mental status change, patients given buprenorphine)

Contraindications

- Allergy to local anaesthetic agents
- Active infection at the site of injection
- Injuries at risk of compartment syndrome
- Uncooperative patient
- Pre-existent neurologic deficit
- Anticoagulation (relative)

Technique – www.nysora.com

Watch video on our YouTube Channel

Types

- Wrist (Ulnar, Median and Radial nerve) block for the hand
- Digital nerve blocks for fingers and toes
- Femoral nerve block for the anterior thigh, femur, knee and skin anaesthesia over the medial aspect of the leg below the knee
- Facial and dental nerve blocks
- Ankle blocks for the foot
- Haematoma blocks

Anaesthetic - Lidocaine

- Dose – 3mg/kg
- Onset of action - < 2 mins
- Duration – 60 mins

43. Low Back Pain Algorithm

This clinical pathway is intended to supplement, rather than substitute for, professional judgment and may be changed depending upon a patient's individual needs. Failure to comply with this pathway does not represent a breach of the standard of care.

Adult with Low Back Pain (LBP)
- Monitor and support ABCs
- **Provide immediate analgesia – see Analgesia Chart**

Perform a focused history and physical examination, evaluating;
- Duration of symptoms
- Risk factors for potentially serious conditions (tumour, infection, cauda equina syndrome, ankylosing spondylitis or vertebral compression fracture).
- Symptoms suggesting radiculopathy or spinal stenosis
- Presence and level of neurologic involvement - All patients should be evaluated for the presence of rapidly progressive or severe neurologic deficits, including motor deficits at more than 1 level, faecal incontinence, and bladder dysfunction.
- Psychosocial risk factors

RED FLAGS FOR LOW BACK PAIN (TUNAFISH)
- **T**rauma
- **U**nexplained weight loss
- **N**eurologic symptoms
- **A**ge > 50 years
- **F**ever
- **I**ntravenous drug use
- **S**teroid use
- **H**istory of cancer

Any potentially serious conditions (RED FLAGS) strongly suspected?

The possibility of low back pain due to problems outside the back, such as **Ectopic pregnancy**, **Pancreatitis, Nephrolithiasis, or Aortic Aneurysm, or Systemic illnesses,** such as endocarditis or viral syndromes, should be considered.

No / **Yes**

Perform diagnostic studies to identify cause
(see Diagnostic Work-up for Low Back pain)
DO NOT *routinely obtain imaging or other diagnostic tests in patients with nonspecific low back pain.* Early, routine imaging and other tests usually cannot identify a precise cause, do not improve patient outcomes, and incur additional expenses.

Specific cause identified — **Yes** → **Consult appropriately**

No

Back pain is mild with no substantial functional impairment Inform all patients of the generally favourable prognosis of acute low back pain with or without sciatica, including a high likelihood for substantial improvement in the first month

Yes →
- **Advice about self-care;**
  - Advice to remain active
  - Application of superficial heat
- **Review indications for reassessment**
  - Risk factors for potentially serious conditions as above
- **Discharge with Analgesia and for Physiotherapy. Reassess in 4 weeks in Orthopaedic Clinic if necessary**

No
- **Advice about self-care;**
  - Advice to remain active
  - Application of superficial heat
- **Discuss non-invasive treatment options;**
  - **Pharmacologic;**
    - 1st line – NSAIDs
    - 2nd line – Tramadol – for severe, disabling pain that is not controlled (or is unlikely to be controlled) with acetaminophen and NSAIDs.
  - **Non-pharmacologic – Physiotherapy**

Arrive at shared decision regarding therapy trial
Educate patient

Patient accepts risks and benefits of therapy — **No** → **Refer to Orthopaedic Clinic**

Yes

Continue self-care and non-invasive options (analgesia and physiotherapy)
Discharge and reassess in 4 weeks in Orthopaedic Clinic if necessary

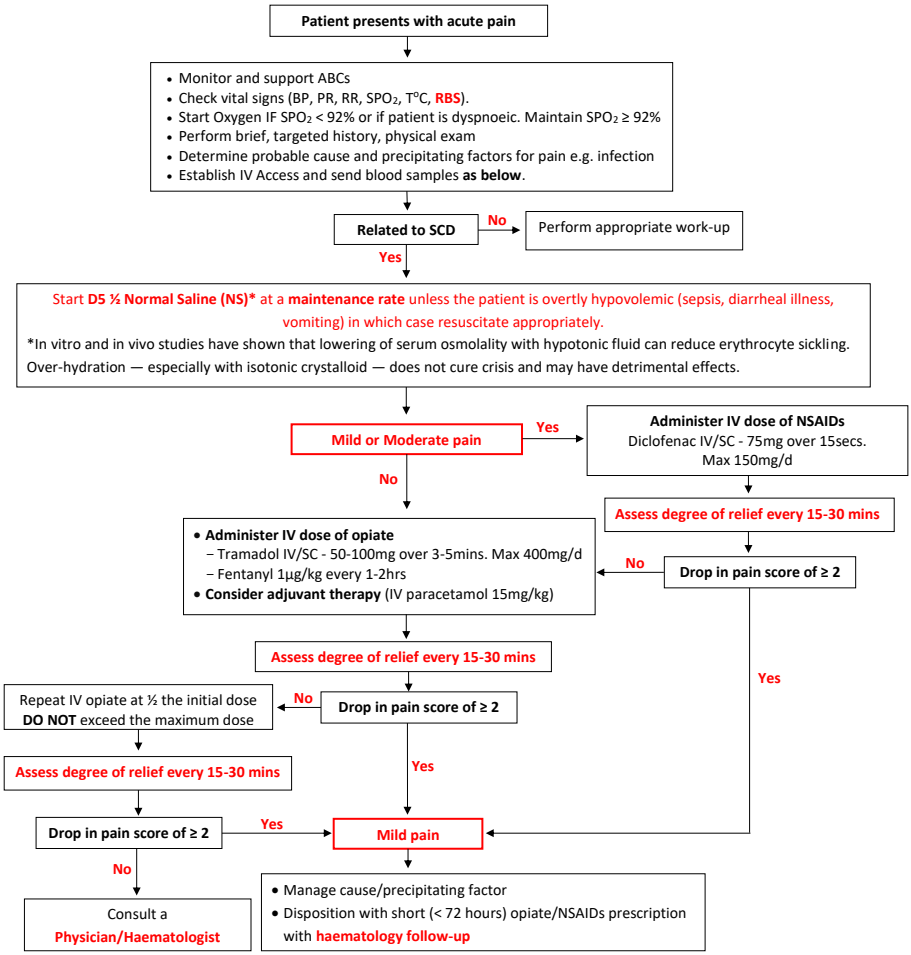
Diagnostic Work-up for Low Back Pain

Possible cause	Key features on history or physical examination	Imaging*	Additional studies*
Cancer	History of cancer with new onset of LBP	MRI	ESR
	Unexplained weight loss Failure to improve after 1 month Age >50 years	Lumbosacral plain radiography	
	Multiple risk factors present	Plain radiography or MRI	
Vertebral infection	Fever Intravenous drug use Recent infection	MRI	ESR and/or CRP
Cauda equina syndrome	Urinary retention Motor deficits at multiple levels Fecal incontinence Saddle anesthesia	MRI	None
Vertebral compression fracture	History of osteoporosis Use of corticosteroids Older age	Lumbosacral plain radiography	None
Ankylosing spondylitis	Morning stiffness Improvement with exercise Alternating buttock pain Awakening due to back pain during the second part of the night Younger age	Anterior-posterior pelvis plain radiography	ESR and/or CRP, HLA-B27
Severe/ progressive neurologic deficits	Progressive motor weakness	MRI	Consider EMG/NCV
Herniated disc (Recommendation 4)	Back pain with leg pain in an L4, L5, or S1 nerve root distribution Positive straight-leg-raise test or crossed straight-leg-raise test	None	None
	Symptoms present >1 month	MRI	Consider EMG/NCV
Spinal stenosis (Recommendation 4)	Radiating leg pain Older age (Pseudoclaudication a weak predictor)	None	None
	Symptoms present >1 month	MRI	Consider EMG/NCV

*Level of evidence for diagnostic evaluation is variable.

44. Management of Pain in Sickle Cell Disease Algorithm

This clinical pathway is intended to supplement, rather than substitute for, professional judgment and may be changed depending upon a patient's individual needs. Failure to comply with this pathway does not represent a breach of the standard of care.



Investigations:

Full Blood Count (FBC);

- Most patients with HbSS disease have a baseline haemoglobin level of 6 to 9 g/dL and tolerate this level of anaemia well because of physiologic adaptations.
- WBC is **NOT** a particularly sensitive nor specific indicator for infection

Reticulocyte count - normally elevated (>5%). Levels < 5% are a serious cause for concern as it signifies bone marrow hypo activity. In patients with worsened scleral icterus, back pain, fever, or signs that suggest haemolysis, additional tests would include; **LFTs** and **LDH**

Renal function tests

Blood typing and screening is necessary **if haemoglobin has dropped > 1 mg/dL below baseline** or if there is concern that the patient may need a transfusion. Indications for blood transfusion; Severe anaemia - **↓ Hb > 2g/dL** below steady state or **< 6g/dL;** Acute chest syndrome; Priapism; CVA in children; Before surgery

45. Procedural Sedation and Analgesia (PSA)

SEE THE EMERGENCY DEPARTMENT PROCEDURAL SEDATION AND ANALGESIA PHYSICIAN CHECKLIST

Procedural sedation is the technique of administering **sedatives or dissociative agents with or without analgesics** to induce a state that allows the patient to tolerate unpleasant procedures while maintaining cardiorespiratory function.

Potential indications for procedural in the ED: fracture reduction, joint reduction, incision and drainage, chest tube placement, electro cardioversion, upper endoscopy (with a gastroenterologist), foreign body removal, burn or wound debridement

Patient selection: A pre-procedural history and physical exam, as documented in the ED record, should reflect a focused evaluation of the airway, cardiovascular status, pulmonary status, allergies, and history of prior adverse reactions to sedatives or anaesthetics. PSA may not be ideal for patients with significant chronic morbidities e.g. sleep apnoea, COPD, low baseline oxygen saturations or blood pressure, or anatomic features that would make bag valve mask (BVM) ventilation or maintaining an airway difficult.

Preparation: Monitoring equipment (continuous telemetry, pulse oximetry, BP; consider continuous end tidal CO_2 monitoring), peripheral IV, Ringer's Lactate/Hartmann's Solution, medications for PSA, naloxone (if opiates are given), equipment for procedure (e.g. scalpel), team (minimum one practitioner for sedation, one for procedure – **ONE OF THEM MUST BE PROFICIENT IN AIRWAY MANAGEMENT**), airway equipment (oxygen source, nasal cannula/face mask, BVM, suction), rescue airway equipment (endotracheal tube, laryngoscope, LMA, nasal trumpet)

OBTAIN CONSENT for **ALL** PSA Procedures

Medication for PSA - give both an Analgesic AND a Sedative unless using Ketamine which is both

Drug	Dosage	Analgesic/ Sedative	Onset/Peak Effect	Duration of Action	Adverse Effects	Comments/Caveats
Ketamine	1 mg/kg IV over 30-60 seconds	Analgesic and Sedative	Onset 1min; Peak effect 1 min	5 - 10mins	Laryngospasm (0.3%), hyper salivation, vomiting, emergence reaction	**Ketamine** is preferred for patients with **hemodynamic instability** or **renal insufficiency.**
Fentanyl	0.5 – 3 µg/kg IV over 3-5mins	Analgesic	Immediate onset, Peak effect 2-3mins	30 - 45mins	Chest wall rigidity and respiratory depression may occur with rapid IV administration	Fentanyl is preferred for a **rapid onset of analgesia** in acutely distressed patients.
Midazolam	0.05 – 0.15mg/kg IV	Sedative	Onset 3-5 mins; Peak effect 15-30 mins	20 - 60mins	Respiratory depression, hypotension	Midazolam has a rapid onset and short duration and is classed as an **ultra-short acting benzodiazepine** and is **2 to 3 times more potent than diazepam,** so can produce significant respiratory depression. Blood pressure decreases, and heart rate increases as compensation for a decreased SVR, although CO remains unchanged.

Emergency Department
Procedural Sedation and Analgesia
Physician Checklist

[patient label]

Pre-Procedure Assessment

- ☐ Past medical history (note history of OSA) _____
- ☐ Prior problems with sedation/anesthesia _____
- ☐ Allergies to food or medications _____
- ☐ Procedure _____
- ☐ Dentures none / upper / lower [should remain in during PSA unless intubation required]
- ☐ Cardiorespiratory reserve no or mild impairment / moderate impairment / significant impairment
- ☐ Difficult airway features none / mild concern / significant concern
- ☐ Last oral intake (see fasting grid on reverse) _____
- ☐ Will delay procedure until _____
- ☐ Weight (kg) _____
- ☐ Benefits of proceeding with PSA exceed risks

Difficult Airway Features

Difficult Laryngoscopy: **L**ook externally, **E**valuate 3-3-2 rule, **M**allampati score, **O**bstruction, **N**eck Mobility
Difficult BVM Ventllation: **B**eard, **O**bese, **N**o teeth, **E**lderly, **S**leep Apnea / Snoring
Difficult LMA: **R**estricted mouth opening, **O**bstruction, **D**istorted airway, **S**tiff lungs or c-spine
Difficult Cricothyroidotomy: **S**urgery, **H**ematoma, **O**besity, **R**adiation distortion or other deformity, **T**umor*

☐ **Is this patient a good candidate for ED procedural sedation and analgesia?**

The less **cardiorespiratory reserve**, the more **difficult airway features**, and the less **procedural urgency**, the more likely the patient should not receive PSA in the emergency department. If not a good candidate for ED-based PSA, other options include regional or local anesthetic; PSA or GA in the operating room; or endotracheal intubation in the ED.

Pre-procedure Preparation

- ☐ Analgesia - maximal patient comfort prior to PSA
- ☐ Informed consent for PSA and procedure
- ☐ Patient on monitor: telemetry, NIBP, SpO_2, $EtCO_2$
- ☐ Oxygenate with NC O_2 **and** high flow face mask O_2
- ☐ Select and draw up PSA agent(s)
- ☐ Reversal agents and paralytic vials at bedside
- ☐ Prepare for endotracheal intubation

Airway Equipment

- ☐ Ambu bag connected to **oxygen**
- ☐ Laryngoscopy handles and blades
- ☐ Suction, oral & nasal airways
- ☐ Endotracheal tubes & stylets
- ☐ LMA with lubricant and syringe
- ☐ Colorimetric capnometer
- ☐ Bougie & difficult airway equipment

Agent	Dose*	Contraindications	Comments
Ketamine	1-2 mg/kg IV over 30-60 sec or 4-5 mg/kg IM, repeat half dose prn	**Absolute:** age < 3 months, schizophrenia **Relative:** major posterior oropharynx procedures; history of airway instability, tracheal surgery, or tracheal stenosis; active pulmonary infection or disease; cardiovascular disease; CNS masses, abnormalities, or hydrocephalus	Preferred for longer procedures; avoid if hypertension/ tachycardia is a concern; have midazolam available to manage emergence distress; muscle tone is preserved or increased; post-procedure emesis may be mitigated by prophylactic ondansetron
Etomidate	0.1-0.15 mg/kg IV, then 0.05 mg/kg q2-3 min prn		Intra-procedure myoclonus or hypertonicity, as well as post-procedure emesis, are common
Fentanyl	1-2 mcg/kg IV, then 1 mcg/ kg q3-5 min prn		Comparatively delayed onset of action; do not re-dose too quickly
Midazolam	.05 mg/kg IV, then .05 mg/kg q3-5 min prn	Pregnancy, allergy to benzyl alcohol	Comparatively delayed onset of action; do not re-dose too quickly
Pentobarbital	1 mg/kg IV, then 1 mg/kg q3-5 min prn	Pregnancy, porphyria	Use for painless procedures where analgesia is not needed
Reversal Agent	**Dose**		**Caution**
Naloxone	0.01-0.1 mg/kg IV or IM (typical adult dose 0.4 mg), max 2 mg		
Flumazenil	0.01 mg/kg IV (typical adult dose 0.2 mg) over 20 seconds, max 1 mg		Only use in benzodiazepine naïve patient

***All doses should be reduced in the elderly and in patients with marginal hemodynamics**

R. Strayer / P. Andrus emupdates.com 11.28.2013

[patient label]

Detect hypoventilation early
Stop the drugs
Position the patient
Jaw thrust
Suction if needed
Laryngospasm notch pressure
Nasal airways
Consider reversal agents
Bag mask or LMA ventilation
Oral airway, ventilation
Intubate

PSA Intervention Sequence

- Proceed down intervention sequence as slowly as patient condition permits
- Jaw thrust as illustrated above - thumbs on maxilla, four fingers posterior to ramus
- Laryngospasm notch is behind the earlobe, between mastoid process and condyle of mandible – bilateral, firm pressure medially and cephalad (up and in)
- If rescue ventilation is required, bag slowly and gently
- see emupdates.com/psa for details

Post-procedure Assessment

- ☐ Adverse events — none / hypoxia (< 90%) / aspiration / hypotension / agitation / other: _____
- ☐ Interventions taken — none / bag valve mask / LMA / ETT / reversal agent / hypotension Rx / admission for PSA / other: _____
- ☐ Adequacy of PSA — nondistressed / mild distress / severe distress
- ☐ Procedure — successful / unsuccessful
- ☐ MD or RN at bedside until patient responds to voice
- ☐ Telemetry, $EtCO_2$, SpO_2 monitoring until patient responding to questions appropriately
- ☐ If reversal agent used, observation two hours after answering questions appropriately
- ☐ Mental status and ambulation at baseline at time of discharge/disposition

Fasting Grid

Standard risk patient**

Oral intake in the prior 3 hours	Emergent Procedure	Urgent Procedure	Semi-urgent procedure	Non-urgent procedure
Nothing	All levels of sedation	All levels of sedation	All levels of sedation	All levels of sedation
Clear liquids only	All levels of sedation	All levels of sedation	Up to and including brief deep sedation	Up to and including extended moderate sedation
Light snack	All levels of sedation	Up to and including brief deep sedation	Up to and including dissociative sedation; non-extended moderate sedation	Minimal sedation only
Heavier snack or meal	All levels of sedation	Up to and including extended moderate sedation	Minimal sedation only	Minimal sedation only

Higher-risk patient**

Oral intake in the prior 3 hours	Emergent Procedure	Urgent Procedure	Semi-urgent procedure	Non-urgent procedure
Nothing	All levels of sedation	All levels of sedation	All levels of sedation	All levels of sedation
Clear liquids only	All levels of sedation	Up to and including brief deep sedation	Up to and including extended moderate sedation	Minimal sedation only
Light snack	All levels of sedation	Up to and including dissociative sedation; non-extended moderate sedation	Minimal sedation only	Minimal sedation only
Heavier snack or meal	All levels of sedation	Up to and including dissociative sedation; non-extended moderate sedation	Minimal sedation only	Minimal sedation only

Minimal sedation only → Dissociative sedation; brief or intermediate-length moderate sedation → Extended moderate sedation → Brief deep sedation → Intermediate or extended-length deep sedation

Brief: < 10 min
Intermediate: 10-20 min
Extended: > 20 min

Additional Comments

MD Name Sign Date/Time

*Walls RM and Murphy MF: Manual of Emergency Airway Management. Philadelphia, Lippincott, Williams and Wilkins, 3rd edition, 2008

**Green, Roback et al. Fasting and Emergency Department Procedural Sedation and Analgesia: A Consensus-Based Clinical Practice Advisory. Ann Emerg Med. 2007;49:454-461.

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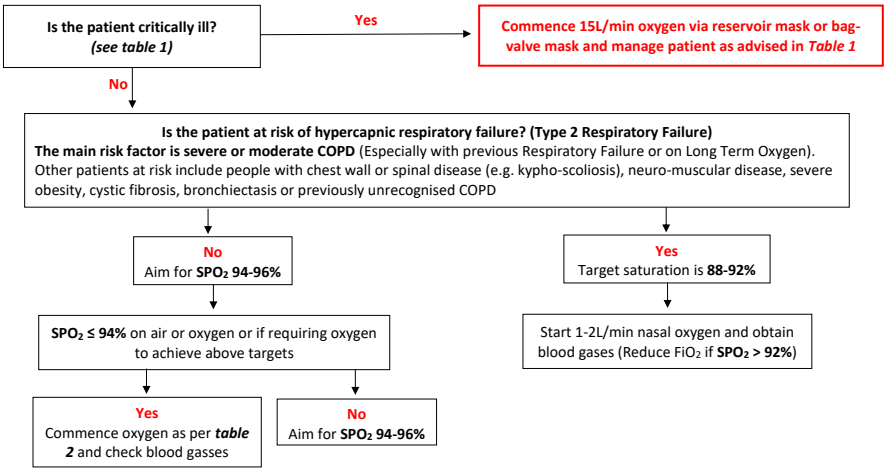
Analgesia Chart

Drug	Dosage	Equianalgesic dose	Onset/Peak Effect	Duration of Action	Adverse Effects	Comments/Caveats
Morphine	IV - 0.1mg/kg; max. 0.3mg/kg SC - 0.1-0.2mg/kg	10mg	IV - Onset 3-5 mins; Peak effect 15-30 mins SC – Onset 15-30 mins	IV - 3 –4 hrs SC – 4 hrs	Respiratory depression Hypotension partly due to histamine release	**Acute severe pain (trauma)** or **persistent pain.** Morphine is better preferred for **obstetric pain**.
Fentanyl	IV - 0.5 – 3 µg/kg over 3-5mins	100µg	IV - Immediate onset, Peak effect 2-3mins SC – Onset 7 - 15mins	IV – 30 - 45mis SC – 1 – 2 hrs	Chest wall rigidity and respiratory depression may occur with rapid IV administration	**Acute severe pain. (trauma)** Fentanyl is preferred for a **rapid onset of analgesia** in acutely distressed patients. **Fentanyl** is preferred for patients with **hemodynamic instability** or **renal insufficiency**
Pethidine	IV - 0.5-1mg/kg SC - 1-2mg/kg	75 mg	IV - 1-3 mins SC - 30-90 mins	IV – 2 - 4 hrs SC – 3 – 4 hrs	High doses may cause respiratory depression, agitation, muscle fasciculations, seizures or histamine induced hypotension	**Moderate-to-severe pain** (migraine, trauma, acute abdominal pain) It may be used in **obstetric practice** to relieve labour pain. Pethidine has an analgesic potency approximately equal to **one-fifth** that of morphine. Pethidine has an active metabolite (nor-meperidine) that causes neuro excitation (apprehension, tremors, delirium, and seizures) and may interact with antidepressants (contraindicated with MOI and best avoided with SSRIs), so it is **NOT RECOMMENDED** for repetitive use. It is also **highly addictive.**
Tramadol	IV/SC - 50-100mg over 3-5mins Max 400mg/d	80mg	IV/SC – 45 mins	IV/SC - 9 – 10 hrs	**> 400 mg/d** are associated with an **increased risk of seizures.**	**Moderate-to-severe pain.** **Tramadol** is **5 to 10 times less potent** than morphine. There is consequently an absence of respiratory depression, a low sedative effect, and less potential for dependence. There is a **high incidence of nausea and vomiting**. Slow administration over **3 - 5 minutes** decreases the incidence of nausea and vomiting. Tramadol does not promote the release of histamine.
Paracetamol	IV – 15mg/kg	-	IV – 15mins (at end of infusion)	IV – 4hrs		**Mild-to-moderate pain** Can be used to supplement opioid analgesics
Diclofenac	IV – 75mg IM – 75mg	-	IV – 5-10 mins IM – 15mins	IV – 6-8hrs IM – 6-8hrs	• Gastrointestinal bleeding • Bleeding secondary to platelet inhibition, and • Development of renal insufficiency	**Mild-to-moderate pain.** Can be used to supplement opioid analgesics e.g. renal colic **All NSAIDs** elevate SBP (median **5 mmHg**). This effect predisposes to the development of congestive heart failure and may contribute to the risk of accelerated atherothrombotic disease. Patients with hypovolemia or hypo perfusion, the elderly, and those with pre-existing renal impairment may be more susceptible to **NSAID-induced renal injury.**

IM administration is **generally NOT RECOMMENDED** due to its multiple disadvantages: Painful administration, Unpredictable absorption, Complications involving tissue fibrosis and abscesses, and Rapid declines in analgesic effect.
Subcutaneous (SC) administration provides **similar pharmacokinetics** with greater patient comfort. The SC route should replace the **IM** route **for opioids.**

Oxygen Prescription

This clinical guideline is intended to supplement, rather than substitute for, professional judgment and may be changed depending upon a patient's individual needs. Failure to comply with this guideline does not represent a breach of the standard of care.



Oxygen is a treatment for hypoxaemia, not breathlessness. Oxygen has not been proven to have any consistent effect on the sensation of breathlessness in non-hypoxemic patients.

Table 1 Critical illness requiring high levels of supplemental oxygen

The initial oxygen therapy is a reservoir mask at 15 L/min pending the availability of reliable oximetry readings.

For patients with spontaneous circulation and a reliable oximetry reading, it may quickly become possible to reduce the oxygen dose while maintaining a target saturation range of 94–96%.

If oximetry is unavailable, continue to use a reservoir mask until definitive treatment is available.

Patients with COPD and other risk factors for hypercapnia who develop critical illness should have the same initial target saturations as other critically ill patients pending the results of blood gas results after which these patients may need controlled oxygen therapy with target range 88–92% or supported ventilation if there is severe hypoxaemia and/or hypercapnia with respiratory acidosis.

Additional Comments	
Cardiac arrest or resuscitation	Refer to resuscitation guidelines for choice of delivery device during active resuscitation. Give the highest possible inspired oxygen concentration during CPR until spontaneous circulation has been restored
Shock, sepsis, major trauma, drowning, anaphylaxis, major pulmonary haemorrhage, status epilepticus	Also give specific treatment for the underlying condition
Major head injury	Early tracheal intubation and ventilation if comatose
Carbon monoxide poisoning	Give as much oxygen as possible using a bag-valve mask or reservoir mask. Check carboxyhaemoglobin levels. A normal or high oximetry reading should be disregarded because saturation monitors cannot differentiate between carboxyhaemoglobin and oxyhaemoglobin, owing to their similar absorbances. The blood gas PO_2 will also be normal in these cases (despite the presence of tissue hypoxia).

COPD, chronic obstructive pulmonary disease; CPR, cardiopulmonary resuscitation; PO_2, oxygen tension arterial or arterialised blood gases.

Table 2 Serious illnesses requiring moderate levels of supplemental oxygen if the patient is hypoxaemic

The initial oxygen therapy is nasal cannulae at 2–6 L/min (preferably) or simple face mask at 5–10 L/min unless stated otherwise.
For patients not at risk of hypercapnic respiratory failure who have saturation below 85%, treatment should be started with a reservoir mask at 15 L/min and the recommended initial oxygen saturation target range is 94–96%. If oximetry is not available, give oxygen as above until oximetry or blood gas results are available. Change to reservoir mask if the desired saturation range cannot be maintained with nasal cannulae or simple face mask (and ensure that the patient is assessed by senior medical staff). If these patients have coexisting COPD or other risk factors for hypercapnic respiratory failure, aim at a saturation of 88–92% pending blood gas results but adjust to 94–96% if the PCO_2 is normal (unless there is a history of previous hypercapnic respiratory failure requiring NIV or IMV) and recheck blood gases after 30–60 min.

Additional Comments	
Acute hypoxaemia (cause not yet diagnosed)	Reservoir mask at 15 L/min if initial SpO_2 below 85%, otherwise nasal cannulae or simple face mask Patients requiring reservoir mask therapy need urgent clinical assessment by senior staff.
Deterioration of lung fibrosis or other interstitial lung disease	Reservoir mask at 15 L/min if initial SpO2 below 85%, otherwise nasal cannulae or simple face mask
Pneumothorax	Needs aspiration or drainage if the patient is hypoxemic. Most patients with pneumothorax are not hypoxemic and do not require oxygen therapy. Use a reservoir mask at 15 L/min if admitted for observation. Aim at 100% saturation. (Oxygen accelerates clearance of pneumothorax if drainage is not required.)
Pleural effusions	Most patients with pleural effusions are not hypoxemic. If hypoxemic, treat by draining the effusion as well as giving oxygen therapy.
Pulmonary embolism	Most patients with minor pulmonary embolism are not hypoxemic and do not require oxygen therapy.
Acute heart failure	Consider CPAP or NIV in cases of pulmonary oedema.
Severe anaemia	The main issue is to correct the anaemia. Most anaemic patients do not require oxygen therapy.
Postoperative breathlessness	Management depends on underlying cause.

COPD, chronic obstructive pulmonary disease; CPAP, continuous positive airway pressure; IMV, invasive mechanical ventilation; NIV, non-invasive ventilation; PCO2, arterial or arterialised carbon dioxide tension; SpO_2, arterial oxygen saturation measured by pulse oximetry.

Table 3 Conditions for which patients should be monitored closely but oxygen therapy is not required unless the patient is hypoxemic

If hypoxemic, the initial oxygen therapy is nasal cannulae at 2–6 L/min or simple face mask at 5–10 L/min unless saturation is below 85% (use reservoir mask) or if at risk from hypercapnia (see below).
The recommended initial target saturation range, unless stated otherwise, is 94–96%.
If oximetry is not available, give oxygen as above until oximetry or blood gas results are available.
If patients have COPD or other risk factors for hypercapnic respiratory failure, aim at a saturation of 88–92% pending blood gas results but adjust to 94–96% if the PCO_2 is normal (unless there is a history of respiratory failure requiring NIV or IMV) and recheck blood gases after 30–60 min.

Additional Comments	
Myocardial infarction and acute coronary syndromes	Most patients with acute coronary artery syndromes are not hypoxemic and the benefits/ harms of oxygen therapy are unknown in such cases. Unnecessary use of high concentration oxygen may increase infarct size. Do not initiate oxygen therapy in patients with $SpO_2 \geq 90\%$
Stroke	Most patients with stroke are not hypoxemic. Oxygen therapy may be harmful for non-hypoxemic patients with mild–moderate strokes. Do not initiate oxygen therapy in patients with $SpO_2 \geq 90\%$
Hyperventilation or dysfunctional breathing	Exclude organic illness. Patients with pure hyperventilation due to anxiety or panic attacks are unlikely to require oxygen therapy. Rebreathing from a paper bag may cause hypoxaemia and is not recommended.
Most poisonings and drug overdoses (see **table 1** for carbon monoxide poisoning)	Hypoxaemia is more likely with respiratory depressant drugs, give antidote if available, for example, naloxone for opiate poisoning. Check blood gases to exclude hypercapnia if a respiratory depressant drug has been taken.
Pregnancy and obstetric emergencies	Oxygen therapy may be harmful to the foetus if the mother is not hypoxemic.

COPD, chronic obstructive pulmonary disease; IMV, invasive mechanical ventilation; NIV, non-invasive ventilation; PCO_2, arterial or arterialised carbon dioxide tension.

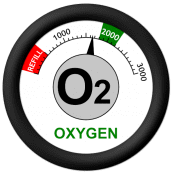
Oxygen Delivery Devices

Device	Flow Rates	FiO_2	How to Titrate	Notes
 **Low-flow nasal cannula**	1-6L/min	Each L/min adds ~4% Fio_2 above room air* 1L/min = 24% 2L/min = 28% 3L/min = 32% 4L/min = 36% 5L/min = 40% 6L/min = 44%	Titrate flow rate only	Best for patients with normal respiratory rates and tidal volumes
 **Simple face mask**	~6-12L/min	35-60%*	Titrate flow rate only	Minimum of 6L/min flow is required to prevent re-breathing CO_2
 **Non-rebreather mask**	10-15L/min	100%	Nontitratable	Short term bridge therapy only
 **High Flow Nasal Cannula**	Up to 60L/min	30-100%	Titrate flow rate and FiO_2	Administers PEEP with high flow rate

*varies based on respiratory rate and minute ventilation

Equipment used to deliver emergency oxygen therapy;

- Humidification is **not** required for the delivery of low-flow oxygen or for the short-term use of high-flow oxygen. It is not therefore required in prehospital care. Pending the results of clinical trials, it is reasonable to use humidified oxygen for patients who require high-flow oxygen systems for > 24 h or who report upper airway discomfort due to dryness.
- In the emergency situation humidified oxygen use can be confined to patients with tracheostomy or an artificial airway, although these patients can be managed without humidification for short periods of time (e.g., ambulance journeys).
- Humidification may also be of benefit to patients with viscous secretions causing difficulty with expectoration. This benefit can be achieved using nebulised normal saline.
- Bubble bottles should **not** be used because there is no evidence of clinically significant benefit but there is a **risk of infection**.



Oxygen Calculator - https://www.oxygencalculator.com/

Acid-Base Disorders Worksheet

This clinical pathway is intended to supplement, rather than substitute for, professional judgment and may be changed depending upon a patient's individual needs. Failure to comply with this pathway does not represent a breach of the standard of care.

Step #1: Gather the necessary data (Na^+, Cl^-, HCO_3^-, pH, PCO_2)
Preferably, all obtained from the same blood sample

Step #2: Look at the pH

If pH > 7.4 → the patient has a primary alkalosis → proceed to **Step 3a**
If pH < 7.4 → the patient has a primary acidosis → proceed to **Step 3b**

Patient has primary:

acidosis	**alkalosis**

Step #3: Look at the pCO_2

3a: If pCO_2 > 40 → patient's alkalosis is metabolic
If pCO_2 < 40 → patient's alkalosis is respiratory
3b: If pCO_2 > 40 → patient's acidosis is respiratory
If pCO_2 < 40 → patient's acidosis is metabolic

Primary process is:

respiratory	**metabolic**

Step #4: Look for disorders revealed by failures of compensation

- If primary process is metabolic alkalosis → pCO_2 should be > 40 but < 55*
  *There are several metabolic alkalosis PCO2 prediction formulas, but fraught with clinical inaccuracy/unreliability
- If primary process is metabolic acidosis → calculate predicted $pCO_2 = (1.5 \times HCO_3^-) + 8 \pm 2$

In either case above:
- If actual pCO_2 is too high → there is an additional respiratory acidosis
- If actual pCO_2 is too low → there is an additional respiratory alkalosis

- If primary process is respiratory → skip to **Steps 5 & 6** (where further metabolic disorders revealed)

Additional disorder:

respiratory acidosis	**respiratory alkalosis**

-or-

no additional disorder

Step #5: Check if the patient has a significant Anion Gap (>12 – 18) (AG = $Na^+ - Cl^- - HCO_3^-$)
If AG is significantly elevated → the patient has an anion gap metabolic acidosis in addition to (or in confirmation of) whatever **Steps 2 - 4** yielded.

± anion gap metabolic acidosis

Step #6: Calculate the corrected HCO_3^- (AG - 12 + HCO_3^-)
In addition to whatever disorders **Steps 1-5** yielded,
- If corrected HCO_3^- > 30 → the patient has an underlying metabolic *alkalosis*
- If corrected HCO_3^- < 23 → the patient has an underlying non-AG metabolic *acidosis*

Underlying:

non-AG metabolic acidosis	**metabolic alkalosis**

Step #7: Make a diagnosis(es) using the differentials below and knowledge of the patient

Metabolic Acidosis		**Metabolic Alkalosis**	**Respiratory**	
Anion Gap	**Non-Anion Gap**		**Acidosis (Acute)**	**Alkalosis**
"MUDPILERS"	"HARDUPS"	"CLEVER PD"	*Anything that causes hypoventilation*	*Anything that causes hyperventilation*
Methanol	**H**yperalimentation	**C**ontraction	CNS depression (CVA/Drugs)	CNS disease
Uraemia	**A**cetazolamide	**L**iquorice*	Airway obstruction	Hypoxia
Diabetic/Alcoholic/Starvation Keto Acidosis	**R**enal tubular acidosis	**E**ndocrine: Conns / Cushing's / Bartter's)*	Pneumonia	Anxiety
Paraldehyde	**D**iarrhoea	**V**omiting, NG suction	Pulmonary oedema	Mechanical ventilation
Isoniazid/ **I**ron toxicity	**U**retero-Pelvic shunt	**E**xcess alkali*	Haemo/Pneumothorax	Progesterone
Lactic acidosis	**P**ost-hypocapnia	**R**efeeding alkalosis*	Myopathy	Salicylates/Sepsis
Ethanol / **E**thylene Glycol	**S**pironolactone	**P**ost-hypercapnia		
Rhabdomyolysis/Renal Failure		**D**iuretics*	***Chronic respiratory acidosis*** is caused by COPD and restrictive lung disease	
Salicylates		*associated with high urine Cl^- levels		

Step #8: Fix it!

Adapted from Joshua Steinberg MD

EMERGENCY MEDICINE KENYA FOUNDATION
emergencymedicinekenya.org

Paediatric Emergency Reference Guide

Age	Length (cm)	Weight (Kg)	Pulse Rate	Resp Rate	Systolic BP mmHg	Diastolic BP mmHg	Temp (°C)	ET Size (mm)	ET Depth (cm tip to lip)	Laryngoscope Blade	LMA	NG Tube	Suction Catheter
Preterm	< 50	1-2	100-180	40-60	30-50	35-45	34.0-38.0	2.5	6+WT	0	1	5	5-6
Term New-born	50	3-4	100-180	40-60	60-90	40-45	34.0-38.0	3.0	6+WT	1	1	5-8	6-8
6 months	67	7	100-160	30-60	83-105	40-45	34.0-38.0	3.5	11	1	1.5	8	8
1 year	75	10	80-110	26-34	95-105	50-65	34.0-38.0	4.0	11-12	1	2	10	8-10
3 years	95	15	70-110	24-26	96-110	55-75	36.1-37.8	4.5	13-14	2	2	10	10
5 years	110	18	65-110	20-24	96-110	55-75	36.1-37.8	5.0	14-15	2	2	12	10
6 years	115	20	65-110	20-24	97-112	65-80	36.1-37.8	5.5	15-16	2	2.5	12	10
8 years	127	25	65-110	20-24	97-112	65-80	36.1-37.8	6.0	17-18	2	3	14	10
12 years	150	40	60-100	12-20	112-128	70-85	35.9-37.6	6.5	19-20	3	3-4	14	12
16 years	> 150	> 50	60-100	12-20	112-128	70-85	35.9-37.6	7.0	20-24	3	3-4	18	12

Appropriate interna diameter (mm) of ET Tube = (Age in years/4) + 4; NB: ET tube size, choose a size larger and a size smaller in addition to the indicated size.
Appropriate length of Oral tube (cm) = New-born = 6 + weight (Kg); in infant and child = (Age in years/2) + 12 or three times the internal tube diameter
Appropriate length of Nasal tube (cm) = (Age in years/2) + 15

Adrenaline
New-born: 0.1-0.3mL/Kg of 1:10,000 IV/IO
Child: 0.1mL/Kg of 1:10,000 IV/IO; 0.1mL/Kg of 1:1,000 ET

Age	Endotracheal Tube (ET)	Intravenous (IV)	Anaphylaxis (IM)
	1:1000	1:10,000	1:1000
Preterm	0.5mL (1:10,000)	0.3mL	0.15mL (150µg)
Term New-born	1mL	0.5-1mL	0.15mL (150µg)
6 months	0.7mL	0.7mL	0.15mL (150µg)
1 year	1mL	1mL	0.15mL (150µg)
3 years	1.5mL	1.5mL	0.15mL (150µg)
5 years	1.8mL	1.8mL	0.15mL (150µg)
6 years	2mL	2mL	0.3mL (300µg)
8 years	2.5mL	2.5mL	0.3mL (300µg)
12 years	2.5mL	4mL	0.3mL (300µg)
16 years	2.5mL	5mL	0.5mL (500µg)

Noradrenaline: 0.02-0.1µg/Kg/min, titrated to effect
Ketamine (to be used with Atropine to counter hypersalivation): 1-2mg/Kg IV. Effect lasts 4-5 mins and there is need to combine with another sedative.
Atropine: 0.02mg/Kg IV/IO or ET (MINIMUM DOSE = 0.1mg ; MAX SINGE DOSE = 0.5mg for child and 1mg for adolescent) may repeat x1
Midazolam: IV 0.1-0.2mg/Kg. Onset of action in 3-5 minutes, peak action 3-5minutes and duration of action up to 60 minutes
Rocuronium: IV 0.6-1.2mg/Kg. Onset of action in 30-60 seconds and duration of action 30-40 minutes

Fentanyl: IV 1-4µg/Kg. Onset of action in 2-3 minutes, peak action 3-4minutes and duration of action 20-60 minutes

Morphine PO,SC,IV
Neonates: 50-100µg/Kg every 6 hours, adjusted according to response
Child: 100-200µg/Kg every 4-6 hours, adjusted according to response. IV or SC infusion: 10-30µg/Kg/hr adjusted according to response.

Lidocaine: 1mg/Kg IV/IO/ET; follow by an infusion.

Adenosine: 0.1mg/Kg rapid IV/IO push; increase to 0.2mg/Kg if needed; MAXIMUM SINGE DOSE = 12mg

Amiodarone: 5mg/Kg IV/IO; rapid bolus for pulseless VT/VF; over 20-60min for perfusing. Tachycardia. MAXIMUM SINGLE DOSE: 300mg. My repeat to MAX DOSE = 15mg/Kg/Day (2.2gm/Day). DO NOT combine with procainamide.

Crystalloid Fluid Challenge in Shock
Choose and ISOTONIC, non-glucose containing solution (Hartmann's solution/ Ringer's Lactate is preferred, use Normal Saline in its absence). Rapid IV Fluid Bolus.
New-born: 10mL/Kg; infant or child: 20mL/Kg; repeat as needed (after reassessment) up to three boluses. If no response after 3rd bolus, consult **Pediatrician.**

Defibrillation: 1st shock 2J/Kg, 2nd Shock 4J/Kg. Subsequent Shocks ≥4J/Kg MAXIMUM 10J/Kg or adult dose.

Cardioversion: 0.5-1J/Kg; if not effective, increase to 2J/Kg.

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Emergency Care Checklist

(Adapted from the WHO Medical & Trauma Checklist)

This clinical pathway is intended to supplement, rather than substitute for, professional judgment and may be changed depending upon a patient's individual needs. Failure to comply with this pathway does not represent a breach of the standard of care.

Immediately after primary & secondary surveys:

IS FURTHER AIRWAY INTERVENTION NEEDED? May be needed if: • Abnormal level of consciousness (AVPU), GCS 8 or below • Hypoxaemia or hypercarbia • Respiratory distress • Face, neck, chest or any severe trauma	☐ YES, DONE ☐ NO
IS THERE A *TENSION* PNEUMO-THORAX?*	☐ YES, CHEST DRAIN PLACED ☐ NO
IS THE PULSE OXIMETER PLACED AND FUNCTIONING?	☐ YES ☐ NO ☐ NOT AVAILABLE
DOES THE PATIENT NEED OXYGEN (SPO_2 <94%) ?	☐ YES ☐ NO ☐ NOT AVAILABLE
LARGE-BORE IV PLACED AND FLUIDS/BLOOD TRANSFUSION STARTED?	☐ YES ☐ NOT INDICATED ☐ NOT AVAILABLE
HEAD-TO-TOE SURVEY FOR (AND CONTROL OF) EXTERNAL BLEEDING, INCLUDING:*	☐ SCALP ☐ PERINEUM ☐ BACK
ASSESS FOR PELVIC FRACTURE BY:*	☐ EXAM ☐ X-RAY ☐ CT-SCAN
ASSESS FOR INTERNAL BLEEDING BY:*	☐ EXAM ☐ ULTRASOUND (E-FAST) ☐ CT-SCAN
IS SPINAL IMMOBILIZATION NEEDED?*	☐ YES ☐ NOT INDICATED
RANDOM BLOOD SUGAR CHECKED	☐ YES ☐ NO
NEUROVASCULAR STATUS OF ALL 4 LIMBS CHECKED?*	☐ YES
IS THE PATIENT HYPOTHERMIC?	☐ YES, WARMING ☐ NO
DOES THE PATIENT NEED (IF NO CONTRAINDICATION)?	☐ URINARY CATHETER ☐ NASOGASTRIC TUBE ☐ CHEST DRAIN ☐ NONE INDICATED

*associated with trauma but not specific

Before TEAM leaves the patient's bedside:

HAS THE PATIENT BEEN GIVEN:	☐ TETANUS VACCINE ☐ ANAGESICS ☐ ANTIBIOTICS ☐ NONE INDICATED
HAVE ALL TESTS AND IMAGING BEEN REVIEWED?	☐ YES ☐ NO, FOLLOW-UP PLAN IN PLACE
WHICH SERIAL EXAMINATIONS ARE NEEDED?	☐ NEUROLOGICAL ☐ RESPIRATORY ☐ ABDOMINAL ☐ CARDIOVASCULAR ☐ NONE
PLAN OF CARE DISCUSSED WITH:	☐ PATIENT/FAMILY ☐ RECEIVING UNIT ☐ PRIMARY TEAM ☐ OTHER SPECIALISTS
RELEVANT EMERGENCY CARE CHART OR FORM COMPLETED?	☐ YES ☐ NOT AVAILABLE

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References

Triage Clinical care for severe acute respiratory infection: toolkit. COVID-19 adaptation. Geneva: World Health Organization; 2020 (WHO/2019-nCoV/SARI_toolkit/2020.1). Available from: https://apps.who.int/iris/handle/10665/331736

1-4. American Heart Association. 2020 American Heart Association Guidelines for Cardiopulmonary Resuscitation and Emergency Cardiovascular Care. *Circulation* 2020;142(16 Suppl 2):S336-604. Available from: www.ahajournals.org/toc/circ/142/16_suppl_2

8. Campbell RL, Li JT, Nicklas RA, Sadosty AT et al. Emergency department diagnosis and treatment of anaphylaxis: a practice parameter. *Ann Allergy Asthma Immunol* 2014;113(6):599-608. doi:10.1016/j.anai.2014.10.007

9. Global Initiative for Asthma. Global Strategy for Asthma Management and Prevention, 2022. Available from: www.ginasthma.org

12. Ibanez B, James S, Agewall S, Antunes MJ, et al. 2017 ESC Guidelines for the management of acute myocardial infarction in patients presenting with ST-segment elevation: The Task Force for the management of acute myocardial infarction in patients presenting with ST-segment elevation of the European Society of Cardiology (ESC). *Eur Heart J.* 2018;39(2):119-177. doi:10.1093/eurheartj/ehx393.

13. Amsterdam EA, Wenger NK, Brindis RG, et al. 2014 ACC/AHA guideline for the management of patients with non–ST-elevation acute coronary syndromes: executive summary: a report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines. *Circulation.* 2014;130(25):2354-94. doi:10.1161/CIR.0000000000000133.

14. 2019 ESC Guidelines for the management of patients with supraventricular tachycardia. *European Heart Journal.* 2019;00:1-66. doi:10.1093/eurheartj/ehz467

16. Unger T, Borghi C, Charchar F, Khan NA, Poulter NR, Prabhakaran D, Ramirez A, Schlaich M, Stergiou GS, Tomaszewski M, Wainford RD, Williams B, Schutte AE. 2020 International Society of Hypertension Global Hypertension Practice Guidelines. Hypertension. 2020 Jun;75(6):1334-1357. doi: 10.1161/HYPERTENSIONAHA.120.15026.

18. Powers WJ, Rabinstein AA, Ackerson T, Adeoye OM, et al. Guidelines for the Early Management of Patients With Acute Ischemic Stroke: 2019 Update to the 2018 Guidelines for the Early Management of Acute Ischemic Stroke: A Guideline for Healthcare Professionals From the American Heart Association/American Stroke Association. *Stroke.* 2019;50(12):e344-e418. doi:10.1161/STR.0000000000000211.

19. Fonseca AC, Merwick Á, Dennis M, et al. European Stroke Organisation (ESO) guidelines on management of transient ischaemic attack. European Stroke Journal. 2021;6(2):CLXIII-CLXXXVI. doi:10.1177/2396987321992905

21. Saccilotto RT, Nickel CH, Bucher HC, et al. San Francisco Syncope Rule to predict short-term serious outcomes: A systematic review. *CMAJ* 2011;183(15):E1116-26. doi:10.1503/cmaj.101326

24. Hoffman JR, Mower WR, Wolfson AB, Todd KH, Zucker MI. Validity of a set of clinical criteria to rule out injury to the cervical spine in patients with blunt trauma. National Emergency X-Radiography Utilization Study Group. *N Engl J Med*. 2000;343(2):94-9. Erratum in: *N Engl J Med* 2001;344(6):464. doi: 10.1056/NEJM200007133430203

Stiell IG, Wells GA, Vandemheen KL, et al. The Canadian C-spine rule for radiography in alert and stable trauma patients. *JAMA* 2001;286(15):1841-8. doi: 10.1001/jama.286.15.1841

25. Stiell IG, Wells GA, Vandemheen K, et al. The Canadian CT Head Rule for patients with minor head injury. *Lancet* 2001;357(9266):1391-6. doi: 10.1016/s0140-6736(00)04561-x

31. Van Ness-Otunnu R, Hack JB. Hyperglycemic crisis. J Emerg Med. 2013;45(5):797-805. doi:10.1016/j.jemermed.2013.03.040

33. Evans LE, Rhodes A. Alhazzani W et al. Surviving Sepsis Campaign: International Guidelines for Management of Sepsis and Septic Shock 2021, Critical Care Medicine: November 2021 - Volume 49 - Issue 11 - p e1063-e1143 doi: 10.1097/CCM.0000000000005337.

35. Suicide Prevention Resource Center. (2015). Caring for adult patients with suicide risk: A consensus guide for emergency departments. Waltham, MA: Education Development Center, Inc. Available from: Suicide Prevention Resource Centre

37. Moayyedi PM, Lacy BE, Andrews CN, Enns RA, et al. ACG and CAG Clinical Guideline: Management of Dyspepsia. *Am J Gastroenterol*. 2017;112(7):988-1013. doi:10.1038/ajg.2017.154.

43. Chou R, Qaseem A, Snow V, et al. Diagnosis and treatment of low back pain: a joint clinical practice guideline from the American College of Physicians and the American Pain Society. *Ann Intern Med* 2007;147(7):478-91. doi: 10.7326/0003-4819-147-7-200710020-00006

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