Emergency Life Support – ELS

Provider Manual for Doctors

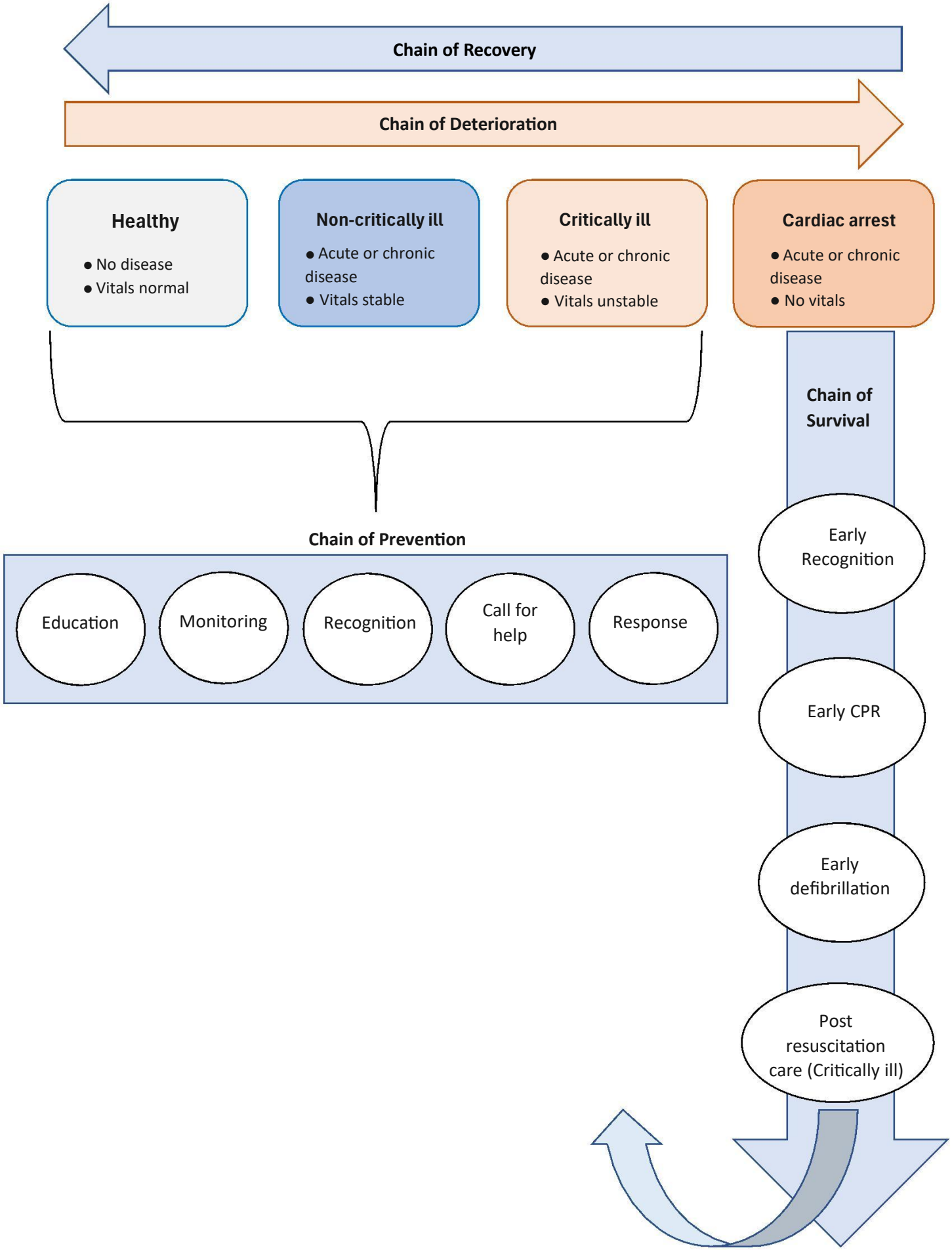
Trauma Resuscitation

Obstetric Resuscitation

Paediatric Resuscitation

Adult Resuscitation

Clinical Governing Chains in Medical Practice



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06. Acute Presentations

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Basic Acute Care Workup

1. Triage (Nursing Officer) –

Eyeball triage – **Cardiac Arrest** Vs **Critically Ill**

Equipment triage – **Critically Ill** Vs **Non Critically Ill**

Re-triage-(Doctor)

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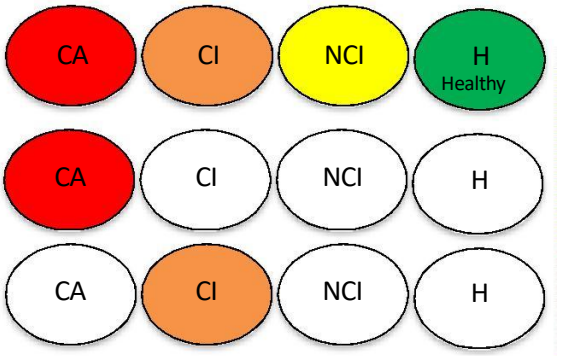


2. Initial Stabilization/Critically Ill Workup - Page 3

(Nursing Officer / Health Care Assistant/ Doctor)

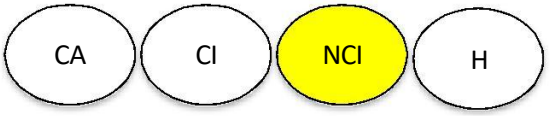
- **A-*Patent***
- **B-*RR*/*auscultation* /*SPO2*** → *O2*
- **C-*PR/HR* /*BP/ECG*/*Cannula***
- **D-*A* *VPU*/*pupils, eye movements*/*Pain*/*RBS***
- **E-*Rash/wounds/* *Temp*.**

Try to identify Major Presentations

1. **Anaphylaxis**
2. **Hypoxia**
3. **Shock**
4. **Unconscious**
5. **Sepsis**
6. **Major trauma**

3. History / Examination / Investigations – *(Doctor)*

4. Problem List – *(Doctor)*



- Major Problems
- Acute Problems – ABCDE Order
  1. Initial vitals related problems
  2. History related problems
  3. Examination / Investigations related problems
- Chronic Problems – ABCDE Order

5. Management, Referral and Disposition Plan – *(Doctor / Nursing in Charge / Nursing Officer / Health Care Assistant)*

Source: Major presentations in Medical Practice. ISBN 978-624-6246-12-9

Triage

First proceed with **Eyeball Triage** → Eyeball triage tool – DRS ABC

Then proceed with **Equipment Triage** for patients not in cardiac arrest to differentiate between critically ill and non-critically ill patients based on their vital signs

D-Danger, Patient safety, and Healthcare provider safety – wear gloves, masks

R-Response + → **Critically ill** go to intial stabilaization

In Trauma, control catastrophic bleeding, go to major trauma worksheet

\-

S-Shout for help

A-Airway – Keep airway patent with chin lift, head tilt, jaw thrust

Trauma, jaw thrust only

B-Breathing + → **Criticallyill** → go to intial stabilaization

\-

C-Central pulse + → **Criticallyill** → go to intial stabilaization

\-

Cardiac Arrest – Follow cardiac arrest workup

Positioning

If critically ill, start initial stabilization with following positionings

Dyspneic – propped up (Provided BP normal).

Ongoing fits – Left lateral / Supine with regular suction.

Pregnant POA > 20 weeks – Left lateral tilt.

- All other conditions keep in supine position +/- regular suction.

Source: Major presentations in Medical Practice. ISBN 978-624-6246-12-9

Critically ill Patient Workup/ Initial Stabilization (Non-Trauma)

(For Trauma – Refer Major Trauma Workup)

Airway Patency

- Complete obstruction – Clear the airway and apply basic airway manures and adjuncts.
  (If unsuccessful, proceed with advanced airway - LMA, ETT, tracheostomy)
  - Suspicion of chocking – Follow choking algorithm
- Partial obstruction - Clear the airway and apply basic airway manures and adjuncts.
  (If unsuccessful, proceed with advanced airway - LMA, ETT, tracheostomy)
  - Snoring - Apply basic airway manures and adjuncts.
  - Gurgling - Suck out secretions.
  - Stridor - Identify the course and treat the course.
  - Grunting - Try to maintain a positive end expiratory pressure.
- Patent
  - ❖ Achieve airway patency
  - ❖ Exclude Anaphylaxis
  - ❖ Proceed to Breathing

RR, Auscultation, SPO_2

Hypoxia is a rapid killer

- Try to achieve saturation targets within minutes
  - 94-98% - non-CO_2 retainer
  - 88-92% - CO_2 retainer (Chronic lung condition)
- If the desired saturation target cannot be achieved with basic ventilatory support, proceed with advanced ventilatory support (Annexure 01)

  FMO_2 NRBM HFNC NIV IPPV
- **Try to find out the cause with SOB workup and correct it while excluding rest of major presentations (Shock, Anaphylaxis, Sepsis, Unconscious, Major Trauma)**
- Prop up the patient if BP normal

- RR low < 10 Ambu ventilation.
- RR high > 20 SPO_2 Normal – O2 via facemask 5-10L.
- RR high > 20 SPO_2 Low – O2 via NRBM 10-15L.
- RR normal - SPO2 normal - No oxygen needed.
- Auscultation – Ronchi – Start nebulization
- B/L crept? APO consider Lasix.

- ❖ Exclude Anaphylaxis
- ❖ Correct Hypoxia
- ❖ If target achieved proceed to Circulation

Pulse Rate, Blood pressure, HR, ECG, IV Cannula (Take blood out ± Start running drip)

- Check pulse rate and heart rate
- Blood pressure < 90 mmHg / PP < 20 mmHg - Shock Algorithm
- Blood pressure > 140 – Refer hypertensive emergency workups after excluding other major presentations

- ❖ Exclude Anaphylaxis
- ❖ Exclude Shock
- ❖ Proceed to Disability

A *VPU, Pupils (eyeball movements)*, Pain assessment, RBS

- Pain- mild/ moderate/ severe- Pain workup

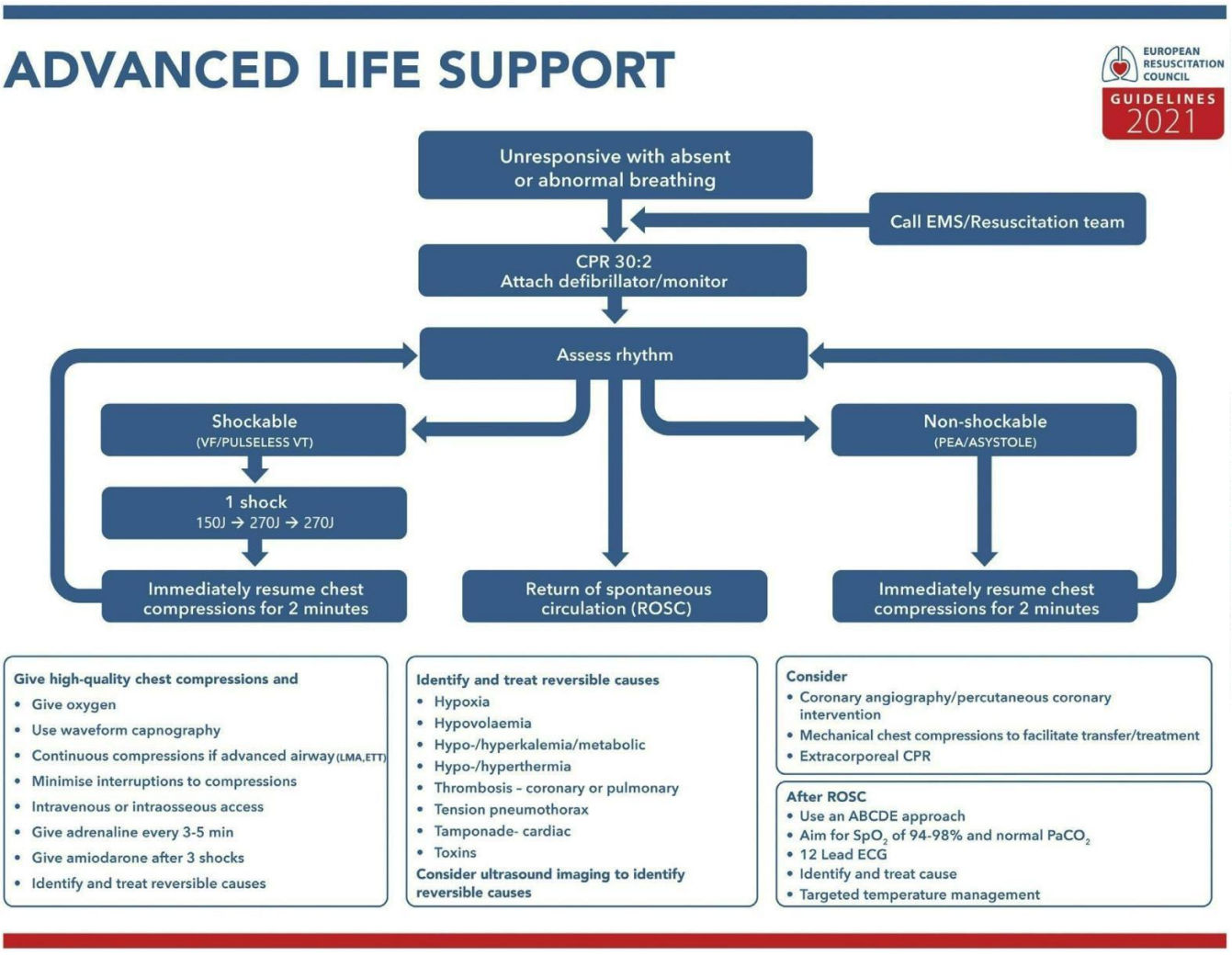
- ❖ Exclude Unconscious
- ❖ Proceed to Exposure

Exposure
Consent,
Curtain,
Chaperone

- Quick head to toe / front and back / Examination for wounds, rashes, etc. Temperature

- ❖ Exclude Sepsis,
  Exclude Major Trauma
  (RTA/Assault/Fall more than 3ft, etc.)

Source: Major presentations in Medical Practice. ISBN 978-624-6246-12-9



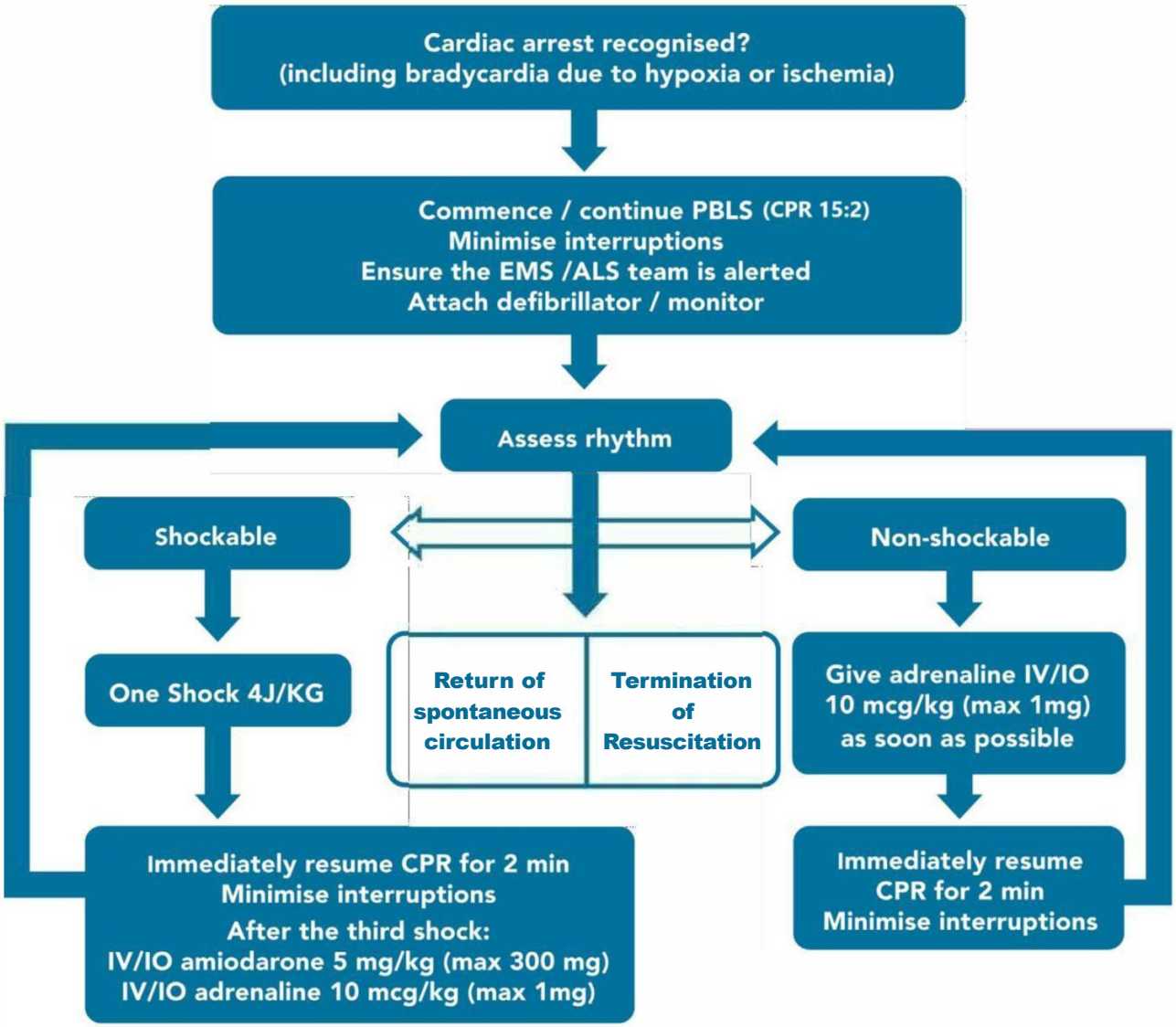
Advanced Life Support algorithm. ABCDE airway, breathing, circulation, disability, exposure CPR cardiopulmonary resuscitation; ECG electrocardiogram; EMS emergency medical system; PEA pulseless electrical activity; $PaCO_2$ arterial partial pressure of carbon dioxide; ROSC return of spontaneous circulation; SpO_2 arterial oxygen saturation; VF ventricular fibrillation; VT ventricular tachycardia.

Source: European Resuscitation Council Guidelines 2021 https://www.erc.edu/assets/documents/RESUS-8903-ALS.pdf

PAEDIATRIC ADVANCED LIFE SUPPORT

EUROPEAN RESUSCITATION COUNCIL GUIDELINES 2021

SAFE? - SHOUT 'HELP'



DURING CPR

- Ensure high-quality CPR 15:2: rate, depth, recoil
- Provide bag-mask ventilation with 100% oxygen (2-person approach)
- Avoid hyperventilation
- Vascular access (intravenous, intraosseous)
- Once started, give adrenaline every 3-5 min
- Flush after each drug
- Repeat amiodarone 5 mg/kg (max 150mg) after the 5th shock
- Consider an advanced airway and capnography (if competent)
- Provide continuous compressions when a tracheal tube is in place. Ventilate at a rate of 25 (infants) - 20 (1-8y) - 15 (8-12y) or 10 (>12y) per minute
- Consider stepwise escalating shock dose (max 8J/kg - max 360J) for refractory VF/pVT (:26 shocks)

CORRECT REVERSIBLE CAUSES

- Hypoxia
- Hypovolaemia
- Hyper/hypokalaemia, -calcaemia, -magnesemia; Hypoglycaemia
- Hypothermia - hyperthermia
- Toxic agents
- Tension pneumothorax
- Tamponade (cardiac)
- Thrombosis (coronary or pulmonary)

ADJUST ALGORITHM IN SPECIFIC SETTINGS (E.G. TRAUMA, E-CPR)

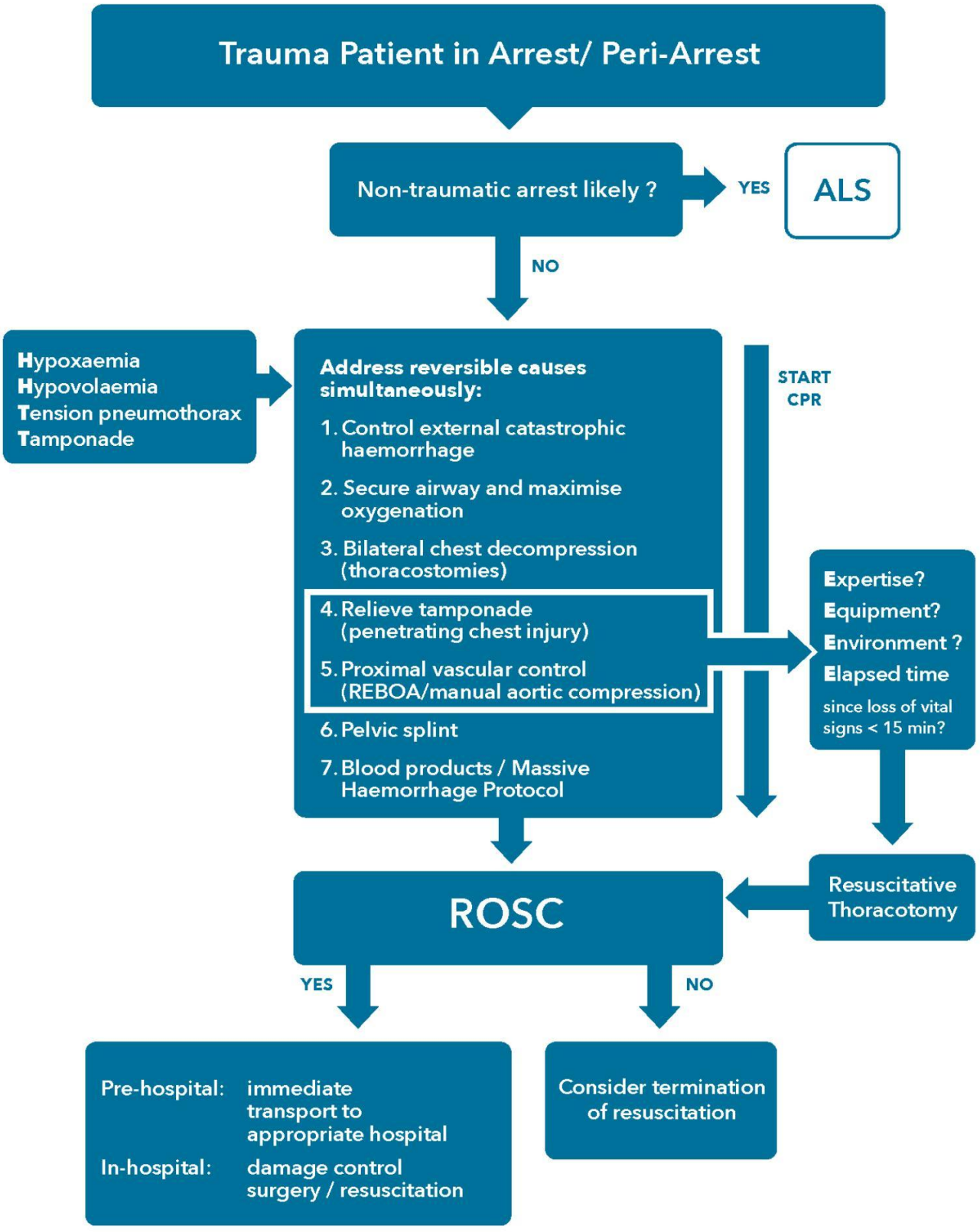
IMMEDIATE POST ROSC

- ABCDE approach
- Controlled oxygenation (SpO_2 94-98%)& ventilation (normocapnia)
- Avoid hypotension
- Treat precipitating causes

Source: European Resuscitation Council Guidelines 2021 https://www.erc.edu/assets/documents/RESUS-8903-ALS.pdf

TRAUMATIC CARDIAC ARREST/ PERI-ARREST ALGORITHM

EUROPEAN RESUSCITATION COUNCIL
GUIDELINES 2021



Source: European Resuscitation Council Guidelines 2021 https://cprguidelines.eu/assets/posters/Traumatic-Cardiac-Arrest-Peri-Arrest.pdf

Cardiac Arrest Scribing Chart

Date : ..... Scribing Nurse : Name: Signature:

Patient name: ..... Team Leader: Name: Signature:

BHT NO: .....

Time-Cycle	Rhythm	Pulse	Action			Airway	$ETCO_2$	CPR	Reversible causes		
			Shock	Drugs	Other	√/×			Cause	Ix	Correction
									Tension		
									Tamponade		
									Hypovolemia		
									Hypoxia		
									Hypokalemia		
									Hyperkalemia		
									Hypothermia		
									H+ / Acidosis		
									Toxins		
									Thrombosis Cardiac		
									Thrombosis Pulmonary		

Cardiac Arrest Scribing Chart

Date : ..... **Scribing Nurse :** Name: Signature:

Patient name: ..... **Team Leader:** Name: Signature:

BHT NO: .....

Time-Cycle	Rhythm	Pulse	Action			Airway	$ETCO_2$	CPR	Reversible causes			
			Shock	Drugs	Other	√/×			Cause	Ix	Correction	
9.46pm		-	-	-	-	-	-	√	**Tension**	Clinical USS [M]	Needle decompression-refer shock workup	-
9.47pm	VT	-	-	-							Finger Thoracostomy- refer shock workup	-
9.48pm	VT	-	150J	-		FM	-	√	**Tamponade**	POCUS	Pericardiocentesis-refer shock workup	-
9.50pm	VF	-	-					√			Thoracotomy	-
9.51pm	VF	-	270J			LMA	16	√	**Hypovolemia**	Cross match in bleeding	Warm IV fluids	√
9.53pm	VT	-	-					√			O group Blood	
9.54pm	VT		270J	IV Adrenaline 1mg IV Amiodarone 300mg		LMA	18	√			Group blood	
9.56pm	Sinus rhythm	+	-								Massive Transfusion	
											Arrest Bleeding	√
									Hypoxia	SpO2	O2 – Bag-valve-mask/LMA-bag-valve/ET-bag-valve	√
									Hypokalemia	VBG	KCL-**Rapid replacement:** Initial infusion of 2 mmol/min for 10 minutes Followed by 10mmol over 5-10 minutes. Slow correction afterwards .	-
									Hyperkalemia	VBG	1.Calcium-IV 10% Calcium Gluconate 30ml -Use large IV access and give as fast bolus 2.Insulin–Dextrose- IV 50% glucose 50 ml as a rapid bolus. Followed by 10% glucose infusion at 50ml/ hour for 5 hours if pre-treatment BG < 7.0 mmol/L 3.Salbutamol 10 – 20 mg nebulised	-
									Hypothermia	Temp	Barehugger	-
											Rewarming – Warm IVF Bladder-Irrigation	-

Time-cycle	Rhythm	Pulse	Action			Airway	ETCO2	CPR			Reversible causes	-
			Shock	Drugs	Other	√/x			Cause	Ix	Correction	
									H+ / Acidosis	VBG	NaHCO3- • Dose: 50 ml of an 8.4% solution IV • Consider in shockable and non-shockable rhythms for cardiac arrest associated with pH< 7.1 or hyperkalaemia or tricyclic overdose.	-
									Toxins	Drug chart/Anaphylaxis	Antidote-Refer management of poisoning. Anaphylaxis management	-
									Thrombosis Cardiac	ECG POCUS	PCI	-
											Thrombolysis-Refer thrombolysis protocol	√
									Thrombosis Pulmonary	POCUS/ ECG DVT signs	Anticoagulation- S/C Enoxaparin 1mg/kg. Refer shock alogrithm	-
											Thrombolysis-Refer shock alogrithm .	-

Anaphylaxis

Anaphylaxis?

A = Airway **B** = Breathing **C** = Circulation **D** = Disability **E** = Exposure

Diagnosis – look for:

- Sudden onset of Airway and/or Breathing and/or Circulation problems[1]
- And usually skin changes (e.g. itchy rash)

Call for HELP

Call resuscitation team or ambulance

- Remove trigger if possible (e.g. stop any infusion)
- Lie patient flat (with or without legs elevated)
  - A sitting position may make breathing easier
  - If pregnant, lie on left side

Give intramuscular (IM) adrenaline[2]

Inject at **anterolateral aspect** – middle third of the thigh

- Establish airway
- Give high flow oxygen
- Apply monitoring: pulse oximetry, ECG, blood pressure

If no response:

- Repeat IM adrenaline after 5 minutes
- IV fluid bolus[3]

If no improvement in Breathing or Circulation problems[1] despite TWO doses of IM adrenaline:

- Confirm resuscitation team or ambulance has been called
- Follow REFRACTORY ANAPHYLAXIS ALGORITHM

1. Life-threatening problems

Airway
Hoarse voice, stridor

Breathing
↑work of breathing, wheeze, fatigue, cyanosis, SpO_2 <94%

Circulation
Low blood pressure, signs of shock, confusion, reduced consciousness

2. Intramuscular (IM) adrenaline
Use adrenaline at 1 mg/mL (1:1000) concentration

Adult and child >12 years:	500 micrograms IM (0.5 mL)
Child 6-12 years:	300 micrograms IM (0.3 mL)
Child 6 months to 6 years:	150 micrograms IM (0.15 mL)
Child <6 months:	100–150 micrograms IM (0.1–0.15 mL)

The above doses are for IM injection **only**.
Intravenous adrenaline for anaphylaxis to be given **only by experienced specialists** in an appropriate setting.

3. IV fluid challenge
Use crystalloid

Adults:	500–1000 mL
Children:	10 mL/kg

Source: Resuscitation Council UK Guidelines 2021 https://www.resus.org.uk/sites/default/files/2021-04/Anaphylaxis%20algorithm%202021.pdf

Resuscitation Council UK

GUIDELINES 2021

Refractory anaphylaxis

No improvement in respiratory or cardiovascular symptoms despite 2 appropriate doses of intramuscular adrenaline

Establish dedicated peripheral IV or IO access

Seek expert[1] help early
Critical care support is essential

Give rapid IV fluid bolus
e.g. 0.9% sodium chloride

&

Start adrenaline infusion
Adrenaline is essential for treating all aspects of anaphylaxis

Give IM* adrenaline every 5 minutes until adrenaline infusion has been started
*IV boluses of adrenaline are not recommended, but may be appropriate in some specialist settings (e.g. peri-operative) while an infusion is set up

Give high flow oxygen
Titrate to SpO_2 94–98%

Monitor HR, BP, pulse oximetry and ECG for cardiac arrhythmia
Take blood sample for mast cell tryptase

Follow local protocol
OR

Peripheral low-dose IV adrenaline infusion:
- 1 mg (1 mL of 1 mg/mL [1:1000]) adrenaline in 100 mL of 0.9% sodium chloride
- Prime and connect with an infusion pump via a dedicated line

DO NOT 'piggy back' on to another infusion line
DO NOT infuse on the same side as a BP cuff as this will interfere with the infusion and risk extravasation

- In both adults and children, start at 0.5–1.0 mL/kg/hour, and **titrate according to clinical response**
- Continuous monitoring and observation is mandatory
- ↑↑BP is likely to indicate adrenaline overdose

Continue adrenaline infusion and treat ABC symptoms
Titrate according to clinical response

[1]Intravenous adrenaline for anaphylaxis to be given only by experienced specialists in an appropriate setting.

A = Airway

Partial upper airway obstruction/stridor: Nebulised adrenaline (5mL of 1mg/mL)

Total upper airway obstruction:
Expert help needed, follow difficult airway algorithm

B = Breathing

Oxygenation is more important than intubation
If apnoeic:
- Bag mask ventilation
- Consider tracheal intubation

Severe/persistent bronchospasm:
- Nebulised salbutamol and ipratropium with oxygen
- Consider IV bolus and/or infusion of salbutamol or aminophylline
- Inhalational anaesthesia

C = Circulation

Give further fluid boluses and titrate to response:
Child 10 mL/kg per bolus
Adult 500–1000 mL per bolus
- Use glucose-free crystalloid (e.g. Hartmann's Solution, Plasma-LaLrgyetev®o)lumes may be required (e.g. 3–5 L in adults)

Place arterial cannula for continuous BP monitoring

Establish central venous access

IF REFRACTORY TO ADRENALINE INFUSION
Consider adding a second vasopressor **in addition** to adrenaline infusion:
- Noradrenaline, vasopressin or metaraminol
- In patients on beta-blockers, consider glucagon

Consider extracorporeal life support

- Start chest compressions early
- Use IV or IO adrenaline bolus (cardiac arrest protocol)
- Aggressive fluid resuscitation
- Consider prolonged resuscitation/extracorporeal CPR

Source: Resuscitation Council UK Guidelines 2021 https://www.resus.org.uk/sites/default/files/2021-04/Anaphylaxis%20algorithm%202021.pdf

Hypoxia

Non-CO_2 retainer < 92%, CO_2 retainer (Chronic lung disease) < 88%

- Try to achieve saturation targets within minutes
- Reduce RR within 1 hour

Targets

- 94-98% - non-CO_2 retainer
- 88-92% - CO_2 retainer

Start with assessment of RR

- RR < 10 → BBVM + IPPV
- RR > 10

Basic Oxygenation	&	Basic Ventilation

- NRBM 10-15 l/min

- Prop up (Provided BP Normal)
- Suggestive of COPD/Asthma → Nebulization
- Suggestive of HF → IV Frusemide if SBP> 90

- Next -

Hypoxia Corrected		Hypoxia Not Corrected

Move to Circulation

Exclude other **major presentations**

- Correct BP Refer Shock Guideline
- Refer to the Guide on escalation of respirator support and initiate HFNO/NIV/IPPV

Treat the cause simultaneously (Refer SOB Workup)

- Acute Asthma
- Anaphylaxis
- Pneumonia
- COPD Exacerbation
- Pulmonary Embolism
- Pneumothorax
- Interstitial Lung Disease
- Pleural Effusion
- ACS
- Acute Pulmonary Edema
- DKA
- Sepsis
- Anemia

Source: Major presentations in Medical Practice. ISBN 978-624-6246-12-9

Guide for escalation of respiratory support

Targets

RR < 25

SpO2- 94%-98% non-CO2 retainer, 88-92% in CO2 retainers (HCO3 30 or more on the VBG)

Timing to achieve targets

Saturation-within minutes

RR- within hours

Parameter									
Respiratory rate, work of breathing		Normal	⇑	⇑	⇑⇑		⇑⇑⇑	⇑⇑⇑	⇓
Saturation		Normal	Normal	⇓	⇓		⇓	⇓	⇓
PCO_2		Normal	⇓	⇓	Normal		⇑	⇑⇑	⇑⇑⇑
Impression		No respiratory failure	**Impending respiratory failure**	**Early Type 1 respiratory failure**	**Late Type 1 respiratory failure**		**Early Type 2 respiratory failure**	**Late Type 2 respiratory failure**	**Near fatal type 2 respiratory failure**
Support	Basic Ventilatory Support	Prop up if BP normal, Nebulize if Rhonchi IV Frusemide if evidence of acute pulmonary oedema	Prop up if BP normal, Nebulize if Rhonchi IV Frusemide if evidence of acute pulmonary oedema	Prop up if BP normal, Nebulize if Rhonchi IV Frusemide if evidence of acute pulmonary oedema	Prop up if BP normal, Nebulize if Rhonchi IV Frusemide if evidence of acute pulmonary oedema		Prop up if BP normal, Nebulize if Rhonchi IV Frusemide if evidence of acute pulmonary oedema	Prop up if BP normal, Nebulize if Rhonchi IV Frusemide if evidence of acute pulmonary oedema	Prop up if BP normal, Nebulize if Rhonchi IV Frusemide if evidence of acute pulmonary oedema
	Basic Oxygenation	Nil	FM 5-10L/min	NRBM 10-15/L/min Follow early advanced therapy	NRBM 10-15/L/min Follow early advanced therapy	NRBM 10-15/L/min Follow early advanced therapy	NRBM 10-15/L/min Follow early advanced therapy	NRBM 10-15/L/min Follow early advanced therapy	NRBM 10-15/L/min Follow early advanced therapy	Ambu ventilation with 100% O2+ nasal cannula
	Advanced Ventilation + Advanced Oxygenation			+/- HFNC 60L/min	HFNC 60L/min	CPAP/BiPAP	HFNC 60L/min (If NIV is contraindicated)	BiPAP Single limb Maximum O2 flush	BiPAP dual limb/ IPPV Maximum o2 flush	NOV Dual limb/ IPPV
	Type of ventilation	Negative pressure spontaneous	Negative pressure spontaneous	Negative pressure spontaneous	Negative pressure spontaneous	Positive pressure spontaneous	Negative pressure spontaneous	Positive pressure spontaneous	Positive pressure spontaneous	Spontaneous / mandatory positive pressure ventilation
Key problem			SOB	Hypoxia	Hypoxia		Hypoxia		Hypoxia	Hypoxia
Treat the underlying cause		Preventive measures	Refer SOB workup	Hypoxia workup ⇑ Then SOB workup			Hypoxia workup → ⇑ Then SOB workup			

Source: Major presentations in Medical Practice. ISBN 978-624-6246-12-9

Indications for HFNC

- Type 1 respiratory failure
- Intubation (pre-oxygenation and apnoeic oxygenation)
- Post-extubation respiratory distress
- Do-not-intubate/ palliative settings
- Oxygen supply during invasive procedures, e.g. BAL, TOE, upper GI endoscopy

Contraindications for HFNC

- epistaxis
- base of skull fracture
- surgery to the nose or upper aero-digestive tract
- nasal obstruction; e.g. nasal fracture, tenacious secretions, tumour

Indications for NIV

- An acute exacerbation of chronic obstructive pulmonary disease (COPD) with a respiratory acidosis (pH 7.25-7.35)
- Type II respiratory failure secondary to chest wall deformity or neuromuscular disease Cardiogenic pulmonary oedema which is unresponsive to CPAP

Contraindications for NIV

- Facial burns/ trauma/ recent facial or upper airway surgery
- Vomiting
- Fixed upper airway obstruction
- The presence of an undrained pneumothorax

Relative contraindications include:

- Recent upper gastrointestinal surgery
- Severe co-morbidities
- Confusion/agitation/decreased level of consciousness
- Bowel obstruction

Targets

- RR< 25
- SpO2- 94%-98% non-CO2 retainer, 88-92% in CO2 retainers (HCO3 30 or more on the VBG)

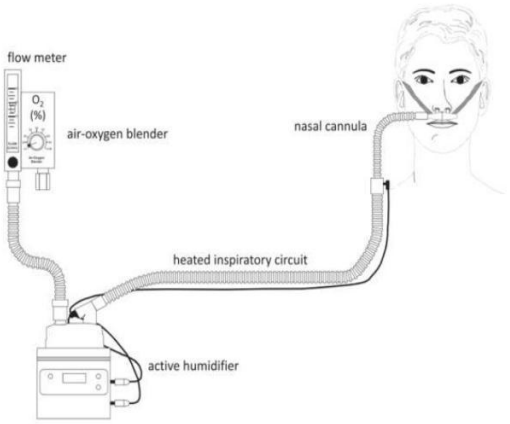
Timing to achieve targets

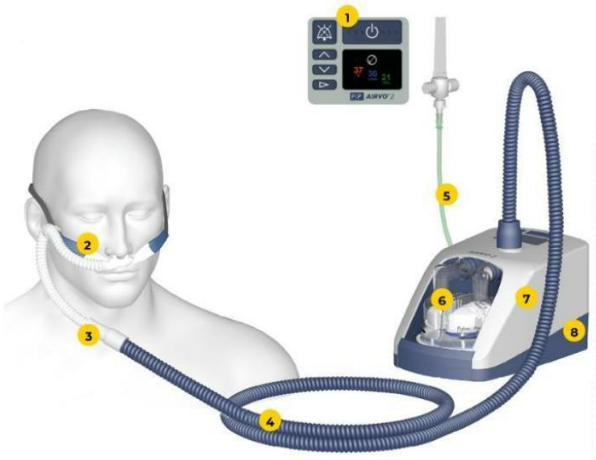
- Saturation-within minutes
- RR- within hours

Source: Major presentations in Medical Practice. ISBN 978-624-6246-12-9

High Flow Nasal Cannula (HFNC)

The high flow nasal cannula (HFNC) is a special device that can deliver a continuous flow of gas between 20 and 60 L/min and offers many physiological advantages that other oxygen delivery systems do not. It requires specific devices, (i.e. OptiFlow™, Airvo etc.) which blend compressed medical air and oxygen to deliver a continuous flow of 20-60 L/min through a warmed and humidified circuit.





How does it work? It's the Flow.

1. HFNC washes out nasopharyngeal dead space, improves oxygenation, decreases the work of breathing and respiratory rate.

- The high flow rate makes breathing more efficient because it washes out the dead space.
- When a patient is in distress, the wash out of dead space makes breathing more efficient because it significantly decreases the amount of re-breathed carbon dioxide and acts as a continuous reservoir of new gas.
- This ultimately decreases the respiratory rate and work of breathing in your patient.

2. HFNC delivers flow, not pressure like CPAP or BiPAP, but the flow can generate an estimated 2-5 cm H_2O of PEEP.

- Even these low levels of upper airway pressure can increase the functional residual capacity (FRC) and lung recruitment

3.HFNC can match your distressed patient's inspiratory flow, high-flow nasal cannula can deliver near 100% FiO2—more than a NRB can.

- HFNC is a better oxygen delivery and respiratory support device than the standard non-rebreather oxygen mask, venturi-mask, and simple low flow nasal cannula in a hypoxic patient.

Source: Major presentations in Medical Practice. ISBN 978-624-6246-12-9

- In respiratory distress, a patient's inspiratory flow and minute ventilation are much higher than the 15 L/min flow of oxygen from a non-rebreather mask.
- This means with each breath room air is being inhaled along with the supplemental oxygen, ultimately decreasing the total FiO_2 being delivered to your patient.
- HFNC can better match the inspiratory flow and minute ventilation of most patients to deliver a consistent amount of oxygen and less inhaled ambient room air

1. **Heat and humidification make the high flow tolerable and probably helps with secretion clearance.**
    - Patients are able to tolerate the high flow rates from a HFNC because of heating and humidification. Prior to reaching the patient's nose, the air can be humidified to 100% and warmed to body temperature.
    - This both improves patient comfort and preserves mucociliary function.
    - It improves secretion management and can reduce re-intubation related to upper airway obstruction.
    - It can also decrease the amount of energy the patient expends heating and humidifying inspired air.
    - **Don't set it and forget it; increase the flow to match your patient's distress.**
    - Beware of the patient on 60 L/min of flow and 100% FiO_2 who remains in respiratory distress! This patient is failing despite a tremendous amount of support from the high flow device and will need escalation of respiratory support to NIV.

2. **HFNC is effective at pre-oxygenation and apneic oxygenation during an intubation attempt.**
    - Leave the HFNC cannula in place throughout induction and laryngoscopy, as the continuous high flow promotes apneic gas exchange.
    - If the patient is already being treated with a HFNC, our practice is to leave it in place with maximal flow and FiO_2 during induction and laryngoscopy.

3. **Similarly, in a patient with a difficult airway who requires an awake fiberoptic intubation, consider initiation of HFNC while preparing to intubate.**
    - For an urgent orotracheal intubation with a patient sitting upright, this approach offers pre-oxygenation while the proceduralist readies equipment and applies topical anesthetic to the mouth and glottis.
    - The nasal cannula does not obstruct the proceduralist and offers respiratory support during the awake intubation.

Source: Major presentations in Medical Practice. ISBN 978-624-6246-12-9

High Flow Machine Setup

Steps

1. Preparation of Breathing Circuit & Chamber/Nasal Interface

1. **Water Chamber Preparation:**
    - Fill the sterile water into the water chamber up to the lower level of the black line around the chamber.
    - Fit the connector into the water chamber to bridge the machine.
    - Insert the water chamber into the machine.
2. **Water Bag Setup:**
    - Prepare a sterile water bag and connect the tube attached to the water chamber.
3. **Breathing Circuit Connection:**
    - Connect the breathing circuit (tube) to the machine.
4. **Nasal Cannula Selection:**
    - **Criteria for Selection:**
        - The nasal cannula should occlude 50% of the nostrils.
        - The nasal cannula should meet the prescribed flow rate.
    - **Flow Ranges for Nasal Cannulas (L/min):**
        - **Adults:**
            - Small (Orange): 10–50
            - Medium (Blue): 10–60
            - Extra Large (Green): 10–60
        - **Juniors:**
            - Small (Red): 2–8
            - Medium (Yellow): 2–20
            - Large (Purple): 2–20
            - Extra Large (Green): 2–25
5. **Final Connection:**
    - Attach the selected nasal cannula to the breathing circuit (tube).

Source: Major presentations in Medical Practice. ISBN 978-624-6246-12-9

2. Machine Settings

1. **Power On the Machine:**
    - Turn on the machine.
2. **Mode Selection:**
    - Set the mode based on the patient group:
        - **Junior:** 2–25 L/min
        - **Adult:** 10–60 L/min
    - Long-press the triangle button for 3 seconds to select the mode.
3. **Temperature Setting:**
    - Unlock by pressing two arrow keys simultaneously.
    - Adjust the temperature:
        - **Junior:** 34°C
        - **Adult:** 37°C (recommended) — can increase by 34°C if needed.
4. **Flow Rate Setting:**
    - Unlock by long-pressing two arrow keys simultaneously.
    - Set the flow rate:
        - **Junior:** 2 × weight (kg) L/min
        - **Adult:** 30 L/min (above 30 L/min if needed).
5. **FiO_2 Setting:**
    - Adjust FiO_2 using the O_2 flow meter.

Final Note

Before connecting the nasal cannula to the patient:

- Run the machine for at least 5 minutes with room air only (do not supply O2).
- This practice is subject to the time of emergency.

Source: Major presentations in Medical Practice. ISBN 978-624-6246-12-9

Administration of NIV- BIPAP/CPAP

Continue basic ventilation and oxygenation support

- Ventilation
  i. Propped-up
  ii. Nebulize if suggestive of Asthma/COPD
  iii. If crepts+ & suggestive of heart failure -> IV Frusemide

- Oxygenation
  i. Face mask 5-10L/min
  ii. NRBM 10-15L/min

Re assess the patient RR and SpO2

if RR>25/min or SpO2 <94% or

SpO2 <88% in chronic CO2 retainers (HCO3 >30 in ABG/VBG)→ Consider escalation to High Flow Nasal Cannula (HFNC)/ NIV- CPAP-BIPAP

Starting BiPAP ventilation

1. Plug the machine
2. Connect the machine to high flow 25L oxygen flow meter(25-70L) and start 251 oxygen flow rate
3. Switch on the machine
4. Unlock the machine & go to settings and select options as mentioned below
   - Pathology- Normal
   - Mode - ST
   - IPAP-10
   - EPAP-5
   - Backup Rate – 15

5. Select the appropriate mask
   - If the mask is a vented mask can directly connect to the inspiratory limb.
   - If the mask is a non-vented mask connect additional ventilatory port to the mask before connecting to the inspiratory limb.
6. Run the Machine - Feel the gas flow coming out from the machine
   - Explain about Non-Invasive Ventilation to the patient.
7. Slightly remove the NRBM and fit the NIV mask.
   - Fit the mask tightly to reduce leak <25L/min
8. Keep tidal volume (TV) at 6-8ml/kg 7ml/kg
   - Adjust TV 7ml/kg by increasing AP (adjust IPAP by 1cm H20 increments - Correct ventilation with achieving the target TV.
9. After achieving target TV if SPO2 less than 94%
   - Increase FiO2 by increasing 02 flow rate above the 25L up to 701

Source: Major presentations in Medical Practice. ISBN 978-624-6246-12-9

- Increase EPAP by 1cmH20, Keep the same AP (Each 1cmH20 increment in EPAP should follow 1cmH20 increment in IPAP to maintain constant (try to maintain AP > 5cm H2O) (If the patient having obstructive lung disease (BA/COPD) never increase EPAP above 5cm H2O.)
- Increase I time (min/max)
- Increase fall time
- Decrease rise time.

10. Re assess the patient clinically after setup and arrange ABG/VBG one hour after starting NIV Target RR <25
    - SPO2 294
    - PCO2 <45

11. while maintaining SPO2294 If PCO2 245
    - Increase TV up to 8ml/kg
    - Decrease EPAP
    - Increase fall time.

12. Monitoring
    - Continuous monitoring ed SPO2, RR, PR and 3 lead ECG BP, TV every 5 min

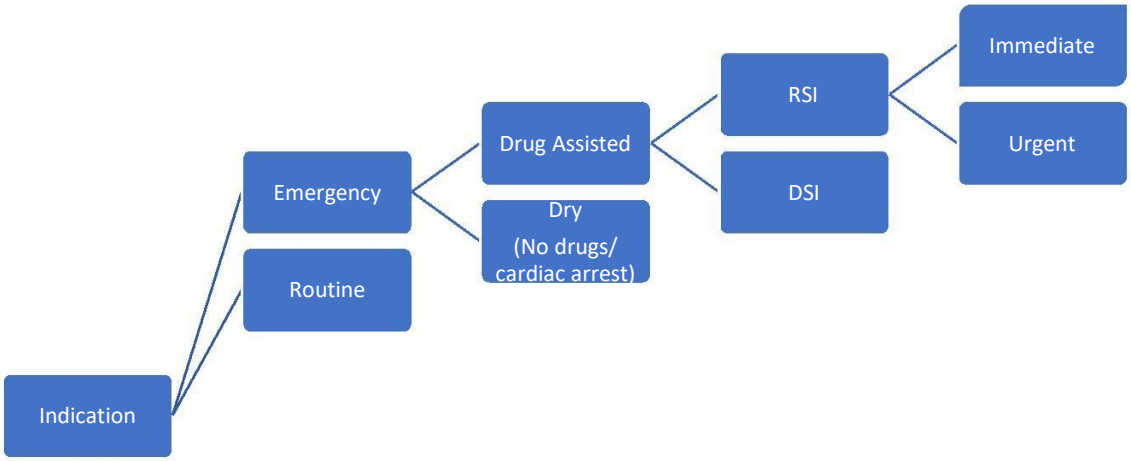
13. De-escalation of NIV support
    - Consider de-escalation when the patient is receiving tidal volumes exceeding 6-8 mL/kg with the given IPAP/EPAP settings, and there is clinical improvement with reduced work of breathing.
    - Begin by reducing oxygenation through a gradual decrease in EPAP.
    - Simultaneously decrease IPAP while maintaining a AP of >5 cmH2O.
    - Once EPAP is reduced to 5-7 cmH2O, continue decreasing IPAP further as tolerated.
    - Adjust the oxygen flow rate downward using the flow meter.
    - Transition to a non-rebreather mask (NRBM) with an oxygen flow rate of 10-15 L/min once the settings reach minimal levels (IPAP 10/ EPAP 5)

Source: Major presentations in Medical Practice. ISBN 978-624-6246-12-9

Intubation in the emergency room

1. Identify indication for intubation

   1.Keep airway patent and continue advanced ventilation with IPPV
   2.Patient with patent airway but requiring advanced respiratory support with IPPV according to escalation criteria.
   3.To keep airway protected in an unconscious/airway -threatened patient and continue advanced ventilation with IPPV



Immediate- Unable to provide basic ventilatory support e.g., Neck trauma, airway injury

Urgent- Encourage Resuscitation supported intubation, if low SPO2 and BP correct with O2 and IVF, inotropes.

2. Identify and treat reversible causes that may negate need for intubation

3. Continue basic and advance ventilatory support up to NIV

Basic Airway> Basic Ventilation> Advance Ventilation HFNC/NIV> Advance airway

4. Identify difficult airway with airway assessment (**LEMON**) and anticipate difficult intubation

- **Look**
- **Evaluate 3-3-2 rule**
- **Mallampati score 1,2,3,4**
- **Obstruction**
- **Neck mobility**

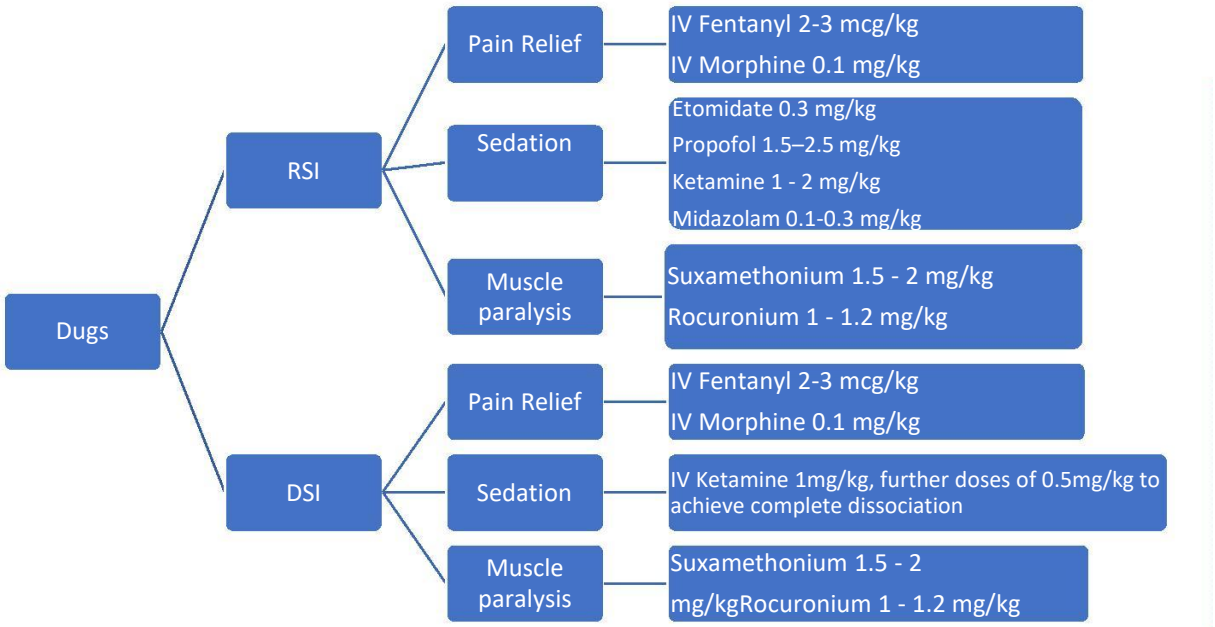
5. Preparation for RSI (**PEACH)**

5.1 Positioning- pre oxygenation and intubation

Source: Major presentations in Medical Practice. ISBN 978-624-6246-12-9

5.2 Equipment

- Monitoring- capnography, pulse oximeter, 3-lead ECG, non invasive BP
- Basic airway & other resuscitation equipment
- Advance airway equipment
- Equipment for failed intubation
- Drugs- induction, paralysis



5.3 Attach

Minimum standard monitoring

Two sources of oxygen- preoxygenation and apneic oxygenation- Ambu, HFNC, NIV

5.4 Checks

Intubation Check List (Annex 01)

Identify backup plans

AMPLE history

IV access with two functioning cannula, contralateral arm BP

ABCDE assessment, identify and treat HOP killers

5.5 Help and assign roles

6. Pre-oxygenation

7. Apnoeic oxygenation

8. Pretreatment if indicated

9. Induction agent and muscle relaxant in quick succession in precalculated doses

Source: Major presentations in Medical Practice. ISBN 978-624-6246-12-9

10. Cricoid pressure or BURP with loss of consciousness

11. laryngoscopy and proceed with intubation

Follow Plan A>B>C>D in difficult airway guideline (Annex 02)

Plan A: Position, Maneuver (BURP), Blade, View

- **Grade 1- just insert the tube**
- **Grade 2- Stillet**
- **Grade 3A- macoid blade**
- **Grade 3B- bougie, connector of size 2 tube**
- **Grade 4- Fiber optic laryngoscope/Video laryngoscope**

Plan B- LMA

Plan C- Face mask ventilation

Plan D- Difficult airway drill/ FONA (Annex 03)

No 10 blade, Bougie, size 6 ET tube

12. Confirm tracheal tube placement

- Hold tube in left hand
- Continue ambu ventilation by the assistant
- Inspect B/L symmetrical chest wall expansion
- Wave form capnography
- Five-point auscultation and confirm tube position with the right hand

13. Cricoid pressure removed

14. Secure tracheal tube with tape/tie

15. Post intubation review

- Reassess vitals using ABCDE- HR, BP, SPO2, RR
- Tube- Lip level 22-24 women, 24-26 men, check cuff pressure ideal is to use a pressure gauge
- Use a suction catheter to clear material form proximal airway
- Continue monitoring
- Request a chest xray to examine position of tube

16. Prepare dugs for sedation and paralysis

- Sedation- midazolam
- Paralysis- long-acting neuromuscular blocking agent if indicated e.g.; vecuronium
- Analgesia- morphine

17. Prepare and connect to the ventilator

- Check the tubing
- Plug
- Ventilator settings

Source: Major presentations in Medical Practice. ISBN 978-624-6246-12-9

- Connect to the ventilator
- first correct **ventilation** (MV= TV * RR), then correct **oxygenation**

1. Select mode
   Obstructive- SIMV volume control
   Restrictive/ Paralysed- SIMV pressure control (VC cause more volume & baro trauma)
2. TV- 6-8ml/kg
3. RR
   - Restrictive- Rate that achieved targeted SPO2 and capno, usually around 25-30
   - Obstructive- 8-12/min

4. PEEP
   - Restrictive- start at 5 and increase
   - Obstructive- 0 to less than 5

5. Trigger low- both restrictive and obstructive

6. PS- 10

7. Adjust RR while keeping TV at 6ml/kg until capno or HR come to target (capno 35-45, HR<120)

8. FIO2 – 100% initially

9. Increase oxygenation

Obstructive-

- Increase FIO2
- low PEEP 0 to 5
- Reduce I time and increase E time
- Increase rise time
- Increase fall time

Restrictive-

- Increase FIO2
- Increase PEEP
- Increase I time and decrease E time
- Reduce rise time
- Reduce fall time

18. Assess ongoing need for paralysis

- Continue paralysis- head injury, post cardiac arrest, massive fluid shifts causing sever acidosis
- Off paralysis all other situations

Source: Major presentations in Medical Practice. ISBN 978-624-6246-12-9

19. Look for spontaneous breaths, keep the trigger low

- No spontaneous breaths- further reduce trigger
- Spontaneous breaths present- Adjust trigger until patient takes 25% spontaneous breaths (8) out of total breaths (32) and 75% mandatory breaths (24) out of total breaths.

20. ABG in one hour

- CO2 ⬆ - increase TV and RR
- CO2 normal- cont same settings
- CO2 ⬇ - Start weaning

21. Weaning off from a ventilator

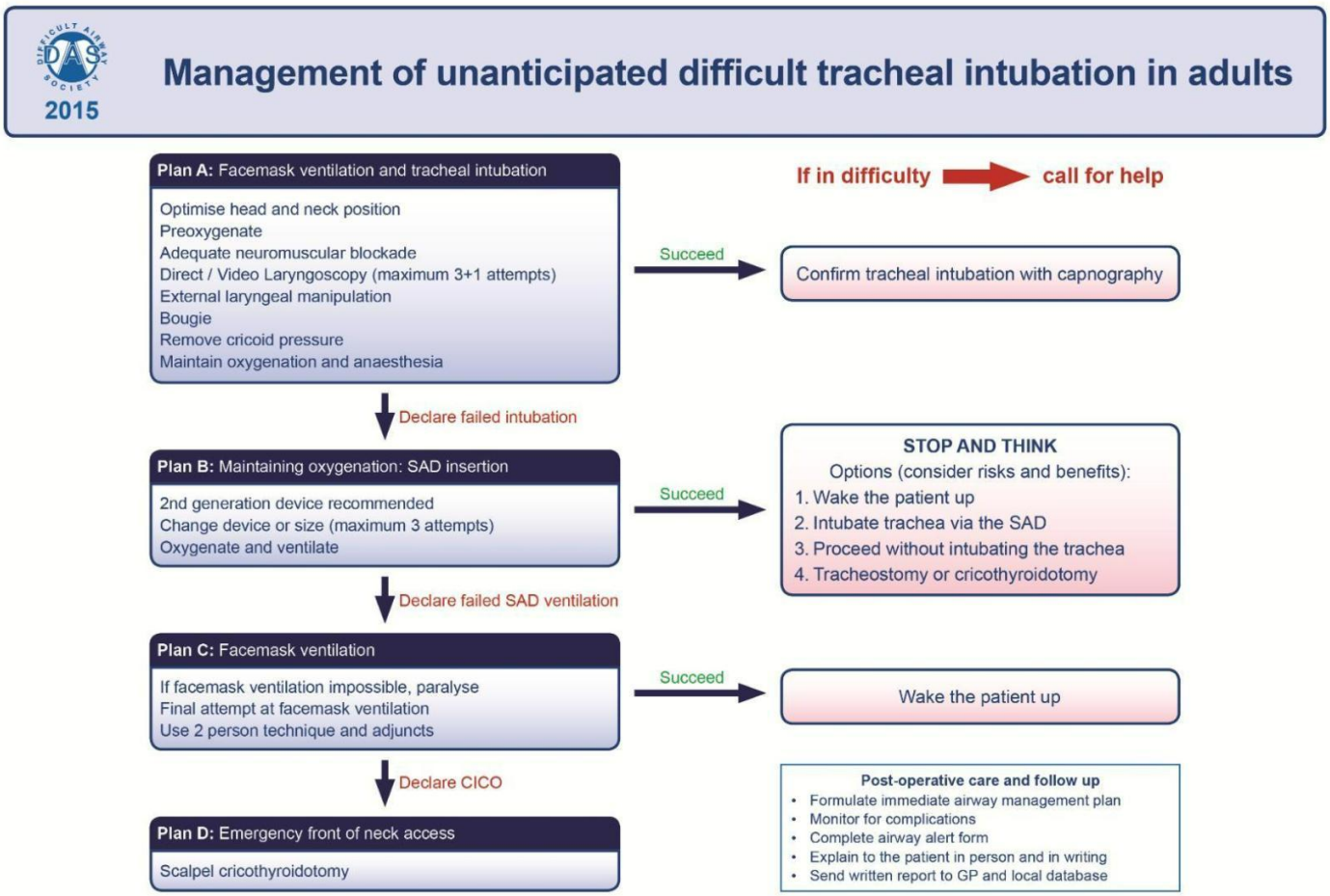
- Reduce FIO2 first- blood Pao2>600 reduce FIO2 100%> 80% >60%, keep at 60%
- Reduce mandatory breaths 20>15
- Increase spontaneous breaths 8>10>15
- Adjust TV with PS
- Total RR<25, 75% spont breaths, 25% mandatory breaths out of total breaths extubate and change to NIV

22. Spontaneous BiPAP in ventilator or NIV

- Dual limb vented mask
- PS 10, PEEP 5, PIP 15
- IPAP 15, EPAP 5 >> IPAP 10/ EPAP 5 >> HFNC >> NRBM

Source: Major presentations in Medical Practice. ISBN 978-624-6246-12-9

Annex



Source: Major presentations in Medical Practice. ISBN 978-624-6246-12-9

Failed intubation, failed oxygenation in the paralysed, anaesthetised patient

2015

CALL FOR HELP

Continue 100% O_2
Declare CICO

Plan D: Emergency front of neck access

Continue to give oxygen via upper airway
Ensure neuromuscular blockade
Position patient to extend neck

Scalpel cricothyroidotomy

Equipment: 1. Scalpel (number 10 blade)
2. Bougie
3. Tube (cuffed 6.0mm ID)

Laryngeal handshake to identify cricothyroid membrane

Palpable cricothyroid membrane
Transverse stab incision through cricothyroid membrane
Turn blade through 90° (sharp edge caudally)
Slide coude tip of bougie along blade into trachea
Railroad lubricated 6.0mm cuffed tracheal tube into trachea
Ventilate, inflate cuff and confirm position with capnography
Secure tube

Impalpable cricothyroid membrane
Make an 8-10cm vertical skin incision, caudad to cephalad
Use blunt dissection with fingers of both hands to separate tissues
Identify and stabilise the larynx
Proceed with technique for palpable cricothyroid membrane as above

Post-operative care and follow up
- Postpone surgery unless immediately life threatening
- Urgent surgical review of cricothyroidotomy site
- Document and follow up as in main flow chart

This flowchart forms part of the DAS Guidelines for unanticipated difficult intubation in adults 2015 and should be used in conjunction with the text.

Source: Major presentations in Medical Practice. ISBN 978-624-6246-12-9

Management of decompensated shock
SBP < 90 mmHg

Targets
SBP > 90 mmHg
MAP >60 mmHg
UOP – 0.5ml/kg/hr

Patient with adequate UOP, normal HR, signs and symptoms of euvolemia, even if SBP <90-70 consider as No Shock eg; CLCD

STEP 01

Heart Rate
- Low → Follow Bradyarrhythmia Algorithm Cause Correction
- High/ Normal → Sinus Tachycardia
  - Yes → Correct the cause, proceed to step 02
  - No → Follow Tachyarrhythmia Algorithm

STEP 02

Exclude the possibility of Anaphylaxis → Follow Anaphylaxis and Allergy Algorithm

STEP 03

Exclude obstructive shocks
1. Tension Pneumothorax
2. Cardiac Tamponade
3. Pulmonary Embolism

→ Follow Obstructive Shock Management Algorithm

STEP 04

Lung Examination

Dry Lung

Hypovolemic
Cardiogenic shock
Distributive
Neurogenic
Correct cause simultaneously- see next page

0.9% NaCl or Hartman's 250cc bolus

Reassess in 5 min, lungs, and BP

SBP < 90 mmHg

Dry Lung

Repeat 250 cc boluses until target BP, provided lungs are dry (Be cautious about dengue)

Wet Lung

Noradrenaline Infusion, titrate to achieve the target BP

SBP > 90 mmHg

No further boluses, continue monitoring

Wet Lung

- B/L Crepitations
- POCUS B/L B lines > 3
- **Hypovolemic -** Leptospirosis with acute pulmonary edema/ AKI
- **Cardiogenic LVF**
- **Distributive** - Sepsis with wet lung

Noradrenaline Infusion
0.05 – 0.5 mcg/kg/min via infusion pump
Titrate to achieve the target BP
Lepto with AKI, arrange urgent HD

STEP 05

Find the cause and treat → Follow Shock Management Algorithms
- Hypovolemic Shock
- Cardiogenic Shock
- Distributive Shock

Source: Major presentations in Medical Practice. ISBN 978-624-6246-12-9

Causes for shock with Dry Lungs

(No crepitations, POCUS B/L B lines<3)

Refer relevant guide lines when giving fluids

- **Hypovolaemia**

- Vomiting/diarrhoea/dehydration/poor oral intake

-Dengue critical phase

-Burns

-Leptospirosis without acute pulmonary oedema/ Pulmonary involvement

-DKA/HHS

-Traumatic/non-traumatic bleeding

-Drug overdose-eg CCB/Beta blocker

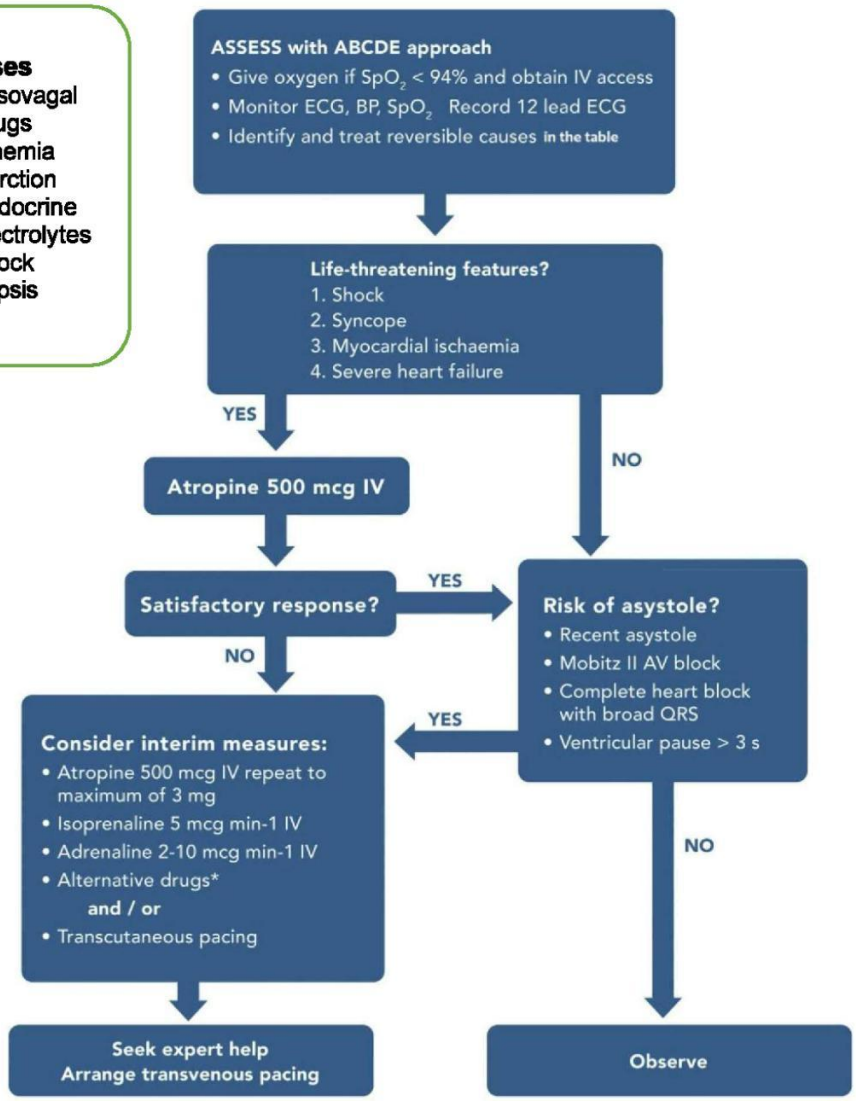
-Endocrine-Addisonian crisis-suspect if history of steroid use, hypoglycaemia

-Myxoedema coma

- **Cardiogenic RVF**
- **Distributive shock**- sepsis with dry lung
- **Neurogenic shock**-start with IVF and start inotropes early

BRADYCARDIA

Causes
V- vasovagal
D- drugs
I -ischemia
I -infarction
E -endocrine
E- electrolytes
S -shock
S -sepsis



"Alternatives include.

1. Aminophylline
2. Dopamine
3. Glucagon (il bradycardia is caused by beta-blocker
4. Or calcium channel blocker overdose)
5. Glycopyrrolate can be used instead of atropine

Trans cutaneous pacing

1. Connect 3 lead ECGs in defibrillator
2. Rotate to fixed pacing mode
3. Select pacing rate 60
4. Pacing output 1mA/kg
5. Conscious sedation with midazolam/ fentanyl
6. Start pacing button
7. Look at the spike (circuit is complete now)
8. Look for capture beats
9. Increase output up to desired heart rate
10. Look for mechanical capturing with pulse
11. Once desired heart rate achieved (HR 60 bpm), with a pulse rate of 60 bpm add another 5mA and continue pacing
12. Try to identify cause and correct it

Source: European Resuscitation Council Guidelines 2021 https://www.erc.edu/assets/documents/RESUS-8903-ALS.pdf

TACHYCARDIA ALGORHYTHM (with pulse)

if sinus tachycardia - correct the cause only
If not sinus tachycardia - follow the algorithm

SVT	VT/Acute AF
100-150 J	150 J
270 J	270 J
270 J	270 J

Assess with ABCDE approach

- Give oxygen if appropriate and obtain IV access
- Monitor ECG, SPO2,12LEAD ECG
- Identify and treat reversible causes in the table

Life threatening features?

1. Shock
2. Syncope
3. Myocardial ischaemia
4. Severe heart failure

YES

Synchronised DC shock up to 3 attempts

- Amiodarone 300mg IV over 10-20min and repeat shock

followed by;

- Amiodarone 900mg over 24hrs

Causes
D-drugs
I-infection
I-ischemia
E-electrolytes
E-endocrine
S-shock
S-sepsis
S- stimulants

UNSTABLE

STABLE
Seek expert help

NO

Is the QRS narrow (< 0.12 s)?

BROAD QRS
Is QRS regular?

IRREGULAR

Possibilities include:

- **Atrial fibrillation with bundle branch block** treat as for irregular narrow complex
- **Polymorphic VT** (e.g. torsades de pointes) give magnesium 2 g over 10 min

REGULAR

If VT (or uncertain rhythm):

- Amiodarone 300 mg IV over 10–60 min
- then 900mg over 24hrs

If previously confirmed **SVT with bundle branch block**: give adenosine as for regular narrow complex tachycardia

NARROW QRS
Is QRS regular?

REGULAR

Vagal manoeuvres

If ineffective:

- Give Adenosine (if no pre-excitation)
  - 6 mg rapid IV bolus
  - If unsuccessful, give 12 mg
  - If unsuccessful, give 18 mg
- Monitor ECG continuously

Normal sinus rhythm restored??

YES

Probable re entry PSVT

- Record 12 lead ECG
- If recurs give adenosine again and consider choice of antiarrhythmic prophylaxis

NO

Seek expert help

- Possible atrial flutter Control rate eg. beta blocker

IRREGULAR

Probable atrial fibrillation:

- Beta blockers or diltiazem
- Consider digoxin or amiodarone if evidence of heart failure
- Anticoagulated if duration>48hrs

❖ *In acute AF before electrical cardioversion, give iv heparin 5000 U bolus*
❖ *In stable SVT/VT if failed chemical cardioersion, go for electrical cardioversion*

Indications for Admission

1. SVT/ AF/Atrial flutter rate not controlled (>110) medically and needs anticoagulation before DC cardioversion.
2. Untreated underlying cause; eg: ischaemia/ electrolyte imbalances/ severe dehydration.
3. Ventricular tachycardias/ frequent ectopics eg: bigeminy/trigemini.

When to discharge

1. Known AF/SVT/Atrial flutter- rate controlled medically or DC cardioversion in an anticoagulated patient and excluded ischemia/ corrected electrolyte imbalances and dehydration.

Obstructive Shock

Obstructive shock			
	Tension Pneumothorax	Cardiac Tamponade	Pulmonary embolism
History	• Sudden onset SOB • Chest pain • History of trauma • History of chronic lung disease	• Trauma to chest	• Sudden onset pleuritic chest pain • Shortness of Breath • Risk factors for DVT • **Modified Well Score** for probability assessment
Examination	• Tachypnoea, air hunger • SBP < 90mmHg • Tachycardia • Unilateral Hyper-resonance and reduced air entry • Tracheal deviation • Engorged neck veins	• Increased JVP • Muffled heart sounds • SBP <90mmHg • Tachypnoea • B/L air entry present	• Tachypnoea • Fine basal crepitation • Low SPO2 • Tachycardia • Loud P2
Investigation/ Adjuncts	• SPO2 – reduced • POCUS Lung- Absent lung sliding Barcode sign Cardiac- Fixed dilated IVC Hyperdynamic RV with systolic collapse	• ECG- Small complexes in ECG • POCUS- Fluid in Pericardium Fixed dilated IVC RV diastolic collapse LV hyperdynamic	• ABG – Hypoxia Hypocapnoea, Respiratory alkalosis • ECG- Tachycardia, P pulmonale (lead II) Right axis deviation, RBBB S1Q3T3 • POCUS-RV dilation LV systolic collapse

Tension Pneumothorax- Management

- Require immediate decompression
  - Using either Large bore cannula 14G/ catheter
  - Or, Finger thoracostomy
- Followed by intercostal tube insertion

Needle decompression

STEP 1. Administer high-flow oxygen and ventilate as necessary.

STEP 2. Surgically prepare the site chosen for insertion.
For pediatric patients- the 2nd intercostal space midclavicular line
For adults- the 4th or 5th intercostal space anterior to the midaxillary line

STEP 3. Anesthetize the area if time and physiology permit.

STEP 4. Insert large bore cannula 14G or catheter with a Luer-Lok 10 cc syringe attached into the skin. Direct the needle just over the rib into the intercostal space, aspirating the syringe while advancing.
(Adding 3 cc of saline may aid the identification of aspirated air.)

STEP 5. Puncture the pleura.

STEP 6. Remove the syringe and listen for the escape of air when the needle enters the pleural space to indicate relief of the tension pneumothorax. Advance the catheter into the pleural space.

STEP 7. Stabilize the catheter and prepare for chest tube insertion.

Finger Thoracostomy / Intercostal Tube Insertion

STEP 1. Position the patient with the ipsilateral arm extended overhead and flexed at the elbow.

STEP 2. Widely prep and drape the lateral chest wall, include the nipple, in the operative field.

STEP 3. Identify the site - **4th or 5th intercostal space, between the anterior and midaxillary lines**. (This site corresponds to the level of the nipple or inframammary fold.)

STEP 5. Inject the site liberally with local anesthetic from skin down to parietal pleura.

While the local anesthetic takes effect, use the thoracostomy tube to measure the depth of insertion. Premeasure the estimated depth of chest tube by placing the tip near the clavicle with a gentle curve of chest tube toward incision. Evaluate the marking on the chest tube that correlates to incision, ensuring the sentinel hole is in the pleural space. Often the chest tube markings will be at 10 14 at the skin, depending on the amount of subcutaneous tissue (e.g., obese patients).

STEP 6. Make a 2- to 3-cm incision parallel to the ribs at the predetermined site, and bluntly dissect through the subcutaneous tissues just above the rib.

STEP 7. Puncture the parietal pleura with the tip of the clamp while holding the instrument near the tip to prevent sudden deep insertion of the instrument and injury to underlying structures. Advance the clamp over the rib and spread to widen the pleural opening.

Air or fluid will be evacuated.

With a sterile gloved finger, perform a finger sweep to clear any adhesions and clots. (i.e., perform a finger thoracostomy)

STEP 8. Place a clamp on the distal end of the tube. Using either another clamp at the proximal end of the thoracostomy tube or a finger as a guide, advance the tube into the pleural space to the desired depth.

STEP 9. Look and listen for air movement and bloody drainage; "fogging" of the chest tube with expiration may also indicate tube is in the pleural space.

STEP 10. Remove the distal clamp and connect the tube thoracostomy to an underwater seal apparatus with a collection chamber.

STEP 11. Secure the tube to the skin with heavy, nonabsorbable suture.

STEP 12. Apply a sterile dressing and secure it with wide tape.

STEP 13. Obtain a chest x-ray.

STEP 14. Reassess the patient.

Cardiac Tamponade – Management

- Definitive management is to perform an emergency thoracotomy or sternotomy by a qualified surgeon.

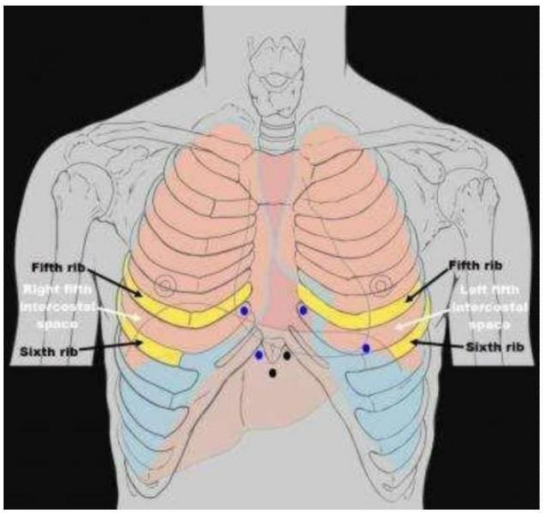
- In the absence of the facilities for emergency surgery, pericardiocentesis should be performed as a temporary measure to drain the collection in the pericardial space using either land-mark technique or ultrasound guidance.

Emergent needle pericardiocentesis

- Patient positioning
  The semi recumbent position at a 30- to 45-degree angle is preferred. The supine position is an acceptable alternative.

- Apply supplemental oxygen, Ensure IV access and connect to a cardiac monitor and continuous pulse oximetry.
  If time permits, insert a NG tube to decompress the stomach and decrease the risk of gastric perforation.

- Identify the anatomic landmarks **(xiphoid process, 5th and 6th ribs)**
  The most commonly used sites are **the left sternocostal margin or the subxiphoid approach**.



Pericardiocentesis needle insertion sites. The subxiphoid and the left sternocostal margin are the most commonly used sites (black dots).

Adapted image from Wikimedia Commons/Patrick J Lynch, Medical Illustrator, and C Carl Jaffe, MD, Cardiologist.

- Use the antiseptic solution to clean and surgically prepare the subxiphoid area, and then apply sterile drapes to delineate the surgical site.

- Infiltrate local anesthetic solution from skin to deeper tissues.

- Puncture the skin using a No. 11 blade scalpel (between the xiphoid process and the left sternocostal margin).

- Use a long 18-22G needle (spinal/epidural needle) connected to a 20mL/ 50mL syringe with 5 mL of normal saline.

- Insert the spinal needle through the skin incision at a 45-degree angle to the abdominal wall and 45 degrees off the midline sagittal plane and direct it toward the left shoulder.

(If time permits, needle insertion should be performed under direct ultrasonographic guidance. An ECG chest lead can be attached to the needle: ST elevation or ventricular ectopic signal contact with ventricle)

- Slowly advance the spinal needle up to a depth of 5 cm, while applying negative pressure on the syringe until a return of fluid is visualized, cardiac pulsations are felt, or an abrupt change in the ECG waveform is noted.

  If the ECG waveform shows an injury pattern (ST segment elevation), then slowly withdraw the needle until the pattern returns to normal.

- Withdraw as much fluid as possible; when the syringe is filled, stabilize the needle against the patient's torso, remove the filled syringe, and replace it with another one. An alternative setup to replacing syringes is using a 3-way stopcock and intravenous tubing, which allows the physician to aspirate pericardial fluid into the syringe and, after turning the stopcock, eject the fluid into a basin or a collection bag. As pericardial fluid is aspirated, the needle may move closer to the heart, and if an injury pattern appears on the ECG waveform, then the needle should be slowly withdrawn.

- Remove the needle when fluid can no longer be aspirated.

Pulmonary Embolism (PE)- Management

- Apply supplemental oxygen to maintain SPO2 >90%
- Consider High flow nasal oxygen/ NIV/ invasive ventilation if unstable
  (HFNO/ NIV is preferred over invasive ventilation)
- Cautious volume loading - ≤500mL IV 0.9% NaCl or Ringer's Lactate over 15-30min.s
  In patients with normal-low CVP/ underfilled IVC
- Use vasopressors (IV Noradrenaline- 0.1micrograms/ kg/ min)
  +/- inotropes (IV Dobutamine 2-20micrograms/ kg/ min)
- Start parenteral anticoagulation (LMWH) in patients with high or intermediate clinical probability of PE while awaiting the results of diagnostic tests
- Reperfusion with systemic thrombolytics or percutaneous catheter directed treatment or surgical embolectomy are the definitive treatment
- Systemic thrombolytics –

  rtPA i) 100mg over 2 hours

  ii) 0.6mg/kg (max 50mg) over 15min-
  (This is the accelerated regimen for rtPA in pulmonary embolism; it is not officially approved, but it is sometimes used in extreme haemodynamic instability such as cardiac arrest)
- If thrombolytic therapy is administered during a cardiac arrest, cardiopulmonary resuscitation should be continued for at least 60_90 min before terminating resuscitation attempts

<u>Contraindications for thrombolysis</u>

Absolute

- History of haemorrhagic stroke or stroke of unknown origin
- Ischaemic stroke in previous 6 months
- Central nervous system neoplasm
- Major trauma, surgery, or head injury in previous 3 weeks
- Bleeding diathesis
- Active bleeding

Relative

- Transient ischaemic attack in previous 6 months
- Oral anticoagulation
- Pregnancy or first post-partum week
- Non-compressible puncture sites
- Traumatic resuscitation
- Refractory hypertension (systolic BP >180 mmHg)
- Advanced liver disease
- Infective endocarditis
- Active peptic ulcer

Modified wells score

Features	Score (points)
Clinical signs and symptoms of DVT	3.0
No alternative diagnosis	3.0
Heart rate >100 beats/min	1.5
Immobilization ≥3 days or surgery in the previous 4 weeks	1.5
Previous DVT or PE	1.5
Hemoptysis	1.0
Malignancy with active treatment in the past 6 months or under palliative care	1.0
Pretest clinical probability	
PE unlikely	≤4.0
PE likely	>4.0

PE = Pulmonary embolism, DVT = Deep vein thrombosis

Hypovolaemic Shock

Hypovolaemic shock				
	Haemorrhagic	Dehydration	Burns	Dengue
History	• History of trauma- RTA/ Assault	• Vomiting/ diarrhoea • Reduced intake	• History of burn	• Fever • Arthralgia • Myalgia. • Retro orbital pain • RHC Pain
Examination	• Visible bleeding • Fractures • Tense abdomen • Pallor • Tachycardia • SBP <90mmhg	• Sunken eyes • Dry mucus membranes • Reduced UOP • Thirst • Tachycardia • SBP may be normal	• Burns involving large surface area **(>20%TBSA)** • Tachycardia • SBP may be normal	• Weak thready pulse • Narrow pulse pressure (<25mmhg) or SBP<90mmhg
Investigation/ Adjuncts	• POCUS (E-FAST) Free fluid in the lungs/ abdomen • Low Hb in ABG	BU-high VBG- DM/RBS HAGMA-DKA		• Increased PCV • POCUS- abdomen/lung Peri-cholecystic fluid, pleural effusion

Dehydration

WHO classification on dehydration

	Dehydration category		
	No Dehydration Fluid deficit- <50ml/kg (<5% of Body Weight)	**Some dehydration** Fluid deficit 50- 100ml/kg (5-10% of B.W)	**Severe dehydration** Fluid deficit >100ml/kg (>10% of B.W)
General	Well Alert	Restless Irritable	Lethargic Unconscious
Eyes	Normal	Sunken	Sunken
Thirst	Not thirsty	Thirsty drink eagerly	Drinks poorly
Skin turgor	Goes back quickly	Goes back slowly	Goes back slowly
CRFT	Normal	3-4 sec	>4 sec
Pulse volume	Normal	Normal- reduced	Weak/ thready
Pulse rate	Normal	Normal- increase	>100 or <60 bpm
UOP	Normal	Reduced	minimal

Management Algorithms

- No dehydration -> Go to management **Plan A**
  Replace the on-going losses + Maintenance
- Some dehydration -> Go to management **Plan B**
  Deficit correction + Replace the on-going losses + Maintenance
- Severe dehydration -> Go to dehydration **Plan C**
  Manage shock if present
  ⇩
  Deficit correction + Replace the on-going losses + Maintenance

<table>
<tr><th>Plan A</th><th>Plan B</th><th>Plan C</th></tr>
<tr><td>Choice of fluid- ORS or
Salted drinks

(and plain water in addition)

Avoid commercially prepared fluids (ex: fruit juices, carbonated drinks, etc.)</td><td>Choice of fluid- ORS or
Salted drinks

(and plain water in addition)</td><td>• <u>If in shock</u>
IV/IO 0.9% NaCl 20ml/kg
↓
Repeat every 10 mins
Can repeat up to 60ml/kg
Until vital signs and mental status improve to normal</td></tr>
<tr><td>• <u>Replace on-going losses</u>

Replace losses with each stool

<2y – 50-100ml/stool
2-10y – 100-200ml/stool
>10y – as much as they drink</td><td>• <u>Deficit correction</u>

Calculation

75ml/kg in initial 4 hours</td><td rowspan="4">• <u>Deficit correction</u>
(Rapid IV rehydration)

IV Ringers lactate or Normal saline 100ml/kg

<u>In < 1y old</u>
Give 30ml/kg bolus within 1st hour (Can repeat if radial pulse is still weak)
Remaining 70 ml/kg within next 5 hours.

<u>>1year old</u>
Give 30 ml/kg within 30 mins (Can repeat till strong radial pulse is present)
Remaining 70 ml/kg within next 2.5 hours</td></tr>
<tr><td rowspan="3">• <u>Give maintenance fluid</u>
Calculation
In child-
for 24 hours
For 1st 10kg- 100ml/kg
For 2nd 10kg- 50ml/kg
Remaining –20ml/kg

In adult-
1.5ml/kg/hour</td><td>• <u>Replace on going losses</u>
As in Plan A</td></tr>
<tr><td>• <u>Give maintenance fluid</u>
As in Plan A</td></tr>
<tr><td rowspan="2">Assess every 15- 30 mins to confirm patient is taking the prescribed amount of fluid
↓
Assess after 4 hours
↓</td></tr>
<tr><td>• <u>Give maintenance fluid</u>
As in Plan A</td><td>• <u>Replace on going losses</u>
As in Plan A</td><td>Assess every 15- 30 mins till strong radial pulse is present
↓
Then 1 hourly
↓
After that 3- 6hours</td></tr>
<tr><td></td><td>Reassess dehydration –
If,
▪ No dehydration -> Plan A
▪ Some dehydration -> plan B
▪ Severe dehydration -> repeat plan C</td><td>Reassess dehydration –
If,
▪ No dehydration -> Plan A
▪ Some dehydration -> plan B
▪ Severe dehydration -> repeat plan C</td></tr>
</table>

Deangue Shock

Early detection of shock

In a patient with features of Dengue Haemorrhagic Fever,

- Compensated shock
  Circulatory failure manifested by narrow pulse pressure (less than or equal to 20mmHg).
- Decompensated shock
  Hypotension (SBP <90mmHg or reduction of SBP by >20% or mean BP <60mmHg)
- Profound shock
  Blood pressure and pulse is un-detectable

It is important to detect the patient before going into shock status (Pre-shockstage)

Symptoms suggestive of Pre-shock/Shock (from 3rd day of illness)

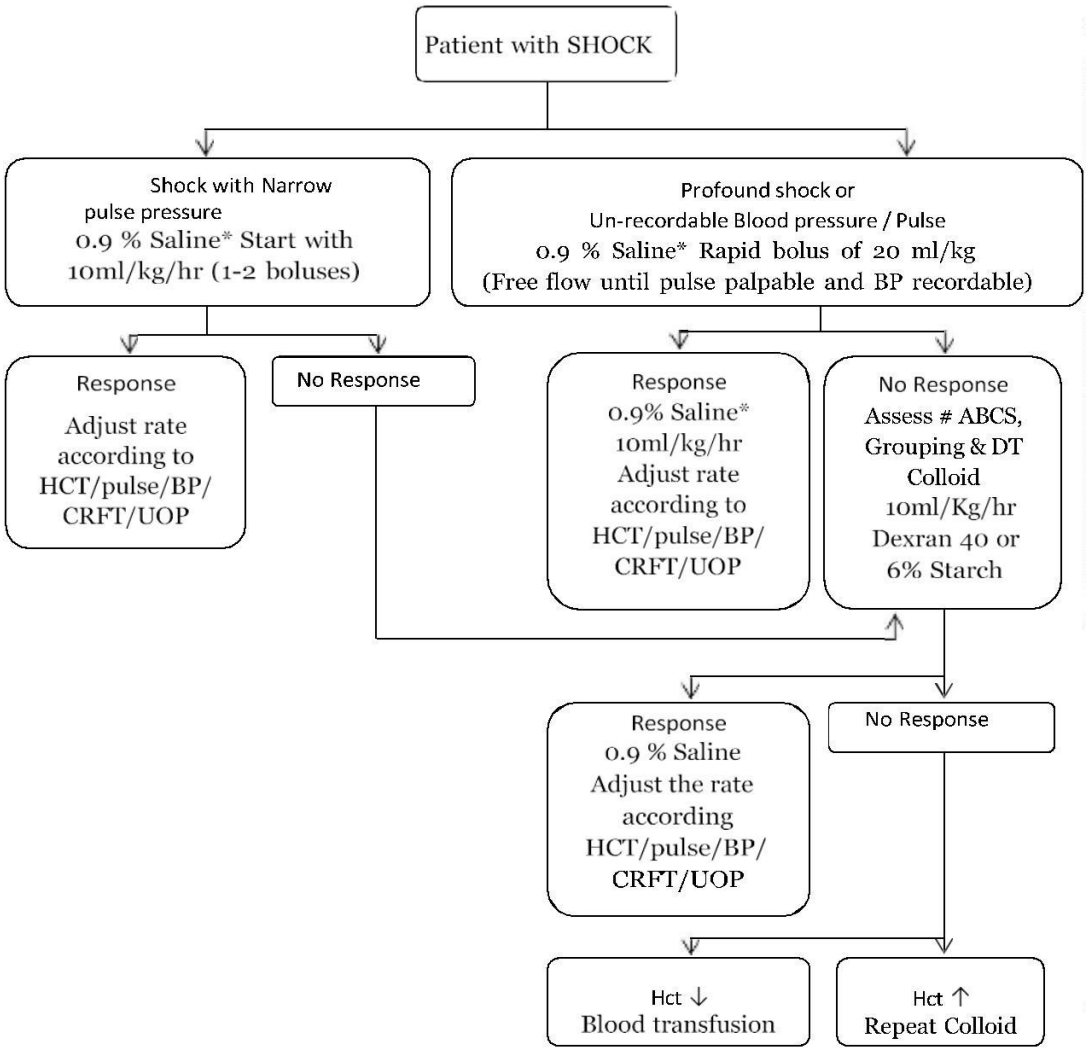
- Sweating
- Abdominal pain
- Persistent vomiting
- Restlessness / altered conscious level
- Postural dizziness
- Decreased urine output (OUP) (<0.5 ml/kg/hour)
- Calculate the urine output in ml/kg/hr., using the same weight used for fluid calculation.

Signs suggestive of Pre-shock/Shock (from 3rd day of illness)

- Cold extremities
- Prolonged capillary refill time >2 seconds
- Unexplained tachycardia
- Increasing diastolic pressure
- Narrowing of pulse pressure ≤20 mmHg
- Postural drop ≥20 mmHg of systolic blood pressure
- Hypotension (< 20% from patient's baseline or SBP<90mmHg if baseline not known or mean BP 60mmHg)
- Increased respiratory rate

▪ Dengue Shock Management– In Child

Figure: Algorithm on management of Shock in DHF



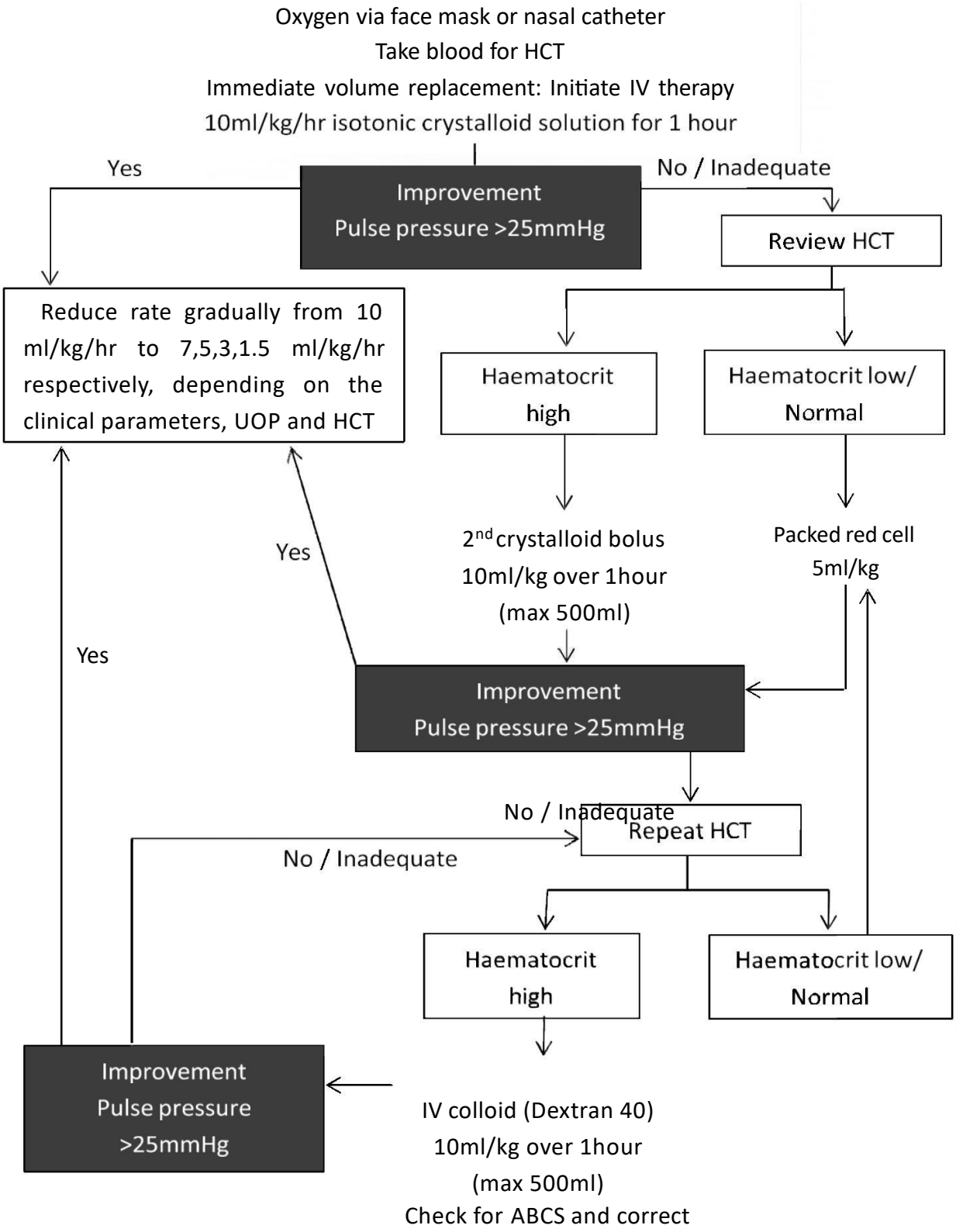
All patients in shock –

Call for help; ensure adequate oxygenation, Keep flat/head low

5 % dextrose in N Saline is a useful alternative to N Saline when available especially in patients who are likely be without any food intake for prolonged periods. In such patients assess blood sugar intermittently.

ABCS A- Acidosis B- Bleeding C- Calcium S- Sugar

SHOCK WITH NARROW PULSE PRESSURE (COMPENSATED SHOCK)

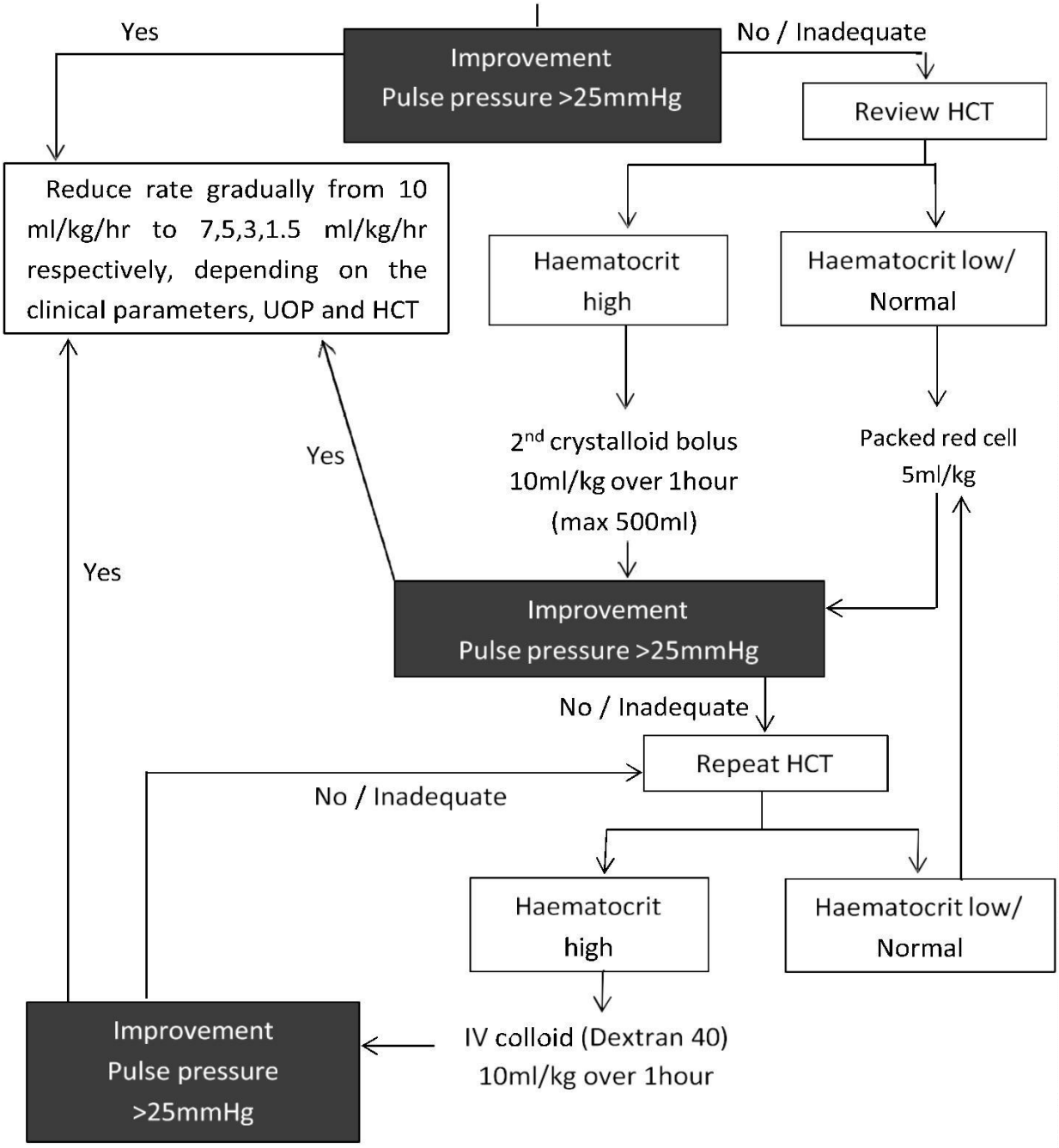


ABCS A- Acidosis B- Bleeding C- Calcium S- Sugar (refer 6.7)
Calculate the urine output in ml/kg/hr, using the same weight used for fluid calculation.

DECOMPENSATED OR PROFOUND SHOCK

Rapid bolus of 10ml/kg crystalloid

(Free flow until pulse palpable and BP recordable)



ABCS A- Acidosis B- Bleeding C- Calcium S- Sugar (refer 6.7)

Calculate the urine output in ml/kg/hr, using the same weight used for fluid calculation.

In all patients with shock –

Call for help; ensure adequate oxygenation, Keep flat/head low

Burns- Fluid Management

In contrast to resuscitation for other types of trauma in which fluid deficit is typically secondary to hemorrhagic losses, burn resuscitation is required to replace the ongoing losses from capillary leak due to inflammation.

- Fluid resuscitation is indicated for deep partial and full thickness burns larger than 20% TBSA.

- Choice of fluid- warmed crystalloid (Ringer's Lactate preferably).

- Calculation of fluid amount for 1st 24 hours- According to Parkland Formula (a modified version)

Adults:	2mL/ kg/ % TBSA
Children:	3mL/ kg/ % TBSA
Electric injury (all ages):	4mL/ kg/ % TBSA

- One half of calculated fluid is infused over 1st 8 hours **from the time of the incident**
- Second half is infused over next 16 hours

- UOP targets: 0.5 mL/kg/hr for adults and 1 mL/kg/hr for children weighing less than 30 kg

Management of the shocked patient

IV 0.9% NaCl rapid bolus (20mL/ kg, maximum 1L) - free flow till pulse is palpable.
Once the patient is haemodynamically stable, continue to manage according to the Parkland Formula.

Fluid amount used for initial resuscitation should be deducted from 1st 8hour fluid quota.

Burn Resuscitation Fluid and Target UOP by age and type of burn

Category of burn	Age and Weight	Adjusted fluid rates	Target UOP
Flame or Scaled	Adults and Older children (≥14 y)	2mL RL/ kg/ %TBSA	0.5mL/ kg/ hour 30-50mL/ hour
	Children (<14 y)	3mL RL/ kg/ %TBSA	1mL/ kg/ hour
	Infants and young children (≤30kg)	3mL RL/ kg/ %TBSA Plus 5% dextrose at maintenance rate	1mL/ kg/ hour
Electric Injury	All Ages	4mL RL/ kg/ %TBSA	1-1.5mL/ kg/ hour

RL- Ringer's Lactate, TBSA- Total Burn Surface Area

Cardiogenic Shock

	Cardiogenic shock (Acute Heart failure)
History	• Central chest pain with radiation • Shortness of breath • Autonomic symptoms • Altered mental status • Reduced UOP
Examination	• Sinus tachycardia, tachypnoea • SBP <90mmhg or Pulse pressure <20mmhg • B/L fine basal crepitations on auscultation • Cool peripheries, sweating • Jugular venous distention/hepatojugular reflex/oedema • Murmurs
Investigation/ Adjuncts	• ECG – ischemia, STEMI, arrhythmias • POCUS-Cardiac- Poor cardiac contractility and low EF In LV failure(common)-Dilated LV In RV failure- Dilated RV, small LV -Lung- Interstitial oedema- B lines

Cardiogenic Shock

Cardiogenic Shock is defined as a state of critical end organ hypoperfusion and hypoxia due to primary cardiac disorders.

Causes of Cardiogenic Shock

Severe depression of cardiac contractility

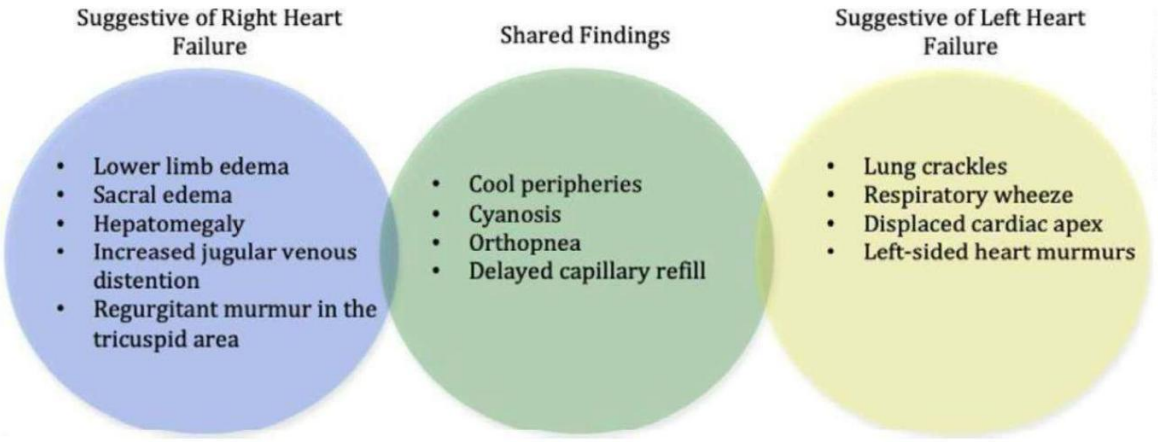
- **Unstable dysrhythmia – Refer Tachycardia algorithm or Bradycardia algorithm.**
- **Acute myocardial infarction (80%) – Acute LVF (anterior, lateral , Posterior , Inferior MI) Acute RVF (Inferior MI with right ventricular involvement)**
- Sepsis
- Myocarditis
- Myocardial contusion
- Cardiomyopathy
- Medication toxicity (e.g., β-blocker overdose, calcium channel–blocker overdose)

Mechanical complications

- Acute MR secondary to papillary muscle dysfunction or chordal rupture
- Ventricular septal defect
- Free wall rupture
- Right ventricular infarction
- Acute aortic insufficiency (aortic dissection)

Mechanical obstruction to forward blood flow

- Aortic stenosis
- Hypertrophic cardiomyopathy
- Mitral stenosis
- Left atrial myxoma
- Pericardial tamponade



JAHA

Management

Check heart rate - Manage unstable Tachyarrhythmias and Bradyarrhythmia If there's no features for unstable Tachyarrhythmias or Bradyarrhythmia - consider Ischemia.

Most important definitive intervention for acute cardiogenic shock due to ischemia is emergency revascularization.

Goals in ED- Airway stabilization
Improvement of myocardial pump function to maintain end-organ perfusion while arranging definitive care.

After stabilization, the patient should be transferred to a Centre with emergency cardiac revascularization facilities.

Air way & Breathing: Apply supplemental oxygen to maintain a SPO2 >90%
Monitor continuously for the need of ventilatory support
NIV may be useful.
(Beware of further deterioration of hypotension following positive pressure ventilation)

Circulation: Give IV crystalloid boluses (250-500mL), if there is RV infarction with hypotension **OR** no evidence of pulmonary congestion

IF there is pulmonary congestion **OR** no improvement with fluid boluses, start vasopressors +/- inotropes.

- 1st line- IV noradrenaline (0.1-1 μg/Kg/min, titrate to response) Can be combined with
- IV Dobutamine (10 μg/kg/ min, titrated up to 20 micrograms/ kg/ min)
  - If acute inferior MI with RV infarct consider fluid boluses (1st line therapy) for shock management reassess the fluid responsiveness. If not responding to fluids, consider IV noradrenaline. (2nd line therapy)

In apex hospital assess peripheral circulation: if it is warm start noradrenaline, if it is cold consider dobutamine equal or more than 10 mic/kg/min. At cluster level Always start Noradrenaline before starting Dobutamine.

Antiplatelets: Aspirin 300mg stat dose unless contraindicated.
Second antiplatelet- Clopidogrel 300-600mg stat dose
Irrespective of reperfusion strategy

Definitive treatment: Emergency coronary intervention (Primary PCI or CABG) is the preferred definitive treatment.
In the absence of facilities for coronary intervention thrombolytics should be considered

Distributive Shock

Distributive shock			
	Anaphylaxis	Sepsis	Neurogenic
History	• History of taking a known allergen • Past history of anaphylaxis • Cough/ wheeze/ difficulty of breathing • Abdominal pain	• Features suggestive of infection	• Trauma to cervical or upper thoracic spine • Spinal anaethesia • Toxins • Transvers myelitis • GBS
Examination	• Urticaria • Ronchi on auscultation • Flushed, Warm peripheries • SBP <90 mmhg	• Temperature >38°C or <36°C • Heart rate >90bpm • RR >20 or PaCO2 <32mmHg • SBP- <90mmHg	• Midline spinal tenderness • Autonomic dysfunction • Bradyarrhythmia • Warm extremities • Temp. dysregulation
Investigation/ Adjuncts	• Send blood for serum tryptase levels	• ABG- metabolic acidosis • Lactate ≥2 mmol/l	• NCCT Spine • POCUS- volume status assessment

Neurogenic Shock

- The joint committee of the American Spinal Injury Association and the International Spinal Cord Society proposed the definition of a neurogenic shock to be-

  General autonomic nervous system dysfunction that also includes symptoms such as orthostatic hypotension, autonomic dysreflexia, temperature dysregulation.

  A focal neurologic deficit is not necessary for the diagnosis of neurogenic shock.

- Neurogenic shock remains a diagnosis of exclusion in the traumatic patient

Causes of neurogenic shock

Trauma to cervical spine / upper thoracic spine
(commonest) Guillain Barre syndrome
Transverse myelitis
Spinal anaesthesia

Management

- Airway with C spine protection with a hard collar or manual in line stabilization
  Supplemental oxygen to maintain SPO2 >94%

- Breathing- may need ventilatory support

- Circulation- Fluid resuscitation with IV crystalloid 500ml- 1000ml
  Vasopressors +/- inotropes if blood pressure is not maintained with fluid
  only 1st line- IV Noradrenaline
  For refractory cases- IV Adrenaline

- IV Methyl prednisolone is not recommended

Definitive surgery for decompression may be required

Sepsis

Clinical Spectrum

Healthy → Localized infection → Sepsis → Shock due to Sepsis → Sepsis shock → MODS → Cardiac arrest

Diagnosis

Clinical suspicion of infection + NEWS score > 4

1 Hour Bundle

Management

3 OUT

01. Blood lactate > 4
02. Blood culture + relevant cultures (urine wound swab, sputum)
03. UOP

3 IN

1. IV crystalloids 30ml/kg within 1 hour (depending on the fluid responsiveness start with 250 ml bolus) assess lungs.
   If lungs dry, can give further 250 ml boluses up to 30ml/kg with assessing lungs.
   If lungs wet, start Noradrenaline 0.05 to 0.5 mcg/kg/min (target MAP > 65 mmHg)
2. IV empiric antibiotic therapy within 1 hour (Refer National Antimicrobial Guideline)
3. Oxygen (10-15L via NRBM)
4. Source control (I&D, wound debridement, etc.)

Source: Major presentations in Medical Practice. ISBN 978-624-6246-12-9

NHS
Brighton and Sussex University Hospitals
NHS Trust

Patient label

Clinical response to NEWS: National Early Warning Score triggers

ADULT PATIENT OBSERVATION CHART

NEWS 2 Score	3	2	1	0	1	2	3
Respiratory rate	**≤8**		9-11	12-20		21-24	**≥ 25**
SpO2 scale 1 (%)	**≤91**	92-93	94-95	**≥96**			
SpO2 scale 2 (%)	**≤83**	84-85	86-87	88-92 **≥93** on air	93-94 on oxygen	95-96 on oxygen	**≥** 97 on oxygen
Air or oxygen		Oxygen		Air			
Systolic BP (mmHg)	**≤90**	91-100	101-110	111-219			**≥** 220
Pulse (per min)	**≤40**		41-50	51-90	91-110	111-130	**≥** 131
Consciousness				Alert			C V P U
Temperature °C	**≤35.0**		35.1-36.0	36.1-38.0	38.1-39.0	**≥39.1**	

Only a registrar or consultant may alter the trigger or change choice of scale. This must be clearly documented in the patient's health records with rationale for decision or confirmed diagnosis and sign below.

Decision to use scale 2 if target range is 88-92% Signed:	Designation	Date

NEW Score	Frequency of monitoring	Clinical response
0	Minimum 12 hourly	• Continue routine NEWS monitoring with every set of obs • If patient is within first 24 hours of admission or step-down from ITU/HDU, 4 hourly observations are required regardless of the NEWS score
Total: 1-4	Minimum 4 - 6 hourly	• Inform registered nurse • Registered nurse decides whether increased frequency of monitoring and / or escalation of treatment is necessary
3 in single parameter	Minimum 1 hourly	• Registered nurse to inform medical team caring for the patient who will review and decide whether escalation of treatment is necessary
Total: 5 or more Urgent response threshold	Increased frequency to minimum of 1 hourly	• Registered nurse to inform nurse in charge of ward/unit • Registered nurse to **immediately** inform medical team caring for the patient (using SBAR) on call team for out of hours • Registered nurse to request urgent assessment by clinical team caring for patient who should plan goals of care and appropriate treatment escalation • Registered nurse to request urgent assessment by clinician or team with core competencies in the care of acutely ill patients. (Critical care outreach team (CCOT) or Clinical Site Manager (CSM) out of hours) • **Could this be sepsis; Complete sepsis screen**
Total: 7 or more Emergency response threshold	Continuous monitoring of vital signs every 15 minutes (using DASH monitor)	• Registered nurse to **immediately** inform medical team caring for the patient (using SBAR)- this should be at least at specialist registrar level. • Emergency assessment by a team with critical care competencies (Critical Care Outreach Team CCOT or CSM out of hours) Consider involving practitioners with advanced airway management skills • Inform CCOT (or CSM out of hours) • **Consider MET call 2222–** emergency assessment undertaken by MET team • Consider transfer of clinical care (for level 2/3 care) • Clinical care in an environment with monitoring facilities
Contacts: CCOT: **RSCH** Bleep 8495 0730-2000 7 days week **PRH** Bleep 6331 24 hours /day CSM: **RSCH** 8152 **PRH** 6014		

- However if you a concerned about the patient do not wait for the patient to **'trigger'**, escalate your concerns to the nurse in charge and medical team without delay.
- If you require a **rapid response** for a sudden acute change in the **patient's** condition use the MET team on 2222.
- **Any** changes to the above recommended frequency of monitoring must be clearly documented in the patients nursing care plan with rationale.

NEWS key	0	1	2	3	FULL NAME

		Score	
MONTH / YEAR	DATE		DATE
	TIME		TIME
A+B Respirations Breaths/min	≥25	3	≥25
	21–24	2	21–24
	18–20		18–20
	15–17		15–17
	12–14		12–14
	9–11	1	9–11
	≤8	3	≤8
A+B SpO_2 Scale 1 Oxygen saturation (%)	≥96		≥96
	94–95	1	94–95
	92–93	2	92–93
	≤91	3	≤91
SpO_2 Scale 2† Oxygen saturation (%) Use Scale 2 if target range is 88–92%, eg in hypercapnic respiratory failure. † ONLY use Scale 2 under the direction of a Consultant or Registrar.	≥97 on O_2	3	≥97 on O_2
	95–96 on O_2	2	95–96 on O_2
	93–94 on O_2	1	93–94 on O_2
	≥93 on air		≥93 on air
	88–92		88–92
	86–87	1	86–87
	84–85	2	84–85
	≤83%	3	≤83%
Air or oxygen?	A=Air		A=Air
	O_2 L/min	2	O_2 L/min
	Device		Device
C Blood pressure mmHg. Score uses systolic BP only	≥220	3	≥220
	201–219		201–219
	181–200		181–200
	161–180		161–180
	141–160		141–160
	121–140		121–140
	111–120		111–120
	101–110	1	101–110
	91–100	2	91–100
	81–90	3	81–90
	71–80	3	71–80
	61–70	3	61–70
	51–60	3	51–60
	≤50	3	≤50
C Pulse Beats/min	≥131	3	≥131
	121–130	2	121–130
	111–120	2	111–120
	101–110	1	101–110
	91–100	1	91–100
	81–90		81–90
	71–80		71–80
	61–70		61–70
	51–60		51–60
	41–50	1	41–50
	31–40	3	31–40
	≤30	3	≤30
D Consciousness. Score for NEW onset of confusion (no score if chronic)	Alert		Alert
	Confusion	3	Confusion
	V	3	V
	P	3	P
	U	3	U
E Temperature °C	≥39.1°	2	≥39.1°
	38.1–39.0°	1	38.1–39.0°
	37.1–38.0°		37.1–38.0°
	36.1–37.0°		36.1–37.0°
	35.1–36.0°	1	35.1–36.0°
	≤35.0°	3	≤35.0°
NEWS TOTAL			TOTAL
	Monitoring frequency		Monitoring
	Escalation of care Y/N		Escalation
	Blood Glucose		Blood G.
	Pain score 0-10		Pain score
	Initials		Initials
	Designation		Designation

NEWS ≥5: THINK SEPSIS, REMEMBER URINE OUTPUT, PROMPT ESCALATION.

NEWS action summary chart

If NEWS2 ≥ 5 screen for sepsis

Please document action taken as a result of a change in patient NEWS.

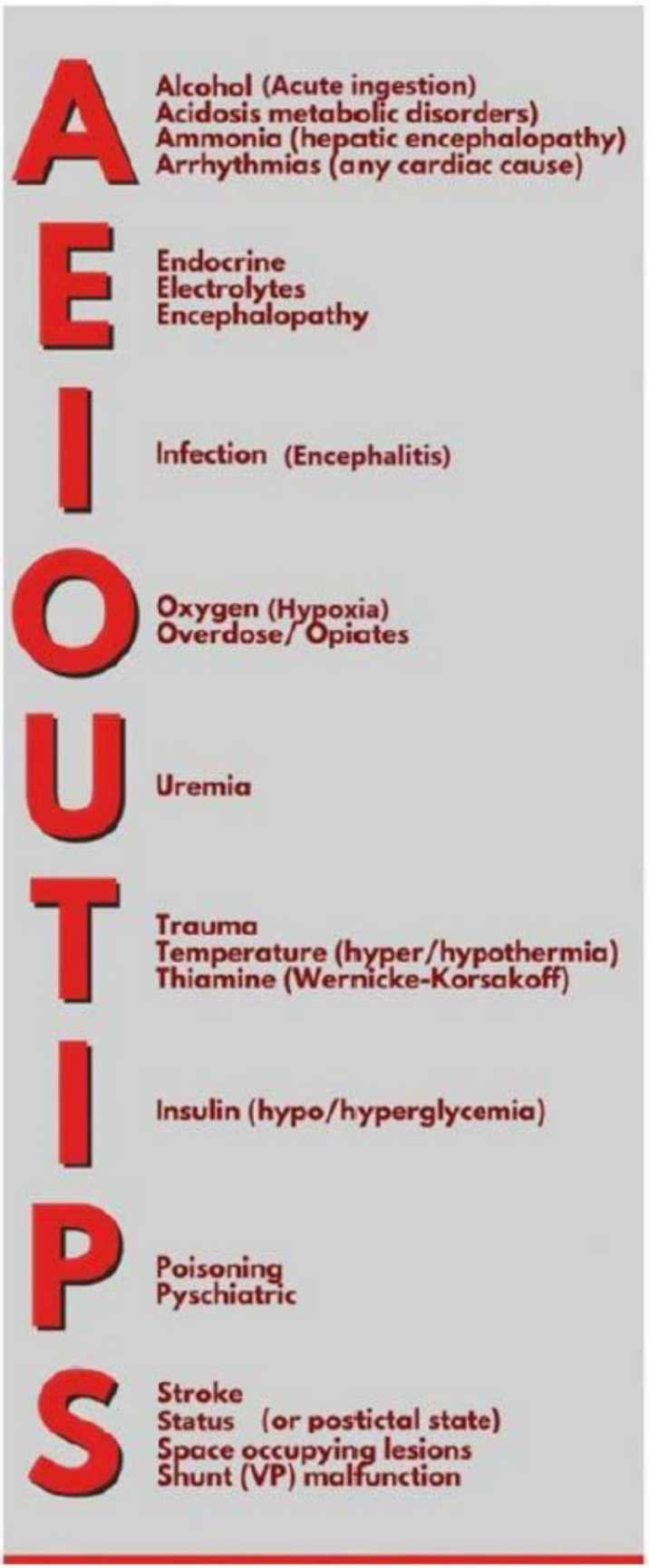
Date	Time	NEWS	Action	Reassess-ment time	Is the action working?	Signature

Codes for recording oxygen delivery on the NEWS2 observation chart	
A (breathing air)	RM (reservoir mask)
N (nasal cannula)	TM (tracheostomy mask)
SM (simple mask)	CP (CPAP mask)
V (Venturi mask and percentage eg.g V24, V28, V35, V40, V80	H (humidified oxygen and percentage eg H28, H35, H40, H60
NIV (patient on NIV system)	OTH (other, please specify.....)

Unconscious Patient

GCS<- 13
AVPU scale V- Follow Confusion workup
P/U- Follow Unconscious workup

Differential Diagnosis of an Unconscious Patient



Differential diagnosis of an unconscious patient

1. Alcohol:

Check for history of alcohol use

Physical signs (odor, tremors)

Bedside investigations

- Breathalyser (quantitative measured of breath alcohol level)
- BSL (hypoglyceamia)
- Blood gas (hyperlactaemia)
- Ketones (alcoholic ketoacidosis – teds to occur in poorly nourished chronic alcohol consumers a few days after a binge)

Laboratory investigations

- Ethanol level (does not exclude co-existant causes of altered mental state)
- High osmolar gap (severe acute intoxication)
- LFTs, lipase (if abdominal pain)
- Paracetamol level (if suspected self-harm)
- Abnormalities proportional to severity of chronic use: electrolyte abnormalities, anaemia, coagulopathy

Imaging

- CT Brain: low threshold for CT brain if suspected trauma or failure of altered mental state to improve over 2-4 hours

Management of acute ethanol intoxication

Resuscitation

- Seek and treat life threats
- Airway compromise due to decreased level of consciousness
- Airway opening manoeuvres and adjuncts, suction, close observation
- Intubation may be required to keep airway protected in an unconscious/airway - threatened patient and continue advanced ventilation with IPPV.
- Ventilatory support if respiratory depression or aspiration
- Hypoglycaemia (due to severe ethanol intoxication)
- Coexistent life-threats (e.g. GI haemorrhage, trauma)

Supportive care and monitoring

- Thiamine 300mg IV
- Adequate hydration
- Replace electrolytes and vitamins
- Manage behavioral disturbance (verbal de-escalation, chemical +/- physical restraint if indicated)
- Commence an alcohol withdrawal chart

Seek and treat underlying causes and complications

- Consider coexistent disorders (e.g. Occult head injury, coingestion)
- Screen for chronic alcohol problems and complications

Source: Major presentations in Medical Practice. ISBN 978-624-6246-12-9

2. Acidosis:

ABG for metabolic or respiratory acidosis.

Treat underlying cause (e.g., DKA, sepsis)

3.Ammonia:

- Serum ammonia levels (consider hepatic dysfunction).
- Identify and treat the cause- infection, dehydration, electrolyte imbalance, GI bleeding, etc.
- Lactulose aiming 2-4 loose stools per day
- Rifaximin/neomycin to decrease the colonic concentration of ammoniagenic bacteria
- Treatments to Increase Ammonia Clearance- LOLA

4.Arrhythmias:

- ECG to identify cardiac abnormalities.
- Refer guideline on shock, bradyarrhythmia and tachyarrhythmia.
- Find and treat the underlying cause

5. Endocrine:

Blood glucose, cortisol, thyroid function tests.

Hypoglycemia- Refer management of hypo/ hyperglycaemia under disability.

Thyroid storm

- Clinical diagnosis and is assisted by Burch–Wartofsky Point Scale
- Atypical presentations (in elderly) –
    - Extreme weakness (Apathetic storm)
    - Liver failure
    - Isolated CVS features – HF / AF
- Precipitants
    - Infection
    - DKA/Hypoglycemia
    - ACS
    - Iodine intake-RAI /Amiodarone/Contrast
    - Pregnancy / Delivery / Pre-eclampsia

Source: Major presentations in Medical Practice. ISBN 978-624-6246-12-9

Table 5.1. Burch–Wartofsky Point Scale for diagnosis of thyrotoxic storm

System involvement	Score determined by severity	Distribution of scores
1. Thermoregulatory dysfunction	5 - 30	99.0-99.9 5 100.0-100.9 10 101.0-101.9- 15 102-102.9 20 103.0-103.9 25 >104 30
2. Central nervous system dysfunction	0 - 30	Absent 0 Mild(agitation) 10 Moderate(delirium,psychosis 20 Severe(seizure, coma)- 30
3. Cariovascular dysfunction -Heart rate	5 - 25	100-109- 5 110-119- 10 120-129- 15 130-139- 20 >140- 25
4. Cardiovascular dysfunction -Heart failure	0 - 15	Absent- 0 Mild - 5 Moderate- 10 Severe- 20
5. Cardiovascular dysfunction-Atrial Fibrillation	0 - 10	Absent- 0 Present-10
6. Gastro-intestinal and hepatic dysfunction	0 -20	Absent-0 Moderate-10 Severe(jaundice)-20
7. Precipitant history	0 - 10	Absent-0 Present-10

Box 5.2. Management of thyroid storm

1. Ameliorate hyperadrenergic state
- Propranolol 40-80 mg orally every 6 hours or short acting BBs such as labetolol and esomolol are preferred
- When BBs are contraindicated, diltiazem can be used for rate control.
- In high output cardiac failure above agents should be used with caution.

2. Inhibit new TH synthesis
- Propylthiouracil 500 – 1000 mg load and 200 mg every 4 hours (also and inhibits peripheral conversion of T4 to T3)

3. Inhibition of peripheral conversion of T4 to T3
- IV hydrocortisone 300 mg load and 100 mg 8 hourly (also corrects relative adrenal insufficiency)

4. Retard the release of pre-formed TH by iodine compounds
- Saturated solution of potassium -iodide (SSKI) 5 drops 6 hourly or Lugol's iodine solution 10 drops 8 hourly
- Start 1 hour after first ATD dose

5. Deplete TH pool by enhancing clearance through enterohepatic circulation
- Cholestyramine 4 g in 6 hourly

Other measures
- Consider ICU care
- Peripheral cooling, intra venous fluids and antipyretics
- Plasmapheresis

Note: Salicylates should be avoided as they increase the free TH and also possibly accelerate the metabolic rate.

Source: Major presentations in Medical Practice. ISBN 978-624-6246-12-9

Myxoedema Coma

- Clinical features
    - Impaired mental status and hypothermia are hallmarks.
    - Hypotension, bradycardia, hypoventilation, hyponatraemia and hypoglycaemia
- Occurs as the culmination of severe longstanding hypothyroidism or after an acute event in a patient with poorly controlled hypothyroidism
    - Events – ACS, Infection, Sedative use, Surgery, Cold exposure
- Coexisting adrenal insufficiency either due to autoimmune adrenal disease or hypothalamo-pituitary disease needs to be considered
    - (Treatment with levothyroxine will precipitate an acute adrenal insufficiency)

Box 5.1. Management of myxoedema coma

Treatment should be initiated on suspicion without waiting for laboratory confirmation.

- Draw serum for TSH, Free T4 and cortisol.
- Thyroid hormone replacement –
    - Preferably parenteral, due to the aspiration risk and uncertain absorption(117)(20)
    - Initial loading dose of IV LT4 200 - 400 µg followed by daily doses of 50-100 µg IV
    - If T3 is available, an initial loading dose of 5–20 µg can be given, followed by a maintenance dose of 2.5–10 µg every 8 hours (20).
    - If IV LT4 is not available, LT4 can be administered via nasogastric tube. Initial oral loading dose is 500 µg, followed by maintenance dose (117).
    - Whether LT4 or combined T4 and T3 is preferred is unclear due to paucity of data. However combined T4 and T3 may be preferred because of the rapid action and high biological activity of T3 (118)
    - In patients who were on IV LT4, change to an appropriate oral dose of LT4 when the patient can tolerate oral medications. (Oral dose is approximately the intravenous dose divided by 0.75).
- Hydrocortisone 100 mg IV every eight hours until exclusion of possible adrenal insufficiency.
- Supportive measures according to clinical indications:
    - Mechanical ventilation
    - Fluids and vasopressor drugs to correct hypotension
    - Monitoring and correction of electrolytes if indicated
    - Passive rewarming
    - Intravenous dextrose
    - Consider empirical antibiotic treatment
    - Monitor for arrhythmias and treat when indicated

Reference: Sri Lanka college of Endocrinologists 2020 guideline on Thyroid disorders

Management of Addisonian crisis

- IM/IV Hydrocortisone 100mg
- Intravenous fluid resuscitation
- Emergency administration of fludrocortisone not required.

6. Electrolytes:

Management of hyponatremia

Symptomatic hyponatremia

- Goal- increase Serum Sodium by 4-6 mEq/L over few hours and < 10mEq/L over 24h
- 3% NaCl 150ml over 20 minutes → Repeat serum electrolytes/VBG and repeat dose 20 minutes later to achieve 4-6mEq/L rise.
- Use 3ml/ kg weight-based dose for patients less than 60 kg.

Asymptomatic hyponatremia

- Hypovolemic hyponatremia- IV crystalloid bolus 250-500 ml guided by BP
- Euvolemic hyponatremia (SIADH)- Correct deficit with isotonic 0.9% NaCl, free water restriction 1-1.5L/day
- Hypervolemic hyponatremia- Nil per oral, fluid restriction, IV furosemide
- Treat the underlying cause

Refer guideline on potassium, calcium, and magnesium abnormalities.

7.Encephalopathy:

Neurological examination

Treat underlying cause (e.g., infection, toxin, hypertension).

Uremic encephalopathy- Anorexia, nausea, restlessness, diminished ability to concentrate, slowed cognitive functions, and disorientation

Hypertensive encephalopathy- headache, confusion, visual disturbances, seizures, nausea, and vomiting. Refer management of hypertensive emergency guideline.

Wernicke's encephalopathy- Acute confusion, delirium, ataxia, ophthalmoplegia, memory disturbance, hypothermia with hypotension and delirium tremens

Hepatic encephalopathy- change in behavior and personality, drowsiness, slurred speech, asterixis, increased muscle tone, and extensor plantar reflexes

8. Infection

- History and examination to identify the focus of infection
- Full septic workup: Blood cultures, urine cultures, chest X-ray, lumbar puncture if meningitis/encephalitis is suspected.
- Broad-spectrum antibiotics based on clinical suspicion and culture results.
- Antiviral therapy for suspected viral encephalitis.

9.Oxygen

SpO2 measurement, ABG for hypoxia.

Administer supplemental O2 or intubation for severe hypoxia.

10.Overdose/ Opiates and other medication

History, physical exam (Pinpoint pupils).

Tox screen

Specific antidotes if available (e.g., naloxone for opioids) and supportive care.
For other medications refer poisoning workup

Source: Major presentations in Medical Practice. ISBN 978-624-6246-12-9

11.Uremia

Check BUN/creatinine levels, urinalysis.

Dialysis for severe uremia.

Correct electrolyte imbalances.

Urgent dialysis indications are;

Acidosis PH<7.15

Refractory hyperkalemia K+ > 6.5 mmol/L

Intoxications- salicylates, uremia, methanol, lithium, dabigatran, ethylene glycol

Refractory fluid overload

Uremic pericarditis or encephalopathy

12.Trauma

Mechanism of injury, Physical exam, imaging (CT)

Manage airway, breathing, circulation; address brain injury

Refer CT head injury guideline.

13.Temperature

Core temperature measurement.

Management of hypothermia

Mild: 32-35C, moderate: 28-32C, severe: <28C

Passive external rewarming

- Remove wet clothes and dry whole body
- Mobilize conscious individuals
- Remove from cold environment and treat in warm environment
- Full body insulation with wool blankets, aluminium foil, cap.

Active external rewarming

- Warm blankets
- Heating pads
- Warm baths
- Forced warm air e.g. Bair hugger

Source: Major presentations in Medical Practice. ISBN 978-624-6246-12-9

Active internal warming

- Warm IVF
- Warm humidified oxygen
- Forced peritoneal lavage
- Extracorporeal life support

Management of hyperthermia

- Mainstay of treatment is supportive therapy
- Patient should be cooled to 38-38.5C
- Simple measures- cool drinks, fanning the undressed patient, spraying tepid water on the patient, ice packs over axillae, groin, neck
- Advanced cooling techniques- cold IVF, intravascular cooling catheters, surface cooling devices, extracorporeal circuits

14.Thiamine

- Consider Wernicke's encephalopathy in malnourished/alcoholic patients.
- IV Thiamine before glucose administration.

15.Insulin (Hypo-/Hyperglycemia)

- Blood glucose levels (finger stick, lab confirmation).
- Hypoglycemia: Refer management of hypo/hyperglycaemia under disability.
- Hyperglycemia: Refer management of hypo/hyperglycaemia under disability, Annex 2-Management of DKA, Annex 3-Management of HHS

16.Poisoning

- Risk assessment- history, examination
- If unknown poison, apply toxidrome
- Tox screen, BSL, VBG, ECG
- Resuscitation, antidotes (if available), supportive care, decontamination (e.g., activated charcoal), elimination
- Refer acute poisoning work up

17.Psychiatric

- Evaluate for suicidal ideation or psychiatric history.
- Safety precautions, psychiatric referral.

18.Stroke

- History, CT head, NIHSS score.
- Thrombolysis or thrombectomy for ischemic stroke
- Manage ICP for hemorrhagic stroke.

Source: Major presentations in Medical Practice. ISBN 978-624-6246-12-9

19.Seizure:

- Ongoing seizure refer status algo rhythm- convulsive, non-convulsive
- All other cases consider post ictal state
- Manage underlying cause

20.Space-occupying lesion:

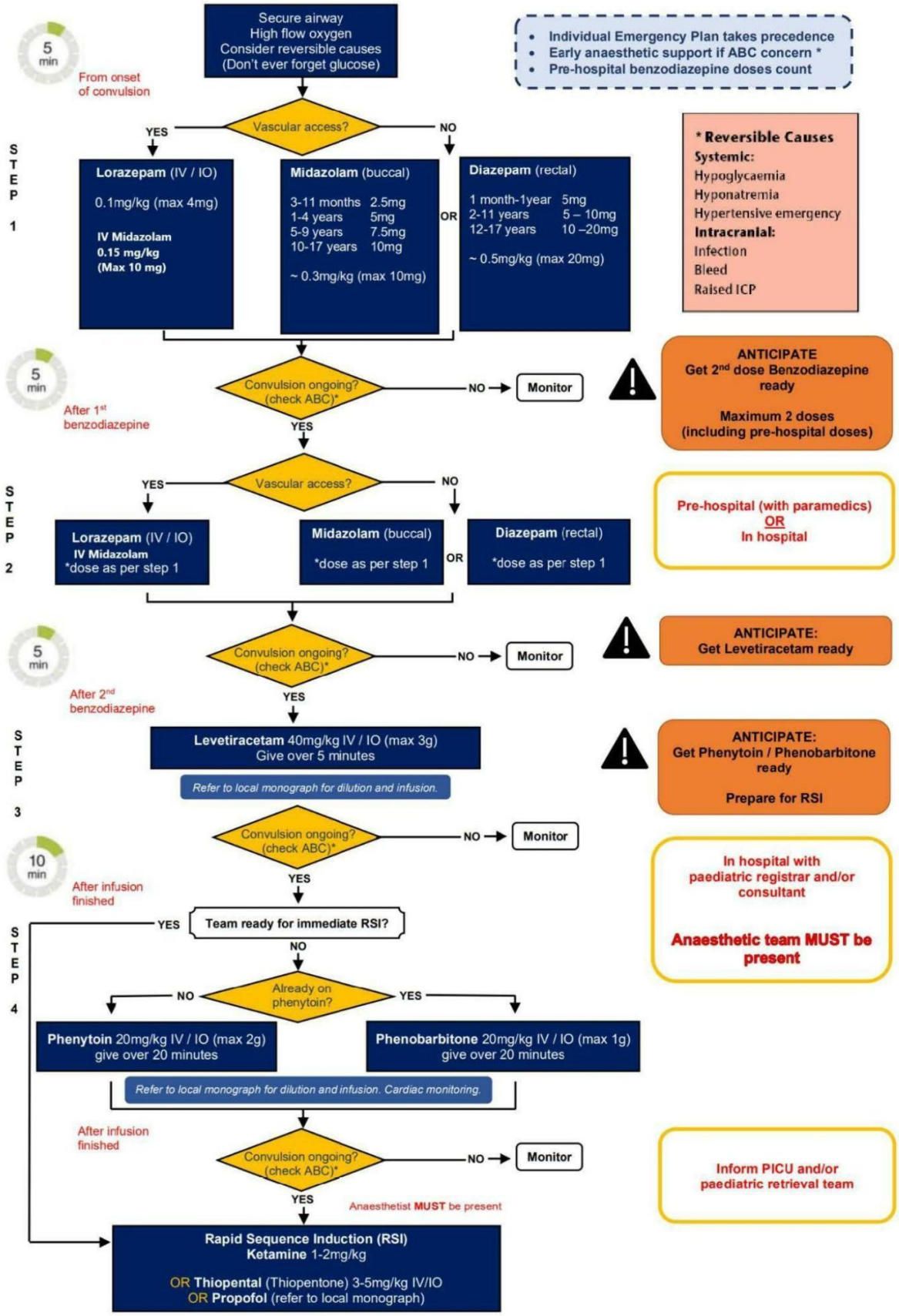
- Imaging (CT/MRI).
- Neurosurgical consultation
- Mx of elevated ICP

21.Shunt malfunction:

- CT head
- Neurosurgical management.
- Mx elevated ICP

Source: Major presentations in Medical Practice. ISBN 978-624-6246-12-9

Advanced Paediatric Life Support (APLS) algorithm on Management of the Convulsing Child



Source: NHS Scotland https://clinicalguidelines.scot.nhs.uk/media/3310/review-of-the-new-apls-guideline.pdf

Algorithm for the Management of Hypoglycaemia in Adults with Diabetes in Hospital

Hypoglycaemia is a serious condition and should be treated as an emergency regardless of level of conciousness. Hypoglycaemia is defined as blood sugar glucose of <4.0mmol/L (if not <4.0mmol/L but symptomatic give a small carbohydrate snack for symptom relief) See full guideline "The Hospital Management of Hypoglycaemia in Adults with Diabetes Mellitus" at www.diabetes.org.uk/joint-british-diabetes-society

DO NOT omit subsequent insulin doses. Continue regular capillary blood glucose monitoring for 24-48 hours. Review insulin and/or oral hypoglycaemic doses. If previously on IV insulin, would generally consider restarting insulin once blood glucose >4.0 but may require review of regimen. Give hypoglycaemia education and refer to inpatient diabetes team if required.

*Glucagon may take up to 15 minutes to work and may be ineffective in treating hypoglycaemia in undernourished patients, in severe liver disease, sulfonylurea induced hypoglycaemia and in repeated hypoglycaemia.

PATIENT ASSESMENT FORM-Triage Category 1/2/3/4

Name : ..... **Male/Female** **Date :** ...../...../.....**Time** .....**am/pm**

Age : .....

Medical officer : .....

BHT No : .....

Pre hospital care :.....

Focus history

Presenting complaint/s:	**Allergic hx: F/D/P/Nil**
	Past Medical hx:
	Drugs hx :
Functional status : **Exercise tolerance** :	
Resuscitation status:	

Focus examination with supportive care

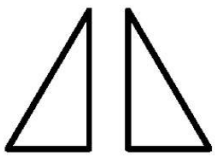
Respiratory system-

Airway assessment: .....

Blood gas:

Breathing/ventilation

RR.....



SPONT/ SIMV

Face mask /NRBM /HFNC/NIV O_2 Flow.....

FIO_2.....

CPAP		TV	
BIPAP IPAP		TV	
EPAP		Leak %	

SPO_2.....% Target : 94-98%

88-92%

Lung USS A/B/AB .....

(Blue protocol)

CVS-EXAMINATION - Circulation & organ perfusion

PR/HR:...../min **Rhythm** :regular/irregular **volume**: good/ low/bounding RR/RF Delay+/-

BP: **R**..... mmHg **L** ..... mmHg **PP** :normal/narrow/wide **Postural drop** +/- **Auscultation**..... **Iv cannula**....

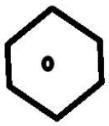
ECG			
POCUS- (RUSH-Protocol)			
Fluid status	Lung bases :wet/dry CRFT: < 2s />2s IVC : >50%collapse/full Bladder full/empty UOP: adequate/low		
Shock +/-	hypovolemic/septic/anaphylactic/cardiogenic/obstructive/dissociative		
Fluid therapy	Resus/optimization maintenance/deescalation	Regime	
Inotropes/vasopressors			
Hypertensive-urgency/emergency : Anti- hypertensive Rx			

Disability & Neuro protection -CNS examination

Conscious/rational/confused/drowsy GCS: E.....V.....M..... ...../15 Pupils: **RBS: .....**

Cranial nerves ex: UL/LL-Examination:

Exposure& Environment control **Temp:**.....



Investigations	**Management plan:** **Problem list**(acute>chronic)
VBG/ABG	
Blood culture	
FBC	
CRP	
UFR	
ECG	
Troponin-I	
Cross-match	
RFT/SE	
LFT	
PT/INR	
APTT	
WBCT	
UHCG	
Urine-KB	
COVID Ag/PCR	
Disposition	Wheel chair/ Trolley Ward/ICU/OT/Transfer

TRAUMA ASSESSMENT FORM: A &E-DGH HORANA

Name:.....

Age:.....

BHT:.....

Primary Survey - Triage Cat: 1 / 2 / 3/4

- Catastrophic Bleeding : +/- Bleeding Arrested: ☐

Airway Patency & C-Spine Motion restriction

- Airway : Patent ☐ C-Spine-Collar applied ☐
  Protected ☐ C-Spine X-Ray ..... ☐
  ET size ☐ C-Spine CT ..... ☐
  Lip Level ☐ .....

Breathing & Ventilation:

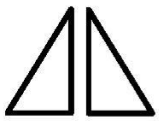
RR: ...../min

CXR: NO ..... ☐

Oxygen –Mask/ET ☐

Tension Pneumothorax	YES/NO
Open Pneumothorax	YES/NO
Tracheobronchial Fistula	YES/NO
Massive Haemothorax	YES/NO
Cardiac Tamponed	YES/NO
(See Ch 4.2)	

SPO



vent mode-SV/IPPV –PC/VC

TV RR PIP

I:E PEEP PS ET CO_2.....

Age .....

Time of Injury.....

Mechanism of injury .....

.....

.....

.....

Impact/ Injuries.....

.....

.....

Signs & Symptoms.....

Treatment at local hospital /1990 -

.....

Type of injury - traffic / home / sports / violence / occupational /miscellaneous

Allergic hx -No allergies / food / drug / plaster)-

.....

Medications - .....

.....

.....

.....

Past hx-DM / HTN / IHD / EPILEPSY / BA COPD / CKD

Pregnancy- + / - /not relevant .....

Last meal at.....

Events Leading to trauma .....

.....

Circulation & Hemorrhagic Control: (See Ch 4.3, 4.4)

- PR : ...../min Rhythm : Regular ☐ Irregular ☐ Volume: Good ☐ Low ☐
- CRFT.....S
- BP: SBP.....mmHg PP <25/>25mmHg
  DBP..... mmHg
- ECG: ..... ☐
- IV Cannula 14/15/16/17/18/20G ☐
- Blood for crossmatch(DT)Sent : ☐
- Urinary Catheter:.....G ☐
- EFAST : ..... ☐
- Pelvic X-Ray ..... ☐
- Pelvic Binder..... ☐
- Shock : Yes ☐ / No ☐

- Type Of Shock : Hypovolemic ☐
  Obstructive ☐
  Neurogenic ☐
  Cardiogenic ☐
  Septic ☐
  Anaphylactic ☐

POCUS/EFAST Time.....am/pm		
Blood in the Chest	YES/NO	
Blood in the Abdomen-Intra Peritoneal	YES/NO	
Retro Peritoneal	YES/NO	
Blood in the Pelvis	YES/NO	
Blood in the Long Bones	YES/NO	
Blood in the Floor	YES/NO	
ABC SCORE	<2	>2

IV NORMAL SALINE (warm)	1st	2nd	3rd		4th
O GROUP BLOOD (warm)	1st	2nd			
GROUP SPEC. BLOOD (warm)	1st	2nd	MAXIMUM 2		
CROSSMATCHED BLOOD(warm)	1st	2nd			
MASSIVE TRANSFUSION PROTOCOL STANDBY/ ACTIVATED/ TERMINATED	BOX 1	BOX 2	BOX 3	BOX 2	BOX 3
TRANEXAMIC ACID- bolus 1g over 10minutes		Infusion 1g over 8 hours			

Neuro-protective measures	
30 ^{0}degree Head Tilt	
Normo-Tension (SBP100-140mmHg) IV Labetalol infusion	
Normo-Oxia (SPO2>94%)	
Normo-Carbia (PaCO2-35-45mmHg)	
Normo-Glycaemia(100-180mg/l)	
Normo-Thermia (36-38c)	
Na^{+} Level (145-155mmol/l)	

Disability & Neuroprotection (See Ch 4.5, 4.6)

- GCS: **E**..... **V**..... **M**..... =...../**15**
-
- Pupils : **Right :**.....R/NR/SR **Left**.....R/NR/SR
- Blood Sugar ..... mg/dl
- CT Brain ☐.....
- Osmotherapy -3% saline-3ml/kg-over 20 min ☐
  .....

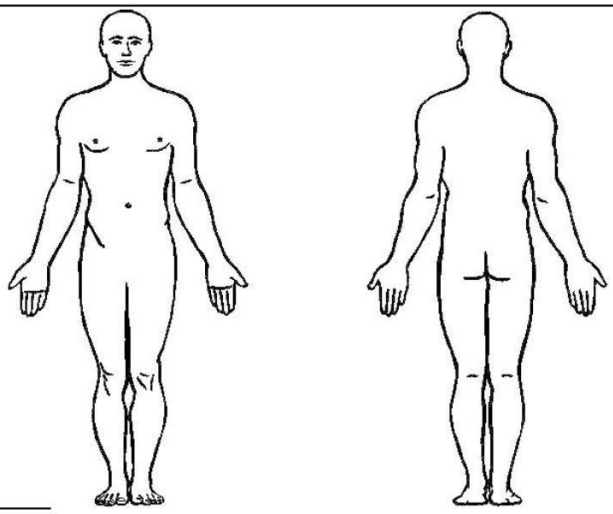
Pain Score .....(0-3 mild/ 4-6 moderate/ 7-10 severe) at.....

Reassess Pain Score after 15 mins following administration of analgesics reassessed Pain Score.....

Exposure & Environmental Control -

- Head & Neck Wounds -.....
- Chest Wounds-.....
- Abdomen Wounds -.....
- Pelvis Wounds -.....
- Spine - X-Ray NO:..... ☐
- Limbs – X –Rays NO:..... ☐
- **Temperature**.....

	RU	LU	RL	LL
Acute Limb Ischemia				
Compartment Syndrome				
Open Fracture				
Dislocation				



Management

☐ Cleaning & Dressing
☐ Suturing
☐ Tetanus Toxoid
☐ Splint
POP

(Tentative) Diagnosis:.....

Supplementary Notes:

PCM	oral/sup		
NSAIDS	oral/sup		
TRAMADOL	oral/IM		
MORPHINE	IM/IV		
PETHIDINE	IM/IV		

Anti-Emetics		
Antacids		
Antibiotics		
Anti-epileptics		

Disposition Plan: Ward ☐ Theatre ☐ ICU ☐
Transfer to NHSL ☐

- Casualty Surgical Team Informed ☐
- Orthopedic Team Informed ☐
- Neurosurgical Team Informed ☐
  Plan.....
  ..... ☐
- ENT Team Informed ☐
- OMF Team Informed ☐
- Radiology Team Informed ☐

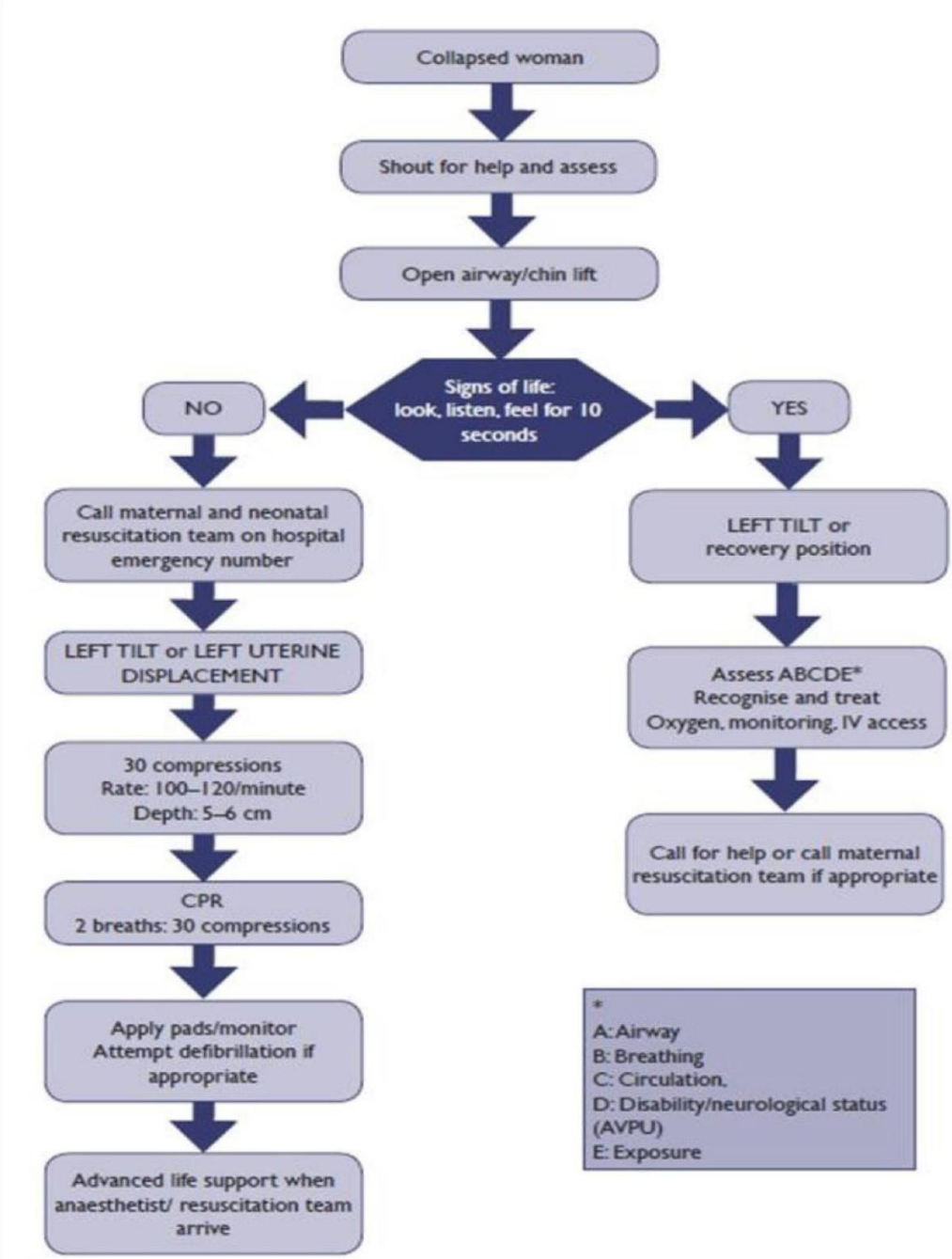
Obstetric Emergencies

- Cardiac Arrest
- Anaphylaxis
- Sepsis
- Maternal shock/ Maternal collapse
- Management of massive hemorrhage in Obstetrics
- Trauma
- APH
- Hypertension in pregnancy

Source: Major presentations in Medical Practice. ISBN 978-624-6246-12-9

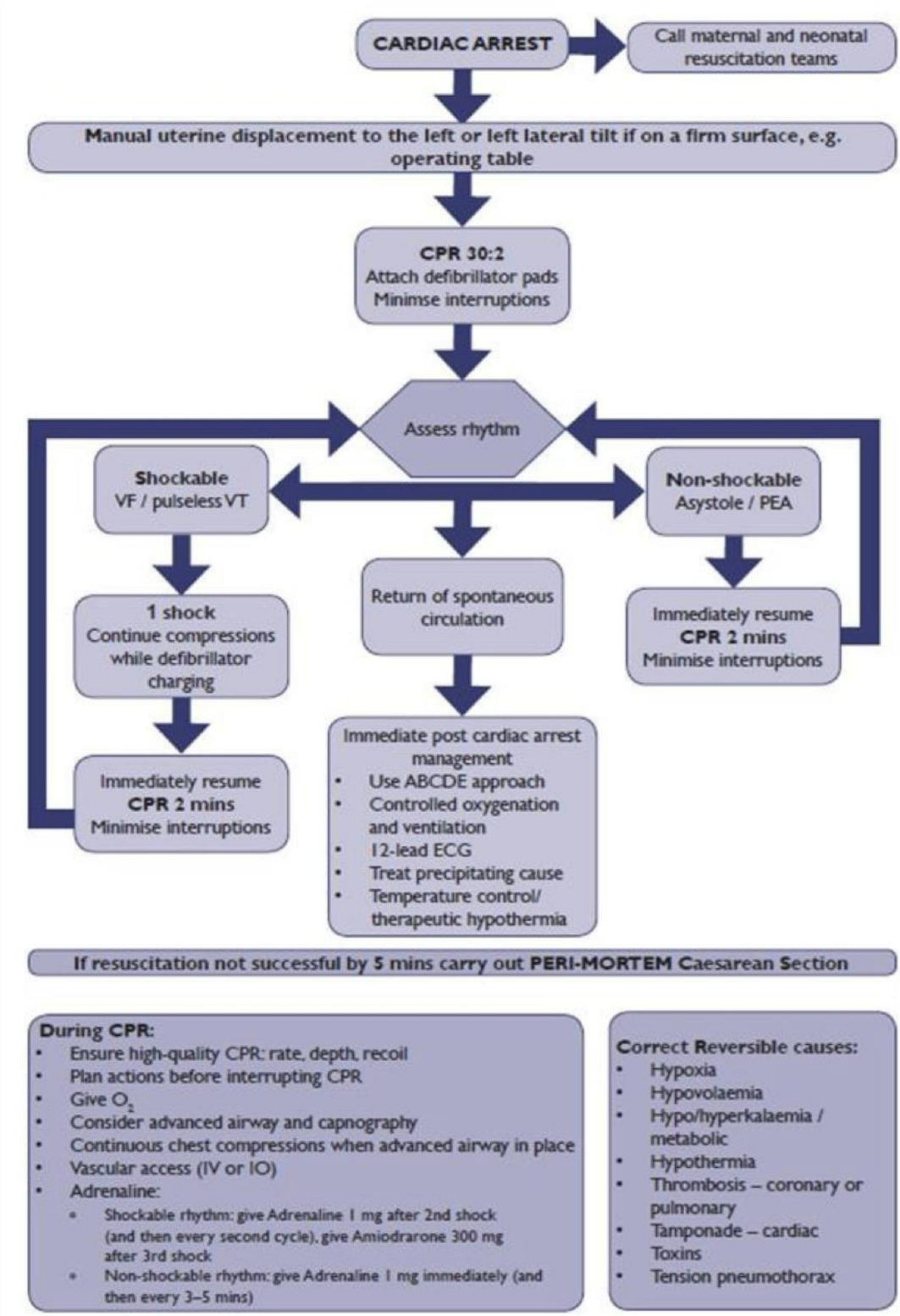
Cardiac arrest

Flowchart 1: Basic Life Support Algorithm



Source: Major presentations in Medical Practice. ISBN 978-624-6246-12-9

Flowchart 2: Advanced Life Support Algorithm



Source: Major presentations in Medical Practice. ISBN 978-624-6246-12-9

Drugs during resuscitation

Feature	Drug to be considered
Cardiac arrest	IV Adrenaline 1mg Shockable rhythm – After 2nd shock then every other cycle Non-Shockable rhythm – Give immediately then every 3-5 min
VF/VT	IV Amiodarone 300 mg after 3rd shock
Opiate overdose	IV Naloxone 400 – 800 micrograms
Magnesium toxicity	IV Calcium gluconate 10% 10ml
Local anesthetic toxicity	1.5 ml/Kg 20% Lipid emulsion (Intralipid)

Reversible causes

Reversible Cause		**Cause in Pregnancy**
4H's	Hypovolaemia	Bleeding (may be concealed) or relative hypovolaemia of dense spinal block; septic or neurogenic shock
	Hypoxia	Pregnant women become hypoxic more quickly
	Hypo / hyperkalaemia and other electrolyte disturbances	
	Hypothermia	
4T's	Thromboembolism	AFE, PE, air embolus, MI
	Toxicity	Local anaesthetic, magnesium, other
	Tension pneumothorax	Following trauma, suicide attempt
	Tamponade (cardiac)	Following trauma, suicide attempt
Eclampsia and pre-eclampsia		Includes intracranial haemorrhage

Resuscitation consideration

- Fetal survival usually depends on maternal survival and initial resuscitation efforts should focus on the pregnant mother.

Prevention of cardiac arrest

- Many cardiovascular problems associated with pregnancy are caused by compression of the IVC.
  - Place the patient in the left lateral position or manually and gently displace the uterus to the left.
- Give high-flow oxygen guided by pulse oximetry.
- Give a fluid bolus if there is hypotension or evidence of hypovolaemia.
- Seek expert help early.
  - Obstetric and neonatal specialists should be involved early in the resuscitation.
- Identify and treat the underlying cause.

Source: Major presentations in Medical Practice. ISBN 978-624-6246-12-9

Cardiac arrest

- Call for expert help early
  - Ensure early involvement of obstetric, anaesthetic, critical care and neonatal teams.
- Start basic life support according to standard guidelines.
- Compression
  - Use the standard hand position for chest compressions on the lower half of the sternum if feasible.
  - If over 20 weeks pregnant or the uterus is palpable above the level of the umbilicus:
    - Manually displace the uterus to the left to remove aortocaval compression.
    - If feasible, add left lateral tilt – the chest should remain on supported on a firm surface (e.g. in the operating room).
    - The optimal angle of tilt is unknown. Aim for a tilt between 15 and 30 degrees.
- Perimortem C-Section
  - Prepare early for emergency hysterostomy early – the fetus will need to be delivered if immediate (within 4 minutes) resuscitation efforts fail.
  - If over 20 weeks pregnant or the uterus is palpable above the level of the umbilicus and immediate (within 4 min) resuscitation is unsuccessful, deliver the fetus by emergency caesarean section (Start at 4 min) aiming for delivery within 5 min of collapse.
  - The best survival rate for infants over 24-25 weeks gestation occurs when delivery of the infant is achieved within 5 min after the mother's cardiac arrest.
  - At older gestational ages (30-38 weeks), infant survival is possible even when delivery was after 5 minutes from the onset of maternal cardiac arrest.
  - Delivery relieves caval compression and permitting an increase in venous return during the CPR attempt.
  - Enables access to the abdominal cavity so that aortic clamping or compression is possible.
  - Gestational age < 20 weeks.
    - Urgent Caesarean delivery need not be considered, because a gravid uterus of this size is unlikely to compromise maternal cardiac output and fetal viability is not an issue.
  - Gestational age approximately 20-23 weeks.
    - Initiate emergency delivery of the fetus to permit successful resuscitation of the mother, not survival of the delivered infant, which is unlikely at this gestational age.
  - Gestational age approximately > 24 weeks.
    - Initiate emergency delivery to help save the life of both the mother and the infant.
- Defibrillation

Source: Major presentations in Medical Practice. ISBN 978-624-6246-12-9

    - Place defibrillator pads in the standard position as far as possible and use standard shock energies.
- Ventilation
    - Consider early tracheal intubation by a skilled operator as there is an increased risk of pulmonary aspiration of gastric contents in pregnancy.
    - Early tracheal intubation decreases this risk, but can be more difficult in the pregnant patient.
    - A tracheal tube 0.5-1 mm internal diameter (ID) smaller than that used for a non-pregnant woman of similar size may be necessary because of maternal airway narrowing from oedema and swelling.
- Reversible causes
    - Identify and treat reversible causes (e.g. haemorrhage).
    - Focused ultrasound by a skilled operator may help identify and treat reversible causes of cardiac arrest.
        - Evaluation of fetal viability, multiple pregnancy, and placental localisation.
    - 4 Hs and 4 Ts approach.
        - Hemorrhage
            - Ectopic pregnancy, placental abruption, placenta praevia and uterine rupture.
            - Stop the bleeding.
            - Massive haemorrhage protocol.
            - Correction of coagulopathy, oxytocin, ergometrine and prostaglandins to correct uterine atony, uterine compression sutures, intrauterine balloon devices, radiological embolisation of a bleeding vessel, and surgical control including aortic cross clamping/compression and hysterectomy.
            - Placenta percreta may require extensive intra-pelvic surgery.
        - Drugs
            - Overdose can occur in women with eclampsia receiving magnesium sulphate, particularly if the patient becomes oliguric.
                - Give calcium to treat magnesium toxicity.
            - Central neural blockade for analgesia or anaesthesia can cause problems due to sympathetic blockade (hypotension, bradycardia) or local anaesthetic toxicity.
        - CVS
            - Acquired cardiac disease - MI and aneurysm or dissection of the aorta or its branches, and peripartum cardiomyopathy.
            - ACS - atypical features such as epigastric pain and vomiting.
                - Percutaneous coronary intervention (PCI) is the reperfusion strategy of choice for STEMI.

Source: Major presentations in Medical Practice. ISBN 978-624-6246-12-9

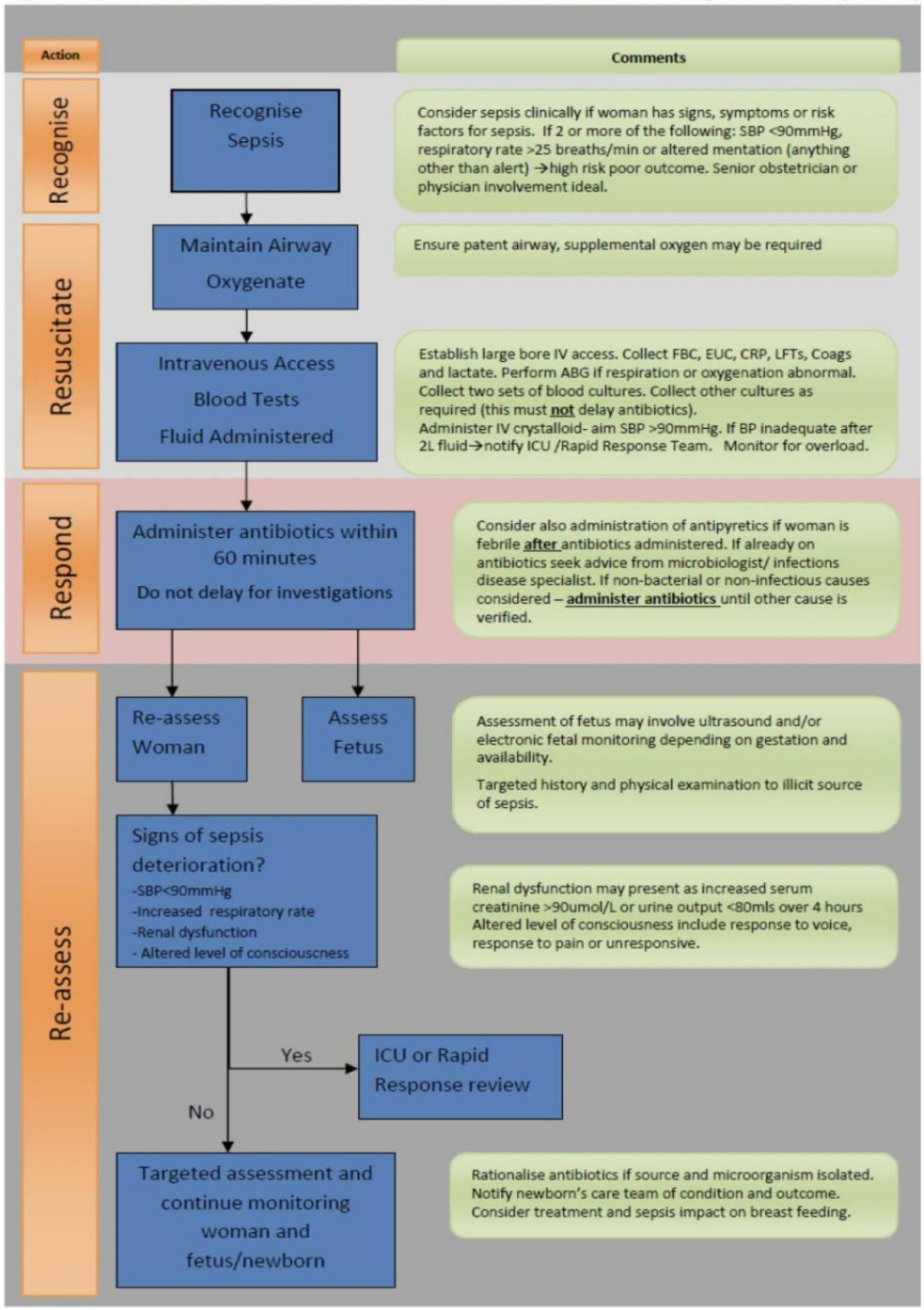
        - Thrombolysis should be considered if urgent PCI is unavailable.
    - Eclampsia - Development of convulsions and/or unexplained coma during pregnancy or postpartum in patients with signs andsymptoms of pre-eclampsia.
        - Magnesium sulphate treatment may prevent eclampsia developing in labour or immediately postpartum in women with pre-eclampsia.
    - Amniotic fluid embolism
        - Presents around the time of delivery often in the labouring mother with sudden cardiovascular collapse, breathlessness, cyanosis, arrhythmias, hypotension, and haemorrhage associated with DIC.
        - Mx - supportive based on the ABCDE approach and correction of coagulopathy. There is no specific therapy.
    - Pulmonary embolism
        - Cardiopulmonary collapse can present throughout pregnancy.
        - CPR should be started with modifications as necessary.
        - Use of fibrinolysis (thrombolysis) needs considerable thought, particularly if a peri-mortem Caesarean section is being considered.
        - If the diagnosis is suspected and maternal cardiac output has not returned it should be given.
- Consider extracorporeal CPR (ECPR) as a rescue therapy if ALS measures are failing.

Anaphylaxis

- Management for anaphylaxis in pregnant women is the same as for non-pregnant women, with modifications to positioning, and multidisciplinary team consideration of emergent birth of the baby.
- Pregnant women should be in left lateral position.
- IM adrenaline should be administered into the mid-outer thigh:
    - Women >/= 50 Kg – 0.5 mg (500 microgram)
    - Women < 50 kg - give 0.01 mg / kg (10 micrograms / kg)
    - The dose can be repeated every 5 minutes.
- If woman is in cardiac arrest and there is no response to cardiopulmonary resuscitation within 4 minutes, perform perimortem caesarean section.

Sepsis

Figure A2.1: Flowchart and checklist for the assessment and management of sepsis in pregnancy



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1. Recognise Sepsis

Calculate omqSOFA
☐ 0 ☐ 1 ☐ ≥2

Is Score ≥ 2?
☐YES (Involve senior obstetrician or physician)
☐NO

TABLE 1 Obstetrically modified qSOFA score

Parameter	Score 0	1
Systolic blood pressure	≥90 mmHg	<90 mmHg
Respiratory rate	Less than 25 breaths/min	25 breath/min or greater
Altered mentation	Alert	Not alert

Min, minute; mmHg, millimetres of mercury; qSOFA, quick Sequential sepsis-related) Organ Failure Assessment score.

TABLE 2 Obstetrically modified SOFA score

System parameter	Score 0	1	2
Respiration			
PaO_2/FIO_2	≥400	300 to <400	<300
Coagulation			
Platelets, $\times 10^9$/L	≥150	100–150	<100
Liver			
Bilirubin (μmol/L)	≤20	20–32	>32
Cardiovascular			
Mean arterial pressure (mmHg)	MAP ≥ 70	MAP < 70	Vasopressors required
Central nervous system	Alert	Rousable by voice	Rousable by pain
Renal			
Creatinine (μmol/L)	≤90	90–120	>120

2. Resuscitate

☐ **Maintain airway**

☐**Consider supplemental oxygen**

☐ **IV access – 2 large bore** (≥18g) cannulas

☐ **Send bloods**
(FBC, UEC, CRP, LFT, COAGS, Lactate)

☐**ABG if respiration or oxygenation abnormal**

☐ **2 sets of blood cultures**

☐ **SEPTIC Screen as indicated**
- Urine MCS
- Vaginal swabs MCS
- Sputum MCS
- Stool MCS

3. Respond

☐**Administer IV antibiotics within 60 minutes**
(Follow local guideline for antibiotic guidance)

☐**Consider antipyretics if febrile AFTER antibiotics**

☐ **Administer IV crystalloid** (Aim SBP >90)

Is BP <90 SBP after 2L IV fluids?
☐ YES (call ICU) ☐ NO

4. Re-assess

☐ **History**
- Targeted to elicit cause of sepsis

☐ **Examination**
- Targeted to elicit cause of sepsis

Calculate omSOFA

SCORE = _____

Are there signs of deterioration
☐ YES (call ICU) ☐ NO
- SBP <90
- RR >25
- Renal dysfunction (Cr>90 or urine output <80ml/4hours)
- Altered mentation

Fetal assessment
☐Ultrasound for growth and welfare
☐CTG

☐ **Notify newborn care**

☐**Consider antibiotic use with breastfeeding**

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Maternal shock/ Maternal collapse

Causes

Possible causes of maternal collapse

Head	Eclampsia, epilepsy, cerebrovascular accident, vasovagal response
Heart	Myocardial infarction, arrhythmias, peripartum cardiomyopathy, congenital heart disease, dissection of thoracic aorta
Hypoxia	Asthma, pulmonary embolism, pulmonary oedema, anaphylaxis
Haemorrhage	Abruption, uterine atony, genital tract trauma, uterine rupture, uterine inversion, ruptured aneurysm
Whole body and Hazards	Hypoglycaemia, amniotic fluid embolism, septicaemia, trauma, complications of anaesthesia, drug toxicity

Primary obstetric survey

Head	How responsive is the woman? Is she alert, responsive to voice, responsive to painful stimuli or unresponsive (AVPU)? Is the woman fitting?
Heart	What is the capillary refill like? What is the pulse rate and rhythm? BP? Is there a murmur?
Chest	Is there good bilateral air entry? What is the breath sounds like? Is the trachea central?
Abdomen	Is there an 'acute' abdomen (rebound and guarding)? Is there tenderness (uterine or non-uterine)? Is the foetus alive? Is there a need for a laparotomy or delivery?
Vagina	Is there bleeding? What is the stage of labour? Is there an inverted uterus?

PPH

Definition

- PPH
  - Blood loss of 500 ml or more from the genital tract within 24hours of the birth of a baby.
- Major PPH
  - Blood loss of over 1000 ml

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    - Major can be further sub-divided into moderate (1001 -2000ml) and severe >2000ml.
- Massive PPH
    - The loss of 40% or more of the blood volume is life threatening (Blood volume = 100ml/Kg)

Causes

- TONE – Rub down.
    - UTERINE ATONY – associated with chorioamnionitis, prolonged labour, polyhydramnios, macrosomia, multiple gestations.
    - UTERINE INVERSION
- TRAUMA – uterus, vaginal or cervical laceration
- TISSUE – retained placenta, accrete.
    - ACCRETA – invasion into first 1/3 of myometrium
    - INCRETA – invasion further into myometrium
    - PERCRETA – invasion through myometrium into surrounding structures (bladder and bowel)
- THROMBIN – coagulopathy from multiple causes (AFE, retained products, intrauterine death, sepsis, PET, abruption)

Management

- Identification of severity of haemorrhage
    - Visual estimation of post-partum blood loss is inaccurate.
    - Clinical signs and symptoms should be included in the assessment of PPH.
    - Shock index (SI)– (Heart rate/Systolic Blood Pressure) as an effective predictor for PPH.
        - SI <0.9 provides reassurance, whereas SI ≥ 1.7 indicates a need for urgent attention in haemorrhage.
    - Call for help.
        - Any PPH should be informed to the highest level of obstetric team.
        - Inform- clear instruction to telephone operator
            - The obstetric middle grade - SHO
            - The aesthetic middle grade; Where available, the early involvement of the aesthetic team, even while the patient is still in the labour room is recommended.
            - Inform theatre.
            - Alert MO blood bank
            - Alert Consultant Obstetrician
            - Alert Consultant Anaesthetist
            - Transfusion medicine specialist / Haematologist.
            - Alert the head of the institution.

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        - Telephone operator should document the list of staff informed and submit it to the ward to be attached to the Bed Head Ticket.
    - Communication
        - Maintain a calm atmosphere.
        - Keep the mother (and labour companion/family) informed and reassure the mother regularly where feasible.
        - Allocate one staff to documentation.
    - Resuscitation
        - ABCDE approach
        - Clear airway. High flow oxygen to keep SPO2> 95%, attach oximeter probe.
        - Intubate, ventilate-if abnormal breathing, unconscious, unresponsive.
        - Insert two 14-16 g cannula, draw 20 ml blood for grouping, DT, FBC, BU, Electrolytes, APTT, PT/INR, ROTEM, S. Fibrinogen.
        - Request 6 U blood, Cryoprecipitate 20 U, FFP 4 U, platelets 1 adult dose.
        - Inform blood bank to activate massive haemorrhage protocol.
        - Monitor BP, ECG, AVPU, CBS, UOP, CVP
        - Transfuse blood as soon as possible - Minimise crystalloid, Replace blood loss with blood.
        - In emergency use on the availability of specific blood.
            - O-ve → O+ve→ group-specific uncross matched →cross-matched.
        - Warm patient with forced air warmer, Warm fluids/blood using rapid warmer infuser. Or normal blood warmer.
        - Control bleeding- medical/ physical manoeuvres & surgical.
        - Get ROTEM result within 5- 10 min. Replace as indicated by ROTEM.
        - If ROTEM not available Start giving shock packs 4:4: I adult dose of platelets.
        - Due consideration must be given to keeping transport facilities available to obtain blood and blood products from another institution.
- Atonic uterus
    - Uterine massage by 'rubbing up the fundus.
    - Clear the cervical canal and vagina of blood clots by vaginal examination.
    - Ergometrine plus Oxytocin combination, misoprostol plus oxytocin combination is more effective in preventing PPH [500ml than using current standard of Oxytocin alone. (Cochrane review 25th April 2018)

- Ergometrine maleate 0.5 mg slow IV or methyl Ergometrine 0.2 mg slow IV or oxytocin 5 IU IV and start an infusion of 40 IU of Oxytocin in 500 ml of Hartmann's / Normal Saline solution at 125 ml per hour via an infusion pump.
- Ergometrine can be repeated in every 2hours up to 3 doses.
- Start bimanual compression of uterus.
- If the bleeding fails to abate completely in 5- 10 minutes administer/repeat Ergometrine 0.5mg IV.
- Tranexamic acid 1 g by slow IV over 10 minutes. Maximum benefit is achieved if given within 30 minutes.
- This dose may be repeated after 30 minutes if necessary and later if bleeding recommences.
- Re-assess in 10 min – If fail to control bleeding
- Misoprostol 1000mic per rectally or sublingually.
- Uterine balloon tamponade.
- Compression of Aorta just above the bifurcation helps to minimize the loss until other measures are readily available.

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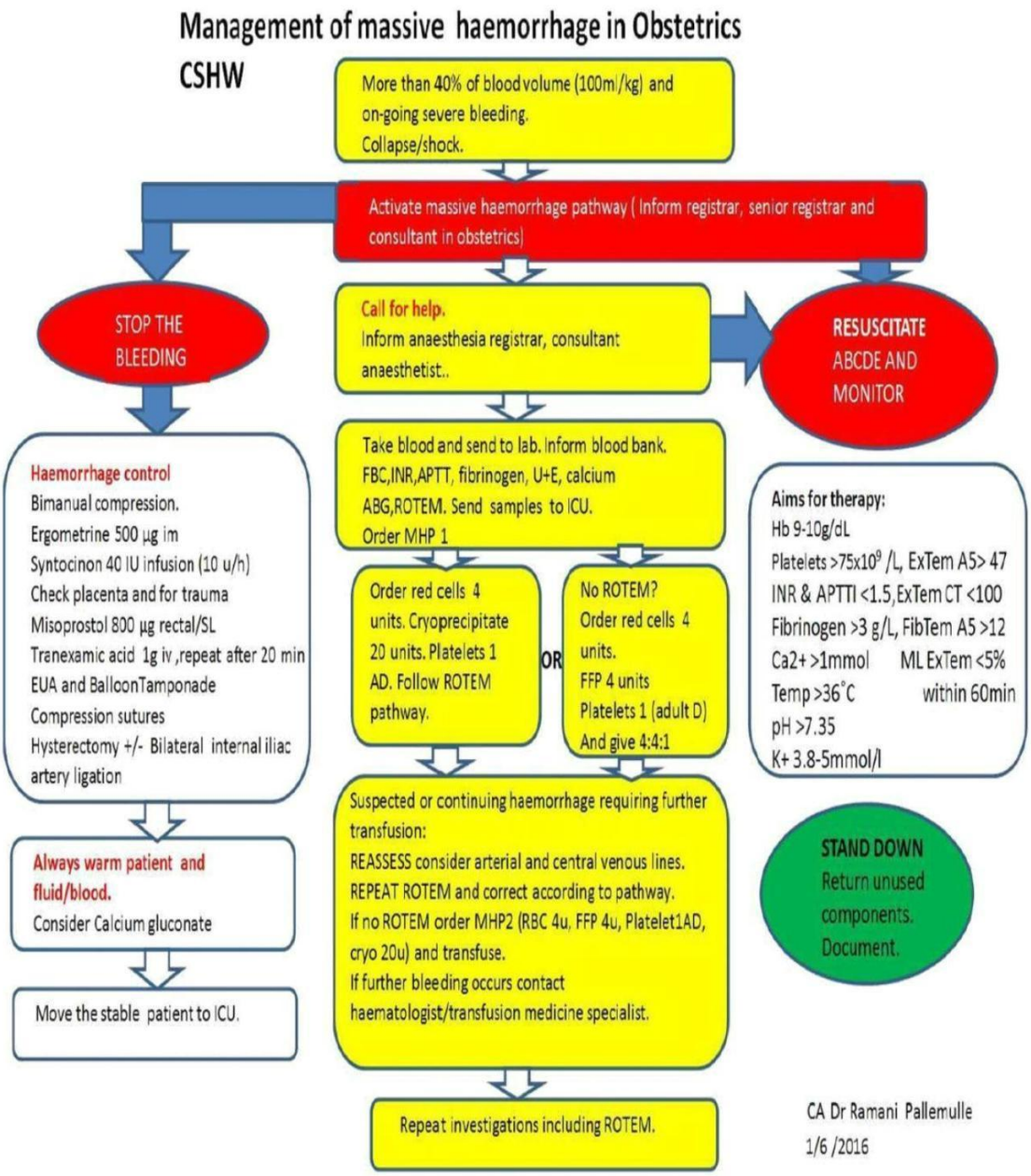

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Trauma

Fundus palpation chart

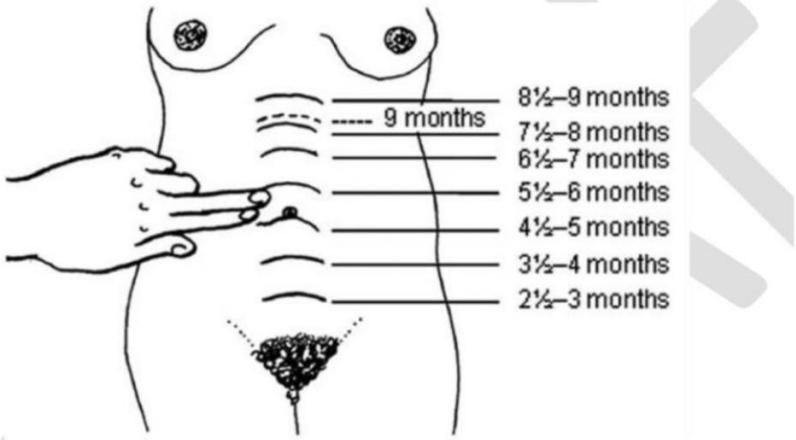
Identifying the top of the fundus

Walk your fingers up the side of the belly.

Find the top of the uterus (it feels like a hard ball under the skin).

You can feel the top by curving your fingers into the belly.

Measuring fundal height. Each increment is approximately two fingers' width.



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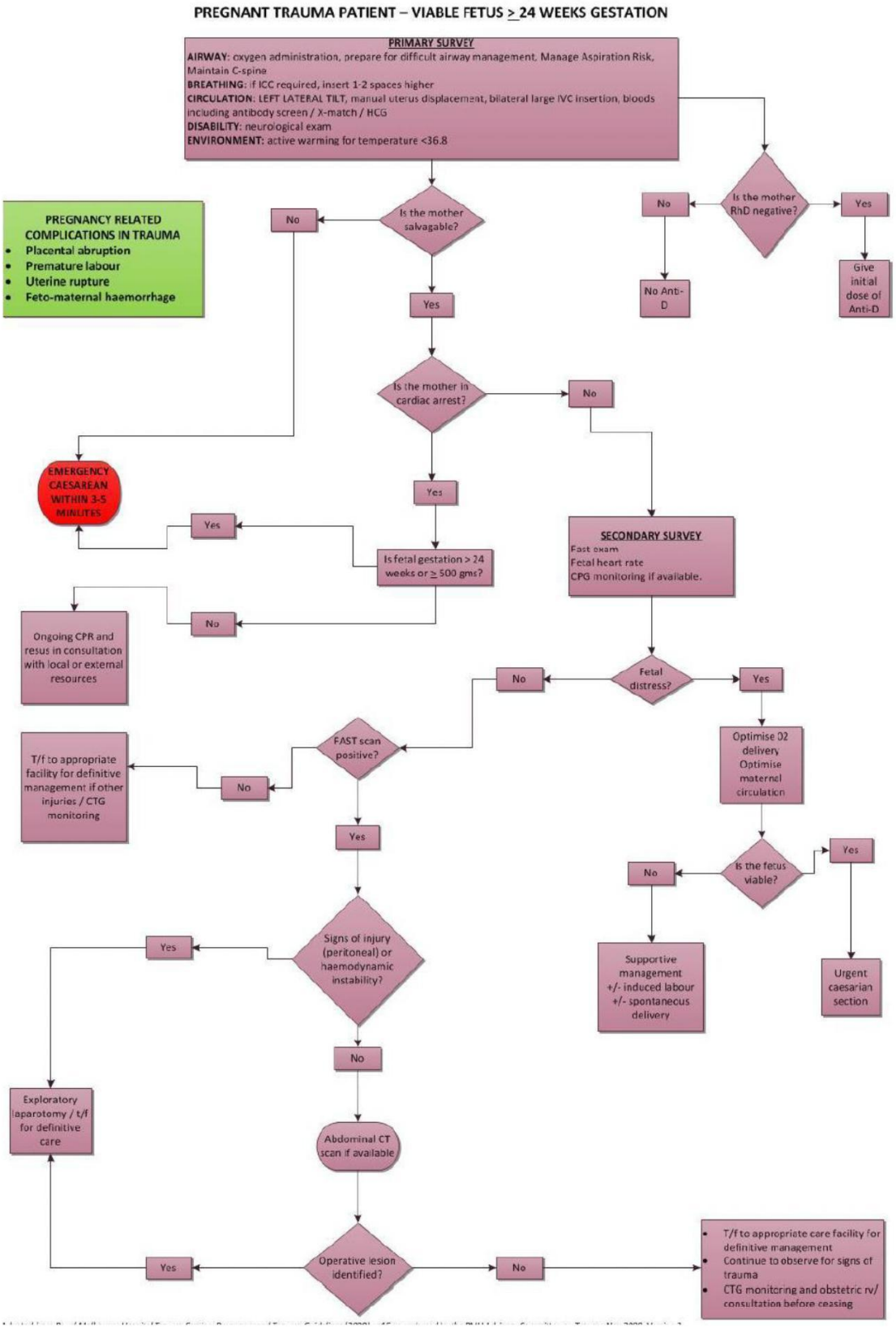
Obstetric emergencies



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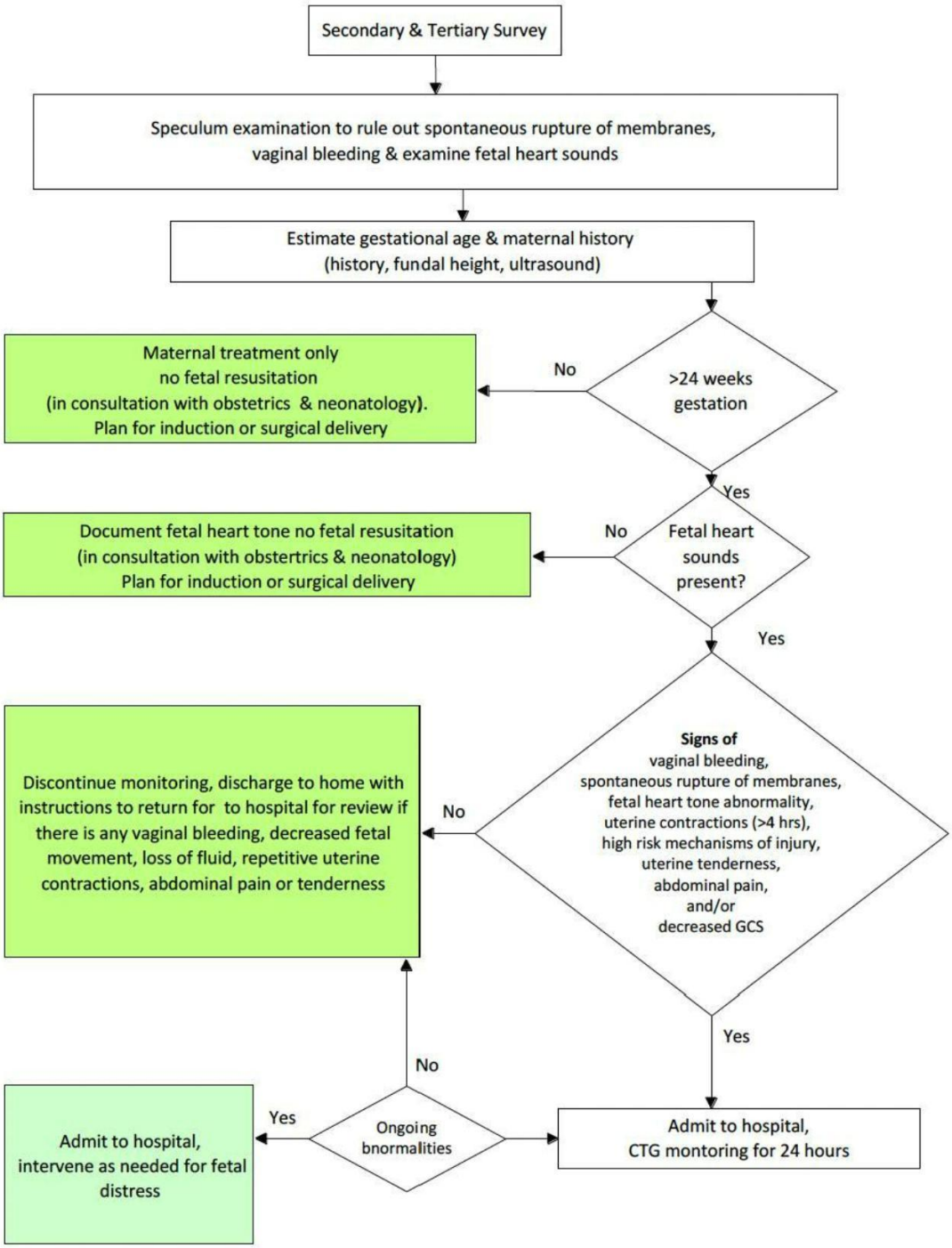
Obstetric emergencies



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APH

Life threatening causes

Less than 20 weeks	More than 20 weeks
• Ruptured ectopic pregnancy. • Retained products of conception (RPOC) • Complication of pregnancy termination. • Miscarriage – Threatened, incomplete, complete, missed.	• Placental abruption • Placenta previa • Uterine rupture • Postpartum haemorrhage (PPH)

	Symptoms	Signs
Placenta praevia	Painless +/- signs of foetal distress	Non-tender uterus Shock in proportion to PV loss.
Placental abruption	Constant pelvic pain Foetal distress	Tense tender uterus – woody feel. Shock out of proportion to PV loss
uterine rupture	Painful or painless, foetal distress.	Loss of the normal uterine contour

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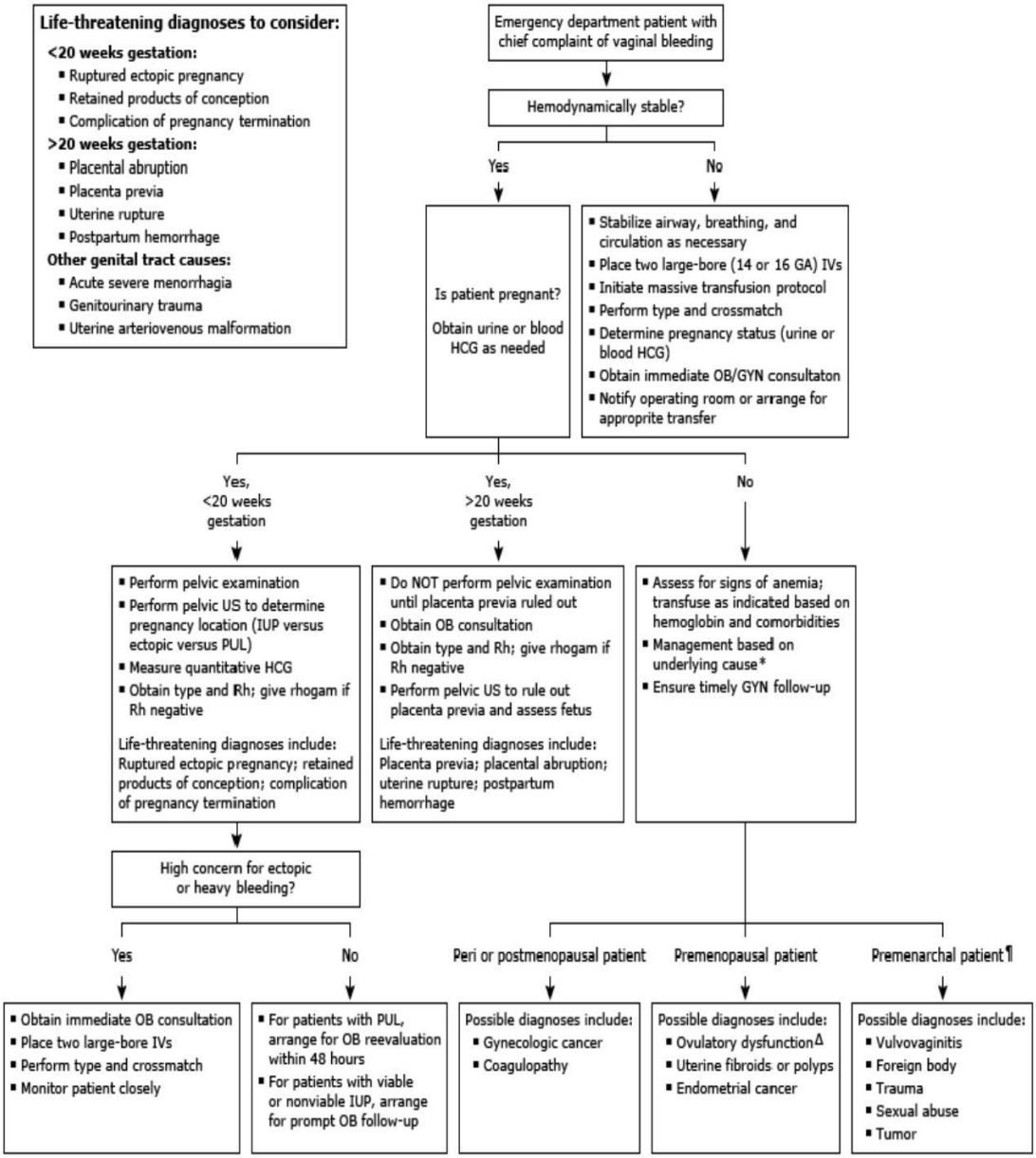
Obstetric emergencies



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Hypertension in pregnancy

Definition

- Hypertension:
  - Systolic blood pressure 140 – 159 mmHg and/or diastolic blood pressure 90 - 109 mmHg.
- Severe hypertension:
  - Systolic blood pressure >/=160 mmHg and/or diastolic blood pressure >/=110 mmHg.
- Chronic Hypertension
  - Women with pre-existing hypertension or hypertension detected before 20th week of gestation in the absence of trophoblastic disease and persisting more than 42 days post-partum.
- Gestational Hypertension
  - New onset of hypertension after 20 weeks gestation without any maternal or foetal features of preeclampsia.
  - Return of BP to normal within 3 months postpartum.
- Pre-eclampsia
  - Gestational hypertension associated with significant proteinuria (UPCR >/=30mg/mmol or 2+ or more on dipstick or 300mg/24 hours).
- Eclampsia
  - Development of convulsions and/or unexplained coma during pregnancy or postpartum in patients with a background of pre-eclampsia or gestational hypertension.

Diagnosis

Pre-eclampsia

- Diagnosed by presence of de novo hypertension after 20 weeks' gestation accompanied by evidence of at least one other organ involvement. (Biochemical and/or haematological impairment).
  - Evidence of maternal acute kidney injury
  - Liver dysfunction
  - Neurological features
  - Haemolysis or thrombocytopenia
  - and/or uteroplacental dysfunction (such as fatal growth restriction, abnormal umbilical artery doppler waveform analysis, or stillbirth).
- Proteinuria is the most commonly recognised additional feature after hypertension (not mandatory for clinical diagnosis).

Clinical features

- Severe headache.

Source: Major presentations in Medical Practice. ISBN 978-624-6246-12-9

- Visual disturbances (blurring of vision or flashing before eyes or neurological symptoms such, altered mental status, blindness, stroke, or persistent visual scotomata).
- Epigastric or right hypochondrial pain, liver tenderness +/- nausea and vomiting
- Sudden swelling of the face, hands or feet
- Clonus (3 beats or more)
- Papilledema.
- Oliguria (less than 400 ml per day or 0.5 ml/Kg/ hour over a 4-hour period)

Biochemical

- Abnormal liver enzymes (ALT or AST rising to above 40IU/liter)
- Thrombocytopenia (platelet count below 150,000/ microliter
- Renal insufficiency (creatinine >/=90micromol/liter)
- HELLP syndrome
- Uteroplacental dysfunction (fetal growth restriction, abnormal umbilical artery doppler waveform analysis, or stillbirth.)

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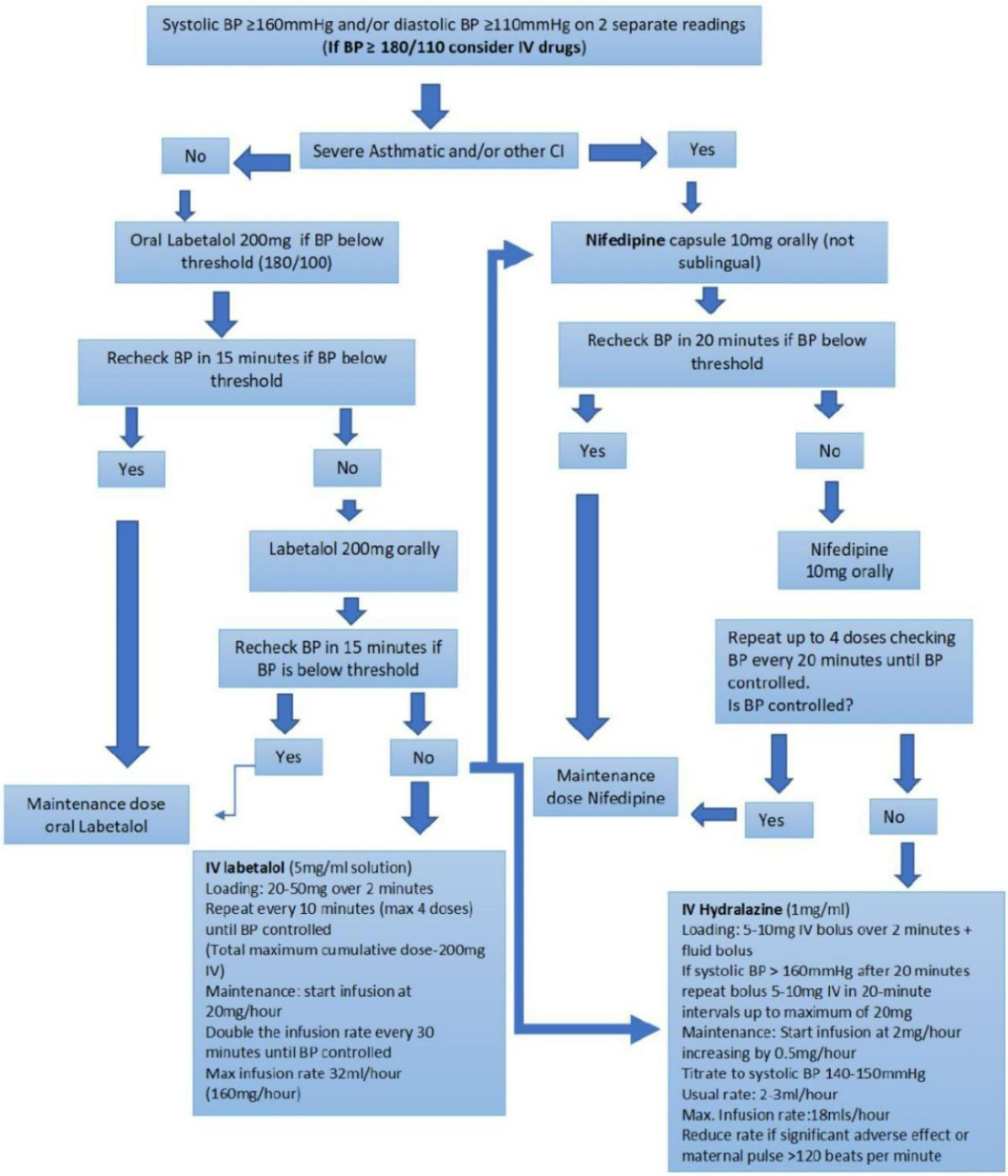
Severe hypertension

Algorithm for management of severe hypertension



- Avoid non-steroidal anti-inflammatory medication postnatally.
- BP monitoring and a gradual withdrawal of antihypertensive therapy may be required for up to 3 months postnatally.

Source: Major presentations in Medical Practice. ISBN 978-624-6246-12-9

Sever pre-eclampsia

- Severe preeclampsia has been defined as BP ≥160/110 mmHg with proteinuria (urinary protein : creatinine ratio > 30mg/mmol or 24 hour urinary protein > 300 mg) **OR** BP 140/90 – 159/109 mmHg with proteinuria with at least one of the following:
  - Severe headache
  - Visual disturbances
  - Severe pain just below the ribs or vomiting
  - Papilloedema
  - Signs of clonus (≥ 3 beats)
  - Liver tenderness
  - HELLP syndrome
  - Platelet count < 100 x 109/L
  - Abnormal liver enzymes

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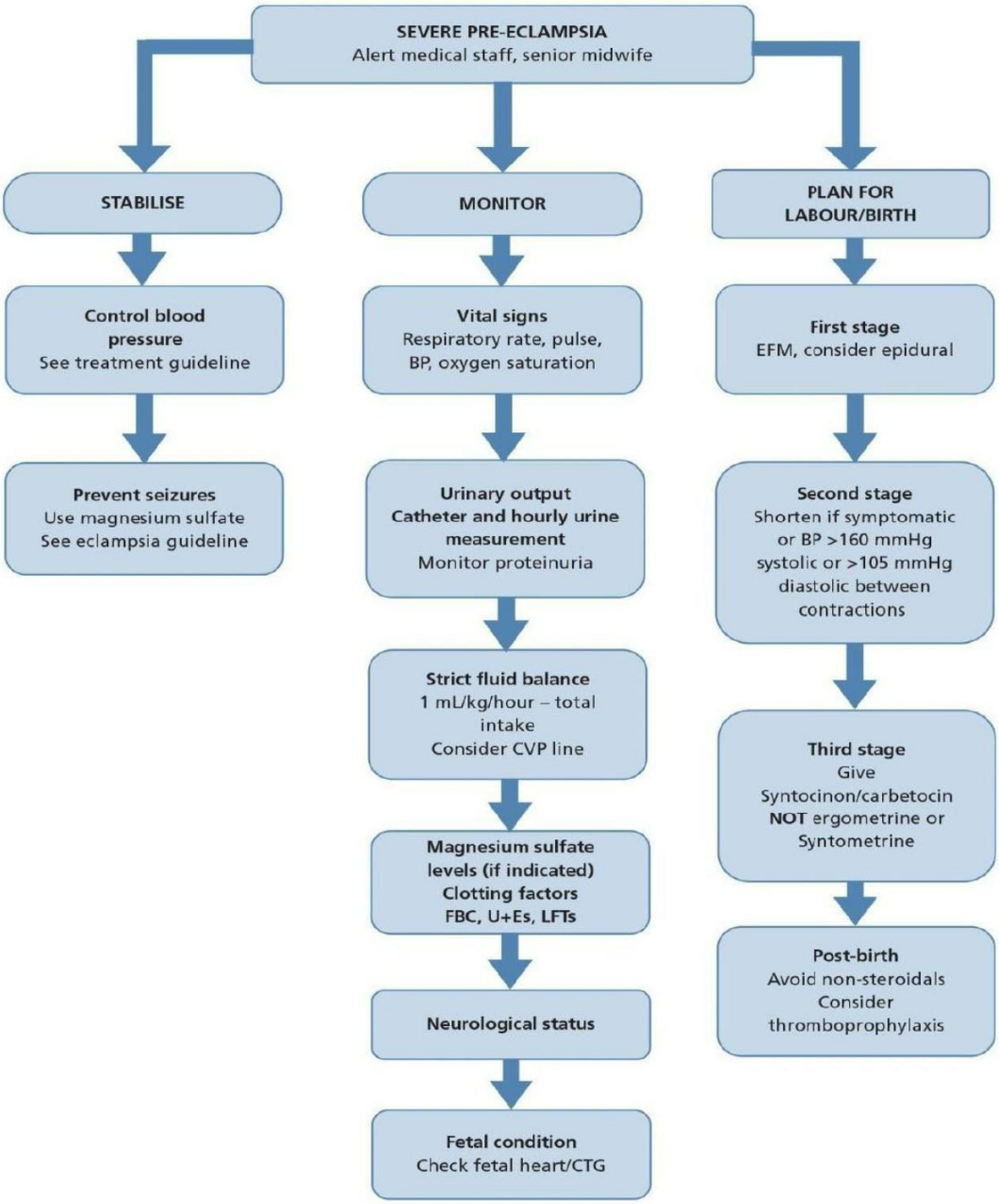
Severe pre-eclampsia management algorithm



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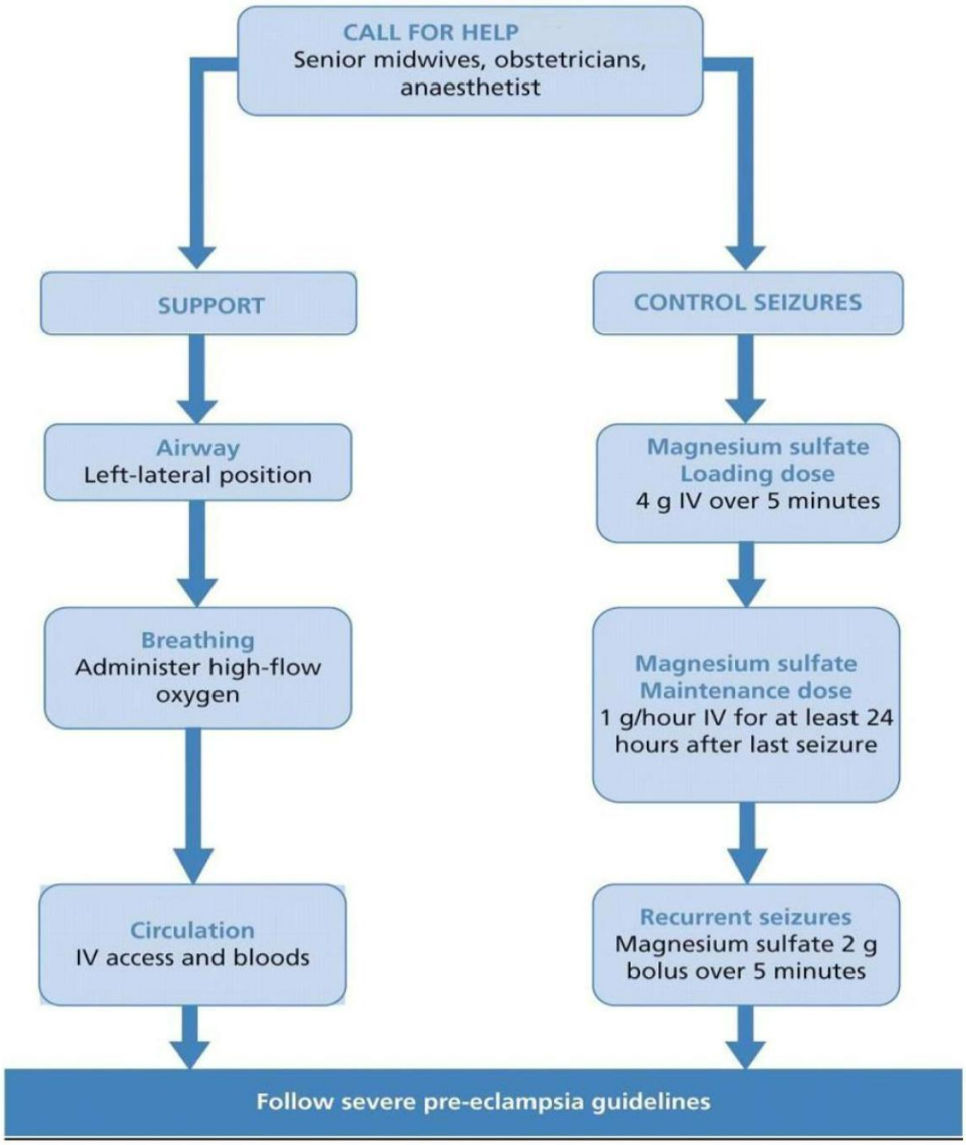
Eclampsia

Eclampsia is characterised by coma and / or convulsions.

Eclampsia may occur at any time up to 24 hours after birth and occasionally later.

Management of eclampsia algorithm



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Obstetric emergencies

Hypertension

- Antihypertensive treatment, If they have:
    - Sustained systolic blood pressure of >/=140 mmHg or sustained diastolic blood pressure of >/=90 mmHg.
- Target blood pressure of 135/ 85mmHg.
- Goal
    - Lower BP to prevent cerebrovascular and cardiac complications while maintaining uteroplacental blood flow, until the delivery is affected.
    - But it does not alter the progression of preeclampsia.

Pre-eclampsia

- Admit to hospital and inform Consultant – Life threatening emergency.
- Observe and monitor.
- Treat hypertension if:
    - SBP >/= 140 mmHg, or if DBP >/= 90 mm Hg
- Target
    - aim for an initial realistic target around 140-150/ 90-100 mmHg.
    - Rapid fall in maternal BP may cause FHR abnormalities and compromise, especially in growth restricted/compromised fetuses.
- Medications
    - Blood pressure <180/110 mmHg - Oral anti-hypertensive medications.
    - If adequate response is not obtained within 30 minutes – IV anti-hypertensives.
- **Nifedipine**
    - Oral nifedipine If BP <180/110mmHg, in asymptomatic patients. (Avoid SL administration as it can cause sudden hypotension and fetal compromise).
    - Give 10mg orally.
    - Repeat at 20-minute intervals up to a maximum of 40mg.
    - If there is no response proceed to intravenous labetalol or hydralazine.
- **Labetalol orally or intravenously**
    - Dose - PO 200mg stat (If BP < 180/110)
    - Check BP in 15 mins and 30 mins.
    - Repeat dose in half an hour if no adequate response.
    - Recheck BP in 15 mins and 30 mins.
    - If inadequate response, consider oral Nifedipine or IV labetalol regimens.
    - 20-50 mg IV loading over two minutes.
    - Record blood pressure after 10 minutes.
    - If either value is still above 160 mmHg systolic and/ or 110 mmHg diastolic, repeat 20-50 mg IV over 2 minutes.
    - Record blood pressure after 10 minutes.
    - Repeat every 10 mins maximum up to 4 doses until BP controlled. (Max. cumulative dose up to 200 mg IV).
    - If the blood pressure is still above 160 mmHg systolic and/or 110 mmHg diastolic, Consider IV labetalol infusion or IV Hydralazine.

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    - Maintenance IV labetalol infusion – starting at 20 mg/hr (4ml/hr), double the infusion rate at every 30 minutes intervals until BP is controlled. (Max Infusion rate 32ml/hr. Total of 160 mg/ hour max).
- **Hydralazine**
    - Hydralazine 5-10 mg IV bolus over 2 minutes.
    - Must be accompanied by fluid bolus of 5ml/kg of 0.9% Nacl or Ringer's lactate solution over 30 min, started at the same time as iv hydralazine.
    - Hydralazine is a direct vasodilator.
    - Fluid bolus helps to overcome vasodilatation and prevents drastic hypotension.
    - This should not be used in the presence of pulmonary oedema.
    - Record blood pressure at 20-minute intervals.
    - Repeat boluses of 5-10 mg IV after a 20-minute interval. may be given if necessary, up to a maximum of 20 mg (the effect of a single dose can last up to 6 hours).
    - If no lasting effect with above boluses, consider an infusion of hydralazine 2.0 mg/hour increasing by 0.5 mg/hour as required (2-18 mg/hour usually required).
- Monitor
    - Foetal heart with continuous CTG during and for 60 minutes after commencing anti-hypertensive therapy.
    - BP must be monitored at l5 minute intervals for 1st hour. Then every 30 min interval.
    - **Foetal surveillance**
        - **Cardiotocography**
        - **USS**
            - Fetal growth and amniotic fluid volume assessment with umbilical artery Doppler velocimetry.
- Evaluate the need for MgSO4.
    - Indications
        - Severe hypertension (>/=160/110 mmHg) and proteinuria
        - Premonitory signs of eclampsia.
            - Should be considered in any woman with features of impending/imminent eclampsia.
                - Presence of >/=3 beats clonus
                - Severe headache
                - Visual disturbances such as scotoma, blurring or flashing before the eyes, papilledema.
                - HELLP syndrome, platelet count falling to below 100×109 per litre, rising liver enzymes.
    - Prevention of convulsion
        - Dose - LD of 4 g should be given IV over 5 to 20 minutes, followed by an infusion of 1g/hour maintained for 24 hours.

- If the woman has had an eclamptic fit, the infusion should be continued for 24 hours after the last fit.
- Recurrent fits should be treated with a further dose of 2-4 g given intravenously over 5 to 20 minutes.
- No IV access
  - LD - 5g deep intramuscularly into each buttock with 1ml of 2% lignocaine in the same syringe.
  - Maintenance - 5g to alternate buttocks 4 hourly, with l ml of 2% lignocaine in the same syringe.

- Administration
  - **Via infusion pump or manually**
    - 4 g, diluted to a total volume of 20 ml with 0.9% sodium chloride solution, given via an infusion pump or 'manually'.
    - (20ml of the loading dose in a syringe pump and administered at a rate of 60ml/ hour, i.e. 4g will be given over a 20 minute period or 240ml/hour if given over 5 minutes in the case of an eclamptic fit).
  - **Via burette set:**
    - Diluted to a total volume of 80 ml with 0.9% sodium chloride solution via a burette.
  - Maintenance
    - 10g in 50ml via a syringe pump:
    - The 50ml syringe containing 50ml of the maintenance dose is to be attached to a syringe pump and administered on completion of loading dose; set rate at 5ml/hour which equates to 1g/ hour.
    - Or
    - Remove 80ml of sodium chloride 0.9% from a 500ml bag of sodium chloride 0.9% and add 80ml of magnesium sulphate injection 50% (This produces 40g in 500ml).
    - The 500ml bag to be attached to a giving set and administered on completion of loading dose set rate at 12.5ml/ hour which equals to 1g/hour).
  - Target
    - Ensure hourly UOP of 30 ml per hour
    - RR >16/ minute
    - SPO2 >90%
    - Presence of patellar reflexes.
  - Toxicity/ Discontinue
    - UOP in the preceding 4 hours <100mls.
    - Absent patellar (knee jerk) reflexes.
    - Respiratory rate <12 per minute.

        - Weakness, sensation of warmth, flushing, drowsiness, double vision and slurred speech.
        - Mx
            - Antidote is calcium gluconate, 1g IV (10ml of 10% solution), given over 10 minutes.
    - Mg levels
        - **If rate exceeds 2g/hr**
            - Normal serum level 0.7-1.0mmol/L
            - Therapeutic level 2.0-4.0mmol/L
            - Disappearance of tendon reflexes at 5.0mmol/L
            - Muscular paralysis and respiratory depression at 6-8mmol/L
            - Cardiac arrest at 12mmol/L
- Strict fluid balance
    - Limit maintenance fluids to 80ml/hour (1ml/Kg/ hr) unless there are other ongoing fluid losses (E.g. haemorrhage).
    - If urine output falls to less than 0.5ml/ kg/hr over 4 consecutive hours a Central Venous Pressure line is to be considered and fluid replacement done cautiously.
    - Diuretics must be restricted to specific instances only - Pulmonary oedema.
- Look for complications – Such as HELLP/ pulmonary oedema/cerebral haemorrhage/ AKI.
- Only known cure is delivery of the baby.
    - Timing of delivery
        - In-utero transfer where necessary evaluate the fetus
        - Continue vigilance post-delivery.
- Prognosis
    - Severe hypertension should be treated as a medical emergency.
    - Main cause of death in severe pre- eclampsia
        - Poorly controlled systolic hypertension causing cerebral haemorrhage.

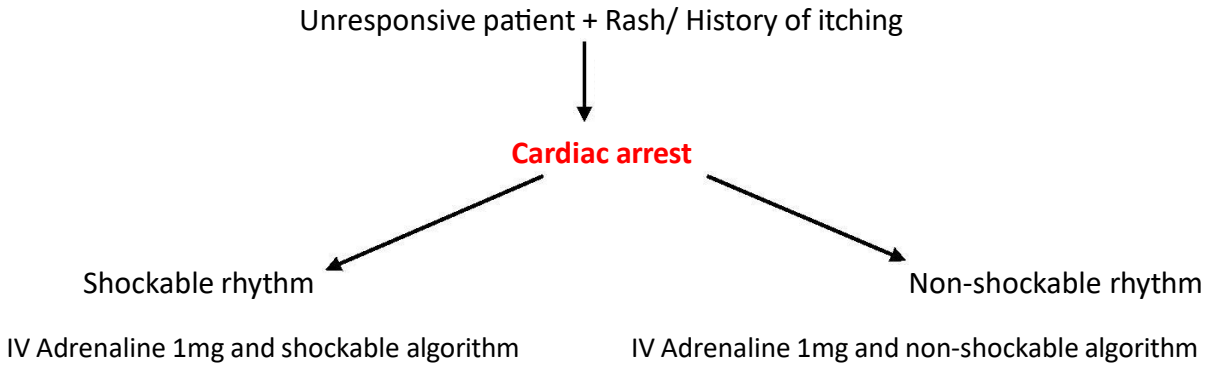
Source: Major presentations in Medical Practice. ISBN 978-624-6246-12-9

Physiology

Cardiovascular	
Blood pressure	Minimal change Slight ↓ in first and second trimester, normal in third
Heart rate	↑ 15–20% ↑
Cardiac output	↑ 30–40% 6–7 L/min during pregnancy
ECG	Non-specific ST changes, Q waves in leads III and AVF, atrial and ventricular ectopics
Systemic vascular resistance	↓ to 1,000–14,000 Due to progesterone and blood volume
Respiratory	
Respiratory rate	No change
Oxygen demand	↑ 15%
Functional residual capacity	↓ 25%
Minute ventilation	↑ 25–50% or 7–15 mL/min
Tidal volume	↑ 25–40% or 8–10 mL/kg
PaO2	↑ 10 mmHg or 104–108 mmHg
PaCO2	↓ 27–32 mmHg
Arterial pH	↑ 7.40–7.45
Bicarbonate	↓ 19–25 mmol/l
Haematological	
Blood volume (mL)	↑ 30–50% volume
White cell count (mm^3)	↑ to 5,000–14,000
Haemoglobin (g/dL)	↓ to 100–140
Haematocrit (%)	32-42
Plasma volume (mL)	↑ 30–50%
Red blood count volume (mL)	↑ to 1900
Coagulation factors ↑ 30–50%	↑ factors VII, VIII, IX, XII
Platelet (mm3)	200,000–350,000
Fibrinogen, plasma (mg/dL)	264-615

Source: Major presentations in Medical Practice. ISBN 978-624-6246-12-9

Allergy and Angioedema



Notes (1)

- Need both IV adrenaline bolus (cardiac arrest protocol, 1 mg every 2-3 minutes) AND aggressive fluid resuscitation in addition to CPR (Normal Saline 20mL/kg stat, through a large bore IV under pressure, repeat if no response)
- Do not give up too soon - this is a situation when prolonged CPR should be considered, because the patient arrested rapidly with previously normal tissue oxygenation and has a potentially reversible cause.

No cardiac arrest

Anaphylaxis (1)

ASCIA defines anaphylaxis as:

- Any **acute onset illness** with **typical skin features** (urticarial rash or erythema/flushing, and/or angioedema), plus involvement of **respiratory** and/or **cardiovascular** and/or persistent severe **gastrointestinal** symptoms; or
- Any **acute onset** of **hypotension** or **bronchospasm** or **upper airway obstruction** where anaphylaxis is considered possible**, even if typical skin features are not present**.

Criteria 1

- Acute onset of an illness (minutes to several hours) with simultaneous involvement of the skin, mucosal tissue, or both (e.g. generalized hives, pruritus or flushing, swollen lips-tongue-uvula), and at least one of the following:
- a) Respiratory compromise (e.g. dyspnea, wheeze-bronchospasm, stridor, reduced peak expiratory flow, hypoxemia).
- b) Reduced blood pressure or associated symptoms of end-organ dysfunction (e.g. hypotonia [collapse], syncope, incontinence).
- c) Severe gastrointestinal symptoms (e.g. severe crampy abdominal pain, repetitive vomiting), especially after exposure to non-food allergens.

Criteria 2

- Acute onset of hypotension or bronchospasm or laryngeal involvement after exposure to a known or highly probable allergen for that patient (minutes to several hours), even in the absence of typical skin involvement.

Signs and symptoms of allergic reaction (1)

Mild and Moderate allergic reactions	Anaphylaxis
Swelling of lips, face, eyes	Difficult or noisy breathing
Hives or welts	Swelling of tongue
Tingling mouth	Swelling or tightness in throat
Abdominal pain, vomiting	Difficulty talking or hoarse voice
Swelling of lips, face, eyes	Wheeze or persistent cough - unlike the cough in asthma, the onset of coughing during anaphylaxis is usually sudden
	Persistent dizziness or collapse
	Pale and floppy (young children)
	Abdominal pain, vomiting - for insect stings or injected drug (medication) allergy.
Oral Antihistamine/ Oral Steroids	**IM Adrenaline/ IV Antihistamine/ IV Steroids**

Management of anaphylaxis (1)

Immediate action

1. **Remove allergen** (if still present), stay with person, call for assistance and locate adrenaline injector.
2. **LAY PERSON FLAT** - do NOT allow them to stand or walk

- If unconscious or pregnant, place in recovery position - on left side if pregnant, as shown below
- If breathing is difficult allow them to sit with legs outstretched
- Hold young children flat, not upright

3. **GIVE ADRENALINE INJECTOR -** Give intramuscular injection (IMI) adrenaline into outer mid-thigh without delay using an adrenaline autoinjector if available OR adrenaline ampoule/syringe. Adrenaline (epinephrine) is the first line treatment for anaphylaxis- adult dosage- IM adrenalin 0.5ml (1:1000)

Supportive management

- Monitor pulse, blood pressure, respiratory rate, pulse oximetry, conscious state.
- Give high flow oxygen (6-8 L/min) and airway support if needed.
- Supplemental oxygen should be given to all patients with respiratory distress, reduced conscious level and those requiring repeated doses of adrenaline.
- Supplemental oxygen should be considered in patients who have asthma, other chronic respiratory disease, or cardiovascular disease.
- Obtain intravenous (IV) access in adults and in hypotensive children.
- If hypotensive:
    - Give intravenous normal saline (20 mL/kg rapidly under pressure), and repeat bolus if hypotension persists.
    - Consider additional wide bore (14 or 16 gauge for adults) intravenous access.

Adrenalin Dosage (1)

Age (years)	**Weight (kg)**	**Volume (mL) of adrenaline 1:1,000 ampoules***	**Adrenaline injector devices (for use instead of ampoules)**
~<1	<7.5	0.1 mL	Not available
~1-2	10	0.1 mL	7.5-20 kg (~<5yrs) 150 microgram device**
~2-3	15	0.15 mL	
~4-6	20	0.2 mL	
~7-10	30	0.3 mL	>20 kg (~>5yrs) 300 microgram device***
~10-12	40	0.4 mL	
~>12 and adults	>50	0.5 mL	>50 kg (~12 years) 500 microgram**** or 300 microgram devices

*Adrenaline 1:1,000 ampoules contain 1mg adrenaline per 1mL

**EpiPen® Jr is a 150 microgram (0.15 mg) device.

***EpiPen® is a 300 microgram (0.3 mg) device.

****Anapen® 500 is a 500 microgram (0.5 mg) device.

Additional measures(1)

wheeze present	➢ Bronchodilators: Salbutamol 8-12 puffs of 100microgram (spacer) or 5mg (nebuliser). Note: Bronchodilators must not be used as first line medication for anaphylaxis as they do not prevent or relieve upper airway obstruction, hypotension or shock. ➢ Corticosteroids: Oral prednisolone 1 mg/kg (maximum of 50 mg) or intravenous hydrocortisone 5 mg/kg (maximum of 200 mg). Note: Steroids must not be used as a first line medication in place of adrenaline as the benefit of corticosteroids in anaphylaxis is unproven.
persistent hypotension/ shock	➢ Give normal saline (maximum of 50mL/kg in first 30 minutes). Glucagon ➢ In adults, selective vasoconstrictors only after advice from an emergency medicine/critical care specialist.
For upper airway obstruction	➢ Nebulised adrenaline (5mL e.g. 5 ampoules of 1:1000). ➢ Consider need for advanced airway

Refractory Anaphylaxis (1)

If there is an inadequate response after 2-3 adrenaline doses or deterioration of the patient, start IV adrenaline infusion, given by staff trained in its use or in liaison with an emergency specialist.

The protocol for 100 mL normal saline is as follows:

- Mix 1 mL of 1:1,000 adrenaline in **100 mL** of normal saline.
    - Initial rate adjusted accordingly to **0.5 mL/kg/hour (**~0.1 microgram/kg/minute).
    - Should only be given by infusion pump.
- Monitor continuously – ECG and pulse oximetry and frequent non-invasive blood pressure measurements as a minimum to maximise benefit and minimise risk of overtreatment and adrenaline toxicity.

Management of anaphylaxis in pregnancy (1)

- ➢ same as for non-pregnant women
- ➢ Left lateral position
- ➢ Adrenaline should be the first line treatment for anaphylaxis (1:1,000 IM adrenaline 0.01mg per kg up to 0.5mg per dose)

Mild to moderate allergic reaction Management

- ✓ Oral antihistamine
- ✓ Identify the cause and prevent triggers
- ✓ No place for oral steroids in acute mild allergic reactions
- ✓ Immunology specialist referral if recurrent

Disposition plan

Observe for 4 hours after giving adrenaline Severe

allergy/ anaphylaxis- admit

Mild or moderate allergy- if stable can discharge with action plan and immunology referral

Angioedema

small blood vessels leak fluid into the tissues under the skin, causing swelling in different parts of the body (2)

Signs and symptoms (2)

Angioedema with hives (urticaria)	**Angioedema without hives**
Pink or red itchy rashes, that may appear as blotches or raised red lumps (wheals) on the body with swelling under the skin that feels itchy, hot, tingly, or burning.	• Large swollen areas under the skin, that look red and are itchy, hot, tingly, burning or generally uncomfortable. • In some people, skin-coloured swellings, that are not itchy, red, or uncomfortable may appear.

Types of angioedema (2)

Acquired	**Hereditary angioedema (HAE)**
Viral infection	low levels (deficiency) or reduced effectiveness of C1-inhibitor enzyme.
Food or drug allergy	Acquired C1-inhibitor deficiency
ACEI medications	
Thyroid disease, Arthritis	
Autoimmune	

Management (2)

- Symptoms may disappear over time
- Avoid the triggers that make symptoms worse
    - Excessive heat, eating spicy foods, and alcohol consumption.
    - Pain relief medications - an alternative such as paracetamol may reduce symptoms.
    - ACE (angiotensin converting enzyme) inhibitors - angiotensin 2 receptor blockers are usually considered safe.
- Antihistamines (3)
- Hereditary angioedema- Purified C1 inhibitor concentrate/ Bradykinin B2 receptor antagonist (Icatibant) or FFP in acute stage
- ACEI induced angioedema- Discontinue ACEI. FFP may be beneficial if severe.
- If severe (lip/eye swelling) – add oral prednisolone 25-50mg- tapered over 5-7days or IV Methylprednisolone 60-80 mg followed by oral prednisolone taper

Allergy and angioedema

Indications for admission

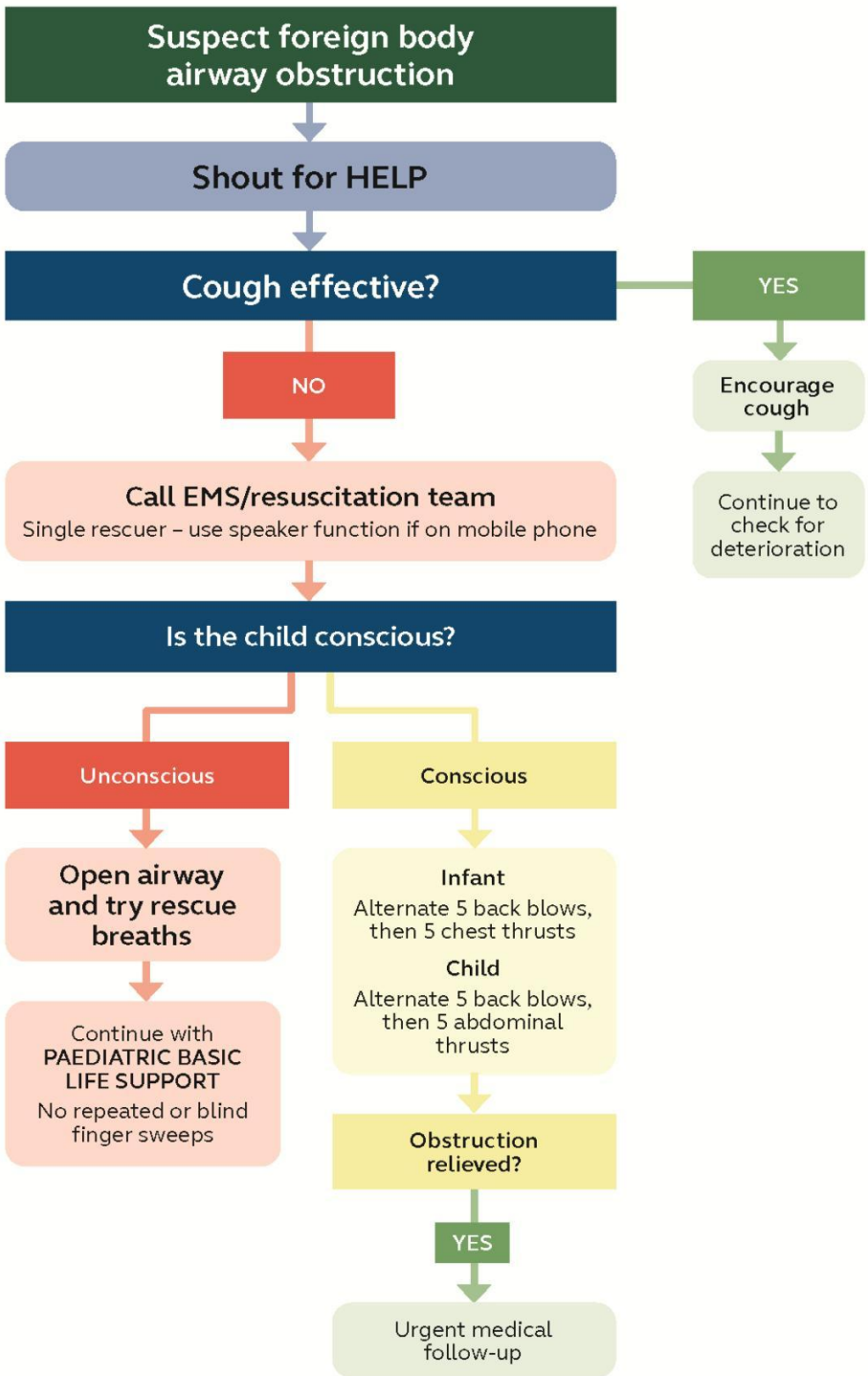
1. Anaphylaxis/ adrenaline given
2. Abnormal vital parameters in non-anaphylaxis allergic reaction after 4 hours of monitoring.
3. Angioedema with ongoing risk of airway obstruction, e.g.: hoarseness/ stridor despite initial emergency treatment.
4. Angioedema with severe GI involvement and loose stools warranting IV fluids.
5. Pregnant women presenting with allergy/anaphylaxis.
6. Social circumstances preventing reliable observation at home/ difficult access to hospital/living alone.

Note:
Recurrent anaphylaxis to known / unknown trigger- 1 dose of adrenaline drawn up to syringe for pre-hospital use. To be changed every month if not used.

Resuscitation Council UK

GUIDELINES 2021

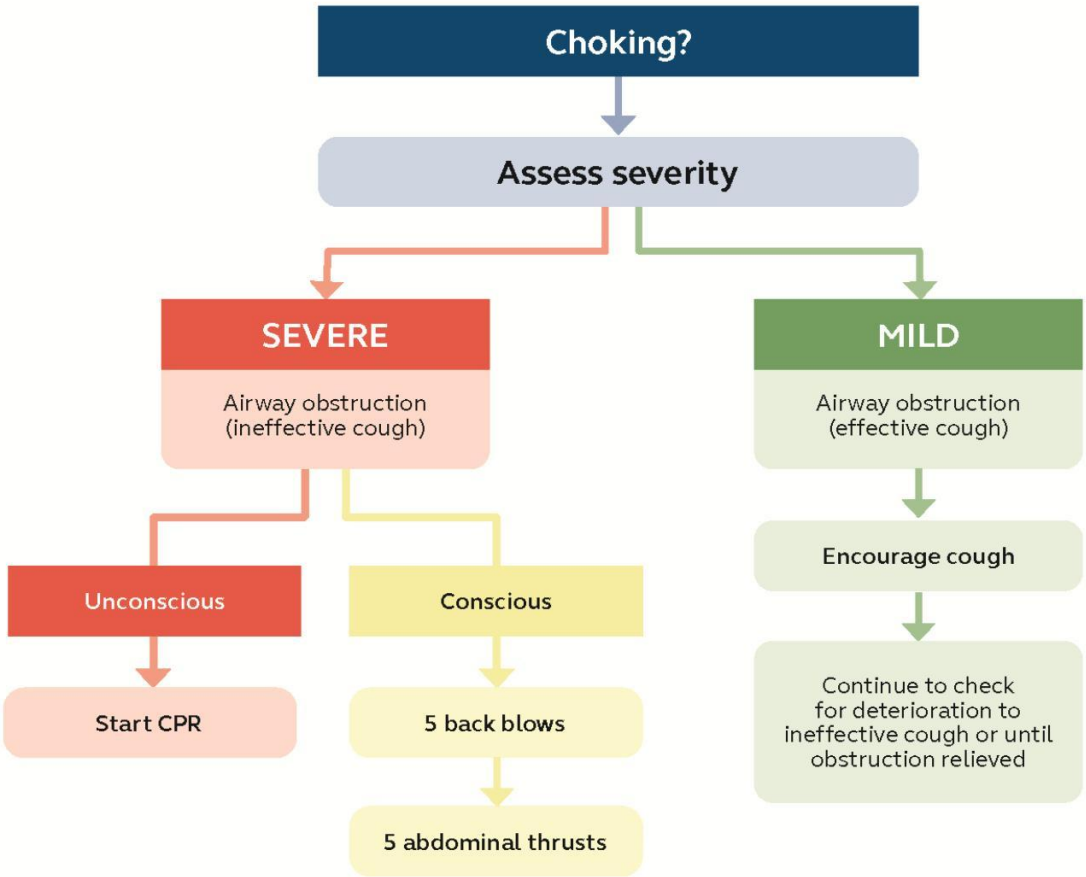
Paediatric foreign body airway obstruction



Resuscitation Council UK

GUIDELINES 2021

Adult choking



Choking

Indications for admission

1.Inadequate removal / inability to remove foreign body.

Consider emergent ENT referral.

Acute SOB – Work up

1. **Acute Asthma** – mild/mod/severe/life-threatening/near-fatal

2. **COPD – mild/mod/severe**
   - Target SpO2 88-92% ((If chronic CO2 retainer/ABG-HCO3 >30)
   - Target SpO2 94-98% (If non-CO2 retainer)

3. **Pneumonia**
   - CURB 65 – antibiotics: refer national antimicrobial guidelines
     - For moderate CAP: IV Co-amoxiclav 1.2g 8H + Clarithromycin 500mg 12H
     - For severe CAP: IV Cefotaxime 1g 8H/Ceftriaxone 1-2g daily + Clarithromycin 500mg 12H
   - SMART-COP – management setting

4. **Pulmonary embolism**

   Apply Wells score and revised Geneva score.

5. **Pneumothorax**

Tension/non-tension	Spontaneous Primary / Secondary	Traumatic Unilateral / Bilateral	Mx: Needle thoracostomy ± IC tube insertion at safe triangle

6. **Pleural effusion**
   - Unilateral/Bilateral
   - mild/mod/massive
   - Mx: For symptomatic mod/massive effusion: IC tube insertion/repeated aspiration

7. **Chronic parenchymal lung disease**
   - Bronchiectasis, ILD, etc.

8. **ACS Chest Pain Workup**

9. **Acute pulmonary oedema**
   - Cardiogenic – LMNOP (Lasix, Morphine, Nitrate if BP- high, Noradrenaline if BP low, O2, Propped-up-pressure (NIV))
   - Nephrogenic – Lasix/ NIV / Dialysis

10. **Anaphylaxis**

11. **DKA – mild/mod/severe • Mx:**
    - IV fluids
    - Insulin infusion (starting with 0.1 unit /kg/h),
    - Treat precipitant cause (IV antibiotics if there's clinical suspicion of infection)

12. **Sepsis**
    - Refer Sepsis workup

13. **Anemia**
    - With IHD – Hb target: 10g/dL
    - Without IHD – Hb target: 8g/dL
    - Slow transfusions under frusemide cover

Table 5 The revised Geneva clinical prediction rule for PE

Items	Clinical decision rule points	
	Original version	Simplified version
Previous PE or DVT	3	1
Heart rate		
75–94 b.p.m.	3	1
≥95 b.p.m.	5	2
Surgery or fracture within the past month	2	1
Haemoptysis	2	1
Active cancer	2	1
Unilateral lower limb pain	3	1
Pain on lower limb deep venous palpation and unilateral oedema	4	1
Age >65 years	1	1

Clinical probability		
Three-level score		
Low	0–3	0–1
Intermediate	4–10	2–4
High	≥11	≥5
Two-level score		
PE-unlikely	0–5	0–2
PE-likely	≥6	≥3

b.p.m. = beats per min; DVT = deep vein thrombosis; PE = pulmonary embolism.

Breathlessness

Bronchial asthma

Indications for admission

1. Life-threatening attack or near fatal asthma
   -SpO2 <92%, ABG showing acidosis/ hypoxia/ normal or high CO2
   -Cyanosis
   -Hypotension
   -Exhaustion, confusion
   -PEFR less than 50% predicted or best
   -Silent chest, poor respiratory effort
2. Tachy-/brady-/arrhythmias
3. Pnuemonia/other precipitant of exacerbation meeting admission criteria.
4. Social circumstances preventing reliable observation at home/ difficult access to hospital/living alone

Indications for ICU/HDU admission

1. Severe dyspnoea responding inadequately to initial emergency therapy.
2. Changes in mental status (confusion/lethargy/coma)
3. Persistent or worsening hypoxaemia and/or severe/worsening respiratory distress requiring HFNO/NIV.
4. Need for invasive mechanical ventilation.
5. Haemodynamic instability-need for vasopressors.

Discharge checklist-mild/mod/severe attack

1. Symptoms improved within 4h of observation, not needing regular SABA
2. PEF improving, and > 60-80% of personal best or predicted
3. SpO2> 94% on room air.
4. Resources at home adequate.

Discharge plan

1.Check inhaler technique
2.Reliever: continue as needed
3.Controller: start or step up
4.Prednisolone: 40-50 mg continue for 5-7 days
5.Followup- within 2-7 days

COPD

Indications for hospital admission

1. Severe symptoms (e.g., high RR, SpO2 < 88% in a CO2 retainer or < 92% in a non retainer, confusion, drowsiness or acute respiratory distress).
2. Acute respiratory failure
   - New respiratory acidosis or hypercapnia above baseline on ABG.(Acute or acute on chronic respiratory acidosis)
   - Significant hypoxemia (PaO2 <60mmHg on room air)/ hypoxaemia below baseline.
3. Onset of new physical signs. (eg: cyanosis/ peripheral oedema)
4. Failure to respond to initial medical management.
5. Presence of serious comorbidities (eg: heart failure, new arrhythmias, etc)
6. Social circumstances preventing reliable observation at home/ difficult access to hospital/living alone

Indications for ICU/HDU admission

1. Severe dyspnoea responding inadequately to initial emergency therapy.
2. Changes in mental status (confusion/lethargy/coma)
3. Persistent or worsening hypoxaemia (PaO2 <40mmHg) and/or severe/worsening respiratory acidosis (pH<7.25) despite supplemental oxygen and non-invasive ventilation.
4. Need for non-invasive/invasive mechanical ventilation.
5. Haemodynamic instability-need for vasopressors.

Discharge plan

1. Check inhaler technique
2. Reliever: continue as needed
3. Check maintenance therapy and understanding.
4. Check smoking status and advice on cessation.
5. Acute medications if indicated- steroids/ antibiotics
6. Ensure understanding withdrawal of acute medications (steroids and/or antibiotics)
7. Arrange follow-up: early <4w or late <12w as indicated clinically.

Pneumonia

Indications for admission

1.Severity assessment tools

SMART COP

S-Systolic BP <90 mmHg- 2
M-Multilobar involvement-1
A-Albumin <35 g/L- 1
R-Respiratory rate (high) 1
T-Tachycardia ≥125/min 1
C-Confusion 1
O-Oxygenation (low) 2
P-pH <7.35 2

Score

4 → need for invasive respiratory or circulatory support → For ICU
1-3 → apply CURB-65

CURB65 Score

C-Confusion 1
U-BU>7mmol 1
R-RR>30 1
B-DBP <60mmhg or SBP <90mmhg1
65->65 years 1

0-1 ➔ Discharge
2 or more➔ Admit

2.Significant comorbidities increasing risk of complications- uncontrolled DM, IHD, chronic lung disease, CKD

3. Social circumstances preventing reliable observation at home/ difficult access to hospital/living alone

Indications for ICU/HDU admission

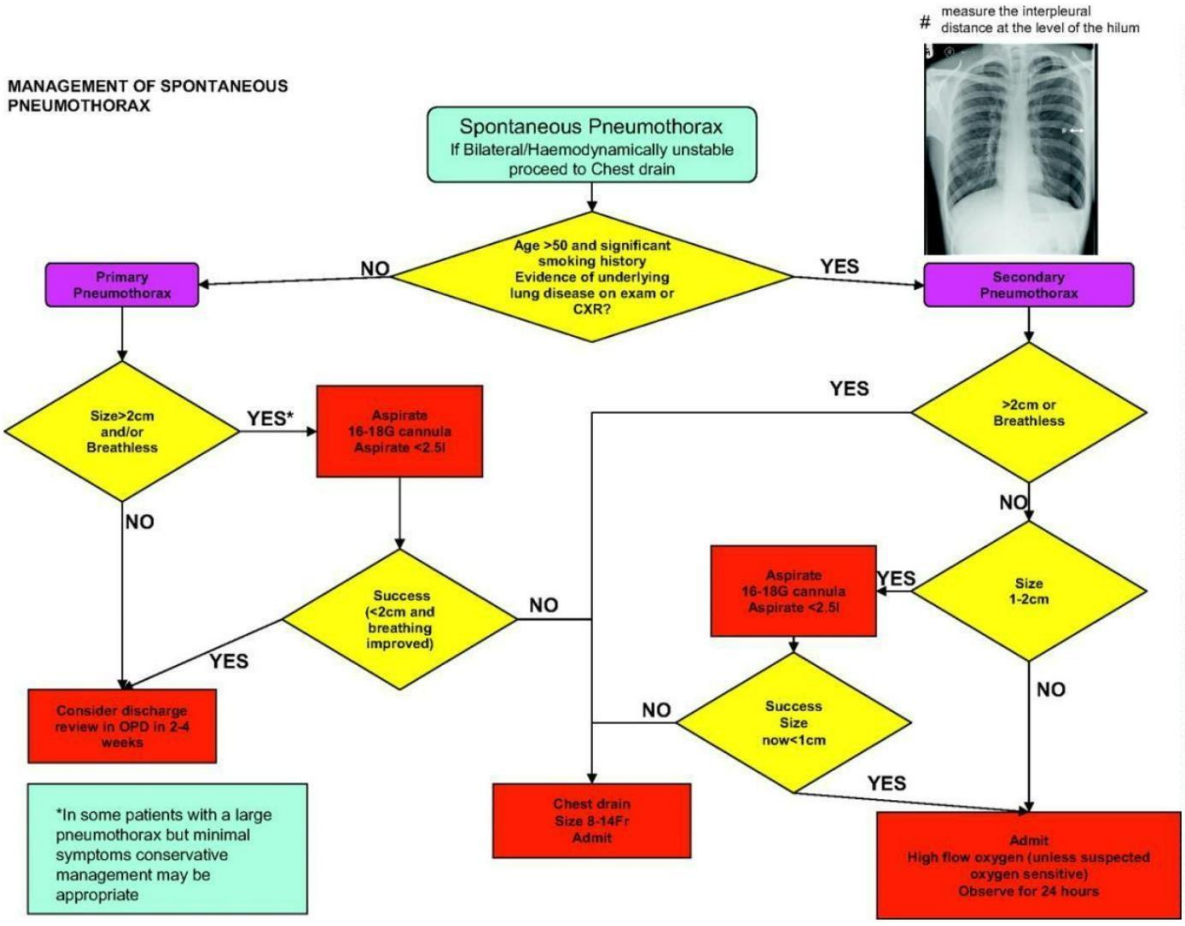
- Altered mental status
- Hypotension requiring inotrope support
- Temperature <36°C (96.8°F)
- Respiratory rate ≥30 breaths/minute
- Arterial oxygen tension to fraction of inspired oxygen (PaO_2/FiO_2) ratio ≤250

- Leukocyte count <4000 cells/microL
- Platelet count <100,000/microL
- Multilobar infiltrates
- CURB 65 score 4-5 or SMART COP score 5 or more

Spontaneous pneumothorax

Indications for admission

1.Patients with satisfactory response (<1cm residual pneumothorax) in a secondary pneumothorax need admission for 24h for observation.
2.Failed outpatient management with aspiration in primary pneumothorax.
3.All patients requiring IC tubes.



Acute pulmonary oedema

Indications for admission-Cardiogenic

1. Severe respiratory distress or failure.
2. Need for invasive or non-invasive ventilation.
3. Need for treatment of underlying cause (e.g., anaemia/ischaemia).

Indications for admission-Non-Cardiogenic

1. Nephrogenic- AEOU-acidosis/electrolyte abnormalities/overload refractory to NIV/uraemia
2. Other critical medical conditions- ARDS, drowning related negative pressure pulmonary oedema

Discharge checklist

1. Resolution of dyspnoea and maintaining normal saturation on room air.
2. Haemodynamically stable.
3. Treatment for underlying cause optimized.
4. Able to reliably increase the diuretic doses as instructed.
5. Check compliance with non-pharmacological management; eg: fluid and salt restriction.

Other causes of breathlessness

DKA-Admit
Anaphylaxis-Admit
Sepsis-Admit
Pleural effusion-Admit
Anaemia-admit if symptomatic dyspnoea/ Hb<7g/dL

How to start and operate BiPAP/CPAP machine

Continue basic **ventilation and oxygenation** support

- Ventilation

i. Propped-up
ii. Nebulize if suggestive of Asthma/COPD
iii. If crepts+ & suggestive of heart failure -> IV Frusemide

- Oxygenation

i. Face mask 5-10L/min
ii. NRBM 10-15L/min

Re assess the patient RR and SpO_2 if
RR>25/min or SpO2 <94% or
SpO2 <88% in chronic CO2 retainers (HCO3 >30 in ABG/VBG)

Consider escalation to High Flow Nasal Cannula (**HFNC**)/ NIV- CPAP-BiPAP
Starting BiPAP ventilation

1. Plug the machine
2. Connect the machine to high flow 25L oxygen flow meter(25-70L) starts 25l oxygen flow rate
3. Switch on the machine
4. Unlock the machine & Go to settings and select options as mentioned below
   Pathology – Normal Mode –
   ST
   IPAP-
   10
   EPAP-
   5
   Backup Rate - 15

5. Select the appropriate mask
   if the mask is a vented mask can directly connect to the inspiratory limb.
   if the mask is a non-vented mask connect additional ventilatory port to the mask before connecting to the inspiratory limb.

6. Run the Machine – Feel the gas flow coming out from the machine explain the patient about the Non Invasive Ventilation.

7. Slightly remove the NRBM and fit the NIV mask. Fit the mask tightly to reduce leak <25L/min

8. Keep tidal volume (TV) at 6-8ml/kg ≈ 7ml/kg

9. Adjust TV 7ml/kg by increasing ΔP (adjust IPAP by 1cm H_2O increments – Correct ventilation with achieving the target TV

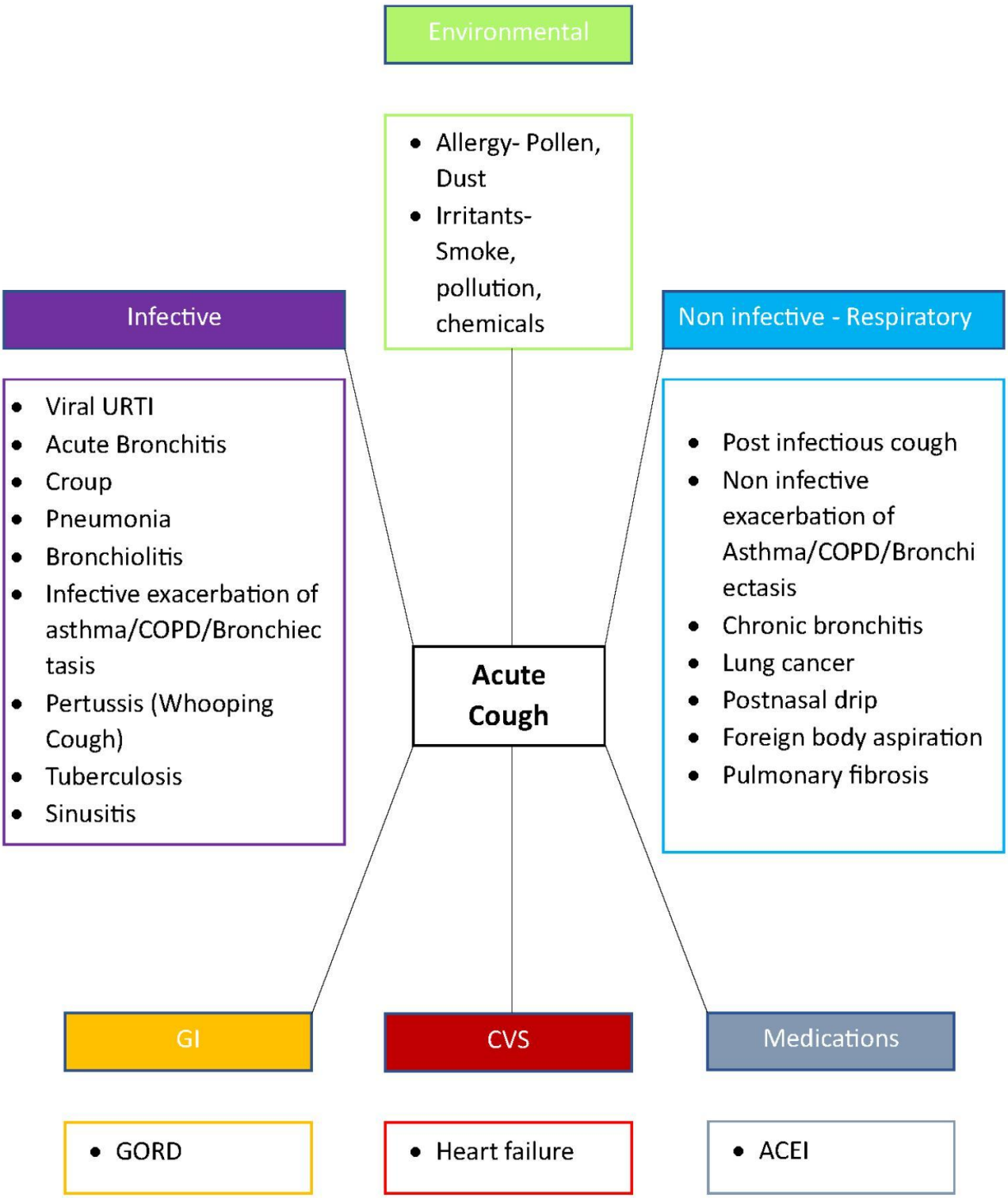
10. After achieving target TV if SPO2 less than 94%

i. Increase FiO2 by increasing O2 flow rate above the 25L up to 70l
ii. Increase EPAP by 1cmH20, Keep the same ΔP (Each 1cmH20 increment in EPAP should follow 1cmH20 increment in IPAP to maintain constant ΔP (try to maintain ΔP > 5cm H2O)
    - If the patient having obstructive lung disease (BA/COPD) never increase EPAP above 5cm H2O.
iii. Increase I time (Imin/IMAX)
iv. Increase fall time
v. Decrease rise time.

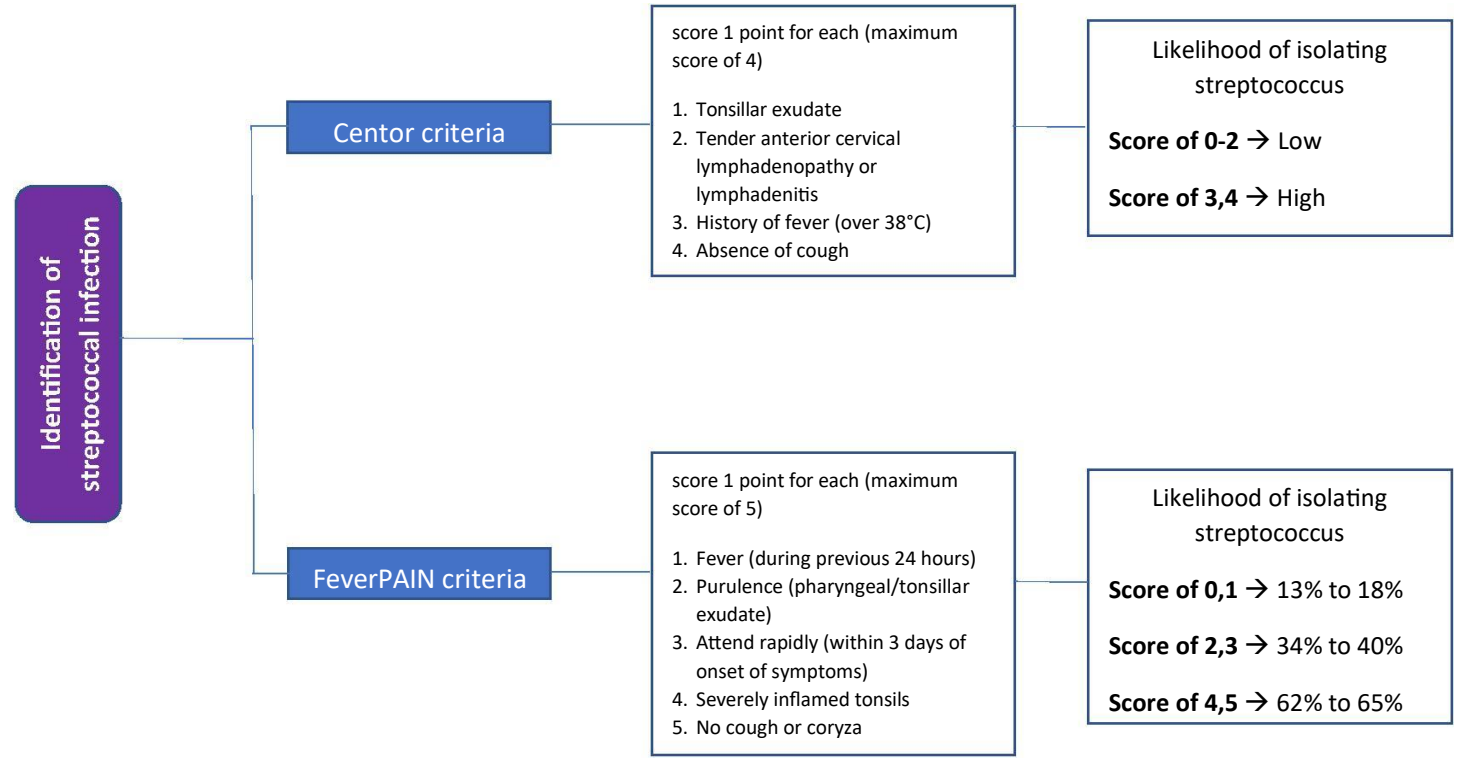
11. Re assess the patient clinically after setup and arrange ABG/ VBG one hour after starting NIV

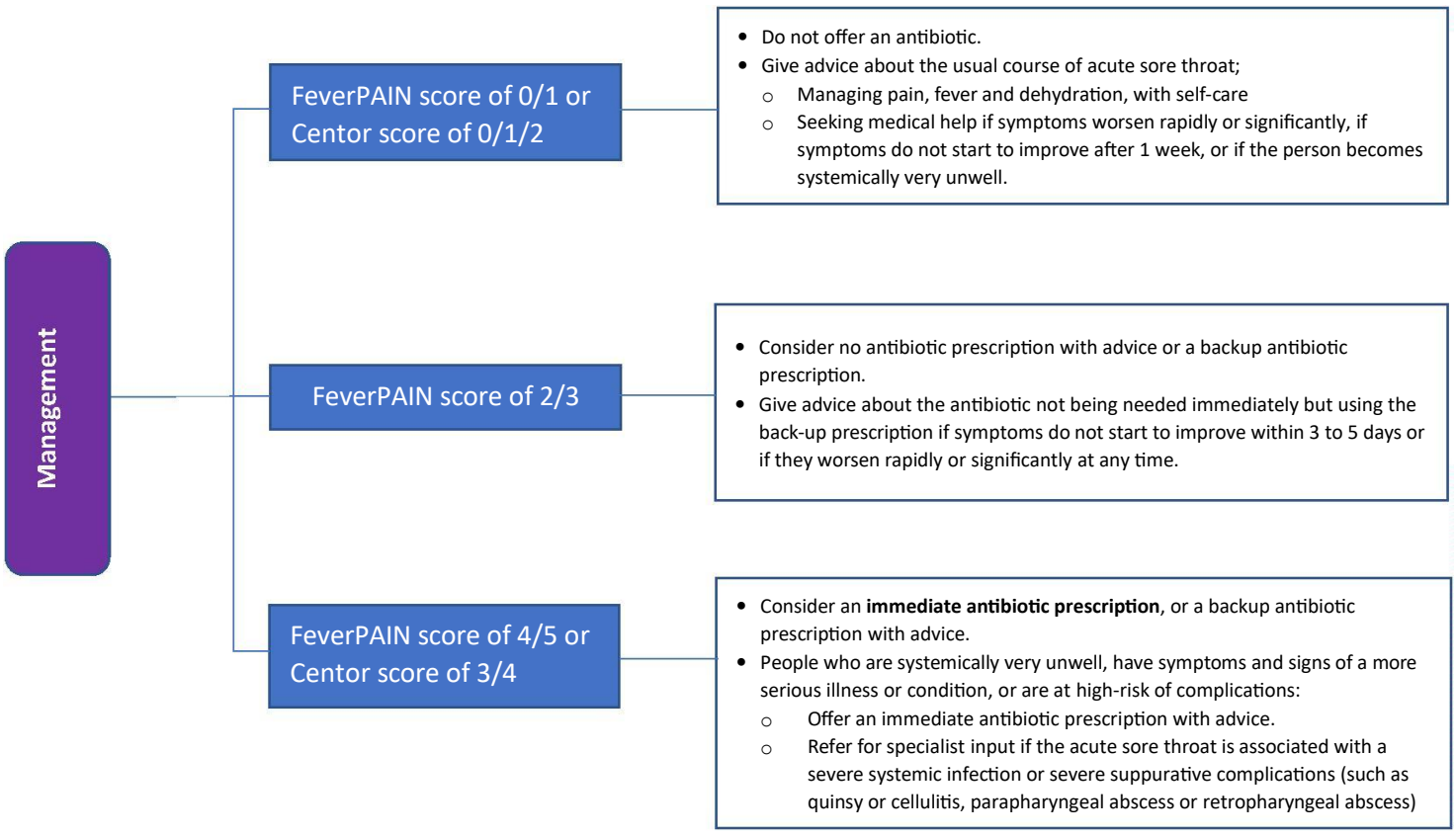
    Target RR <25 SPO2 ≥94 PCO2 <45

12. while maintaining SPO2≥94 If PCO2 ≥45
    - Increase TV up to 8ml/kg
    - Decrease EPAP
    - Increase fall time.


Environmental
Allergy- Pollen, Dust
Irritants- Smoke, pollution, chemicals
Infective
Viral URTI
Acute Bronchitis
Croup
Pneumonia
Bronchiolitis
Infective exacerbation of asthma/COPD/Bronchiectasis
Pertussis (Whooping Cough)
Tuberculosis
Sinusitis
Non infective - Respiratory
Post infectious cough
Non infective exacerbation of Asthma/COPD/Bronchiectasis
Chronic bronchitis
Lung cancer
Postnasal drip
Foreign body aspiration
Pulmonary fibrosis
Acute Cough
GI
GORD
CVS
Heart failure
Medications
ACEI

Sore Throat Workup





Choice of antibiotic:

- **First choice: phenoxymethylpenicillin for 5 - 10 days**
- **Alternative first choice: clarithromycin or erythromycin for penicillin allergy or intolerance**

Cyanosis

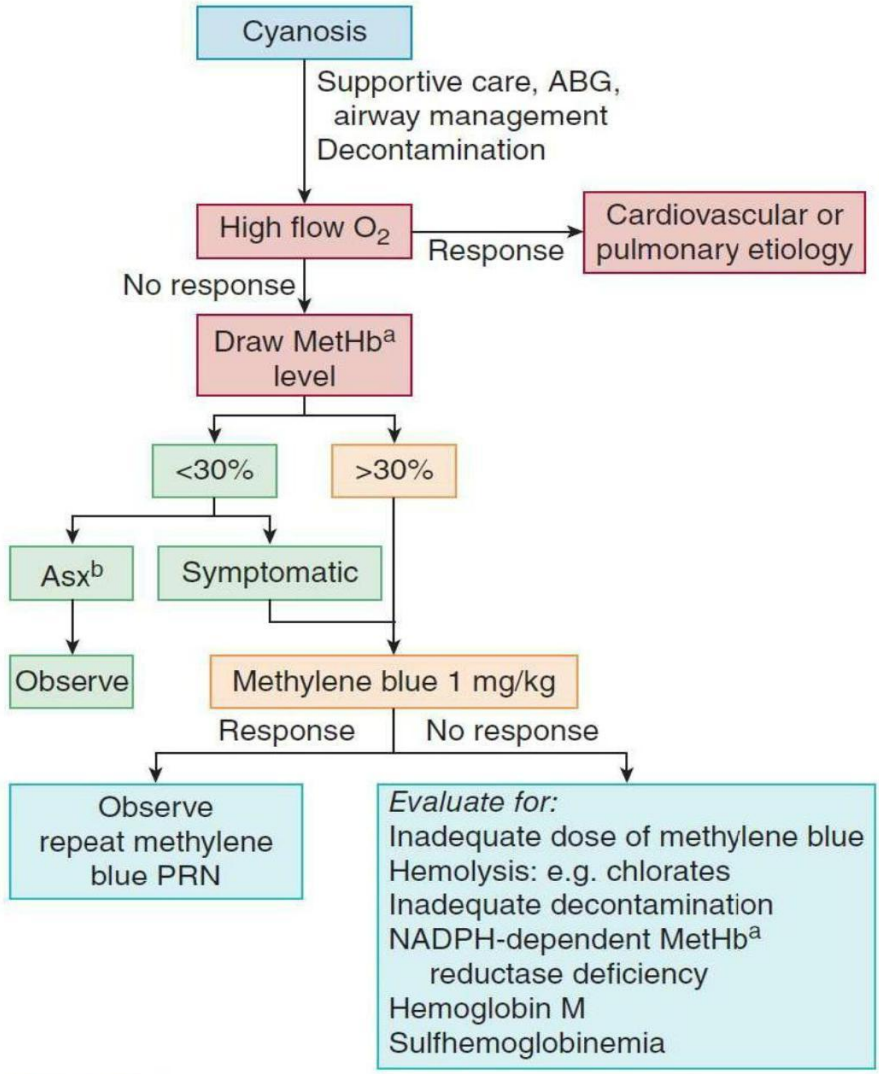


FIGURE 124–7. Toxicologic assessment of a cyanotic patient.
[a] = MetHb = methemoglobin; [b] = Asx = asymptomatic.

Reference

1. **'Dyshemoglobinemias' (2020) in *Tintinalli's Emergency Medicine, A Comprehensive Study Guide*.** 9th edn. McGraw-Hill Education, pp. 1331–1331.

Acute chest pain - Work up 01

Cardiovascular

1. ACS

- Serial ECGs → Ongoing chest pain - 10 minutes
  → No ongoing chest pain - 30 minutes
- Tropl
- ST elevation → STEMI work-up → STEMI Equivalent / STEMI Mimics
- ST depression/T inversion dynamic → NSTEMI/UA workup
- ST dep/T inversion no dynamic changes → HEART/EDACS score
- If ECG normal → HEART/EDACS score

HEART score

- 0-3: low risk → discharge
- 4-6: mod risk → admit
- 7-10: high risk → admit+ early angiography

2. Aortic dissection

- Hypertensive emergency refers hypertensive emergency workup
- BP control with beta-blockers(preferably)
- Cardio-thoracic referral

3. Cardiac tamponade

- Pericardiocentesis

4. Pericarditis

- Tropl/ECG → pericarditis work-up

Respiratory (Refer SOB work-up)

1. Pulmonary embolism
2. Pleurisy -pneumonia, lung malignancy, rib fractures, rheumatoid arthritis, and so on
3. Pneumothorax
4. Hyperventilation

Gastrointestinal

1. Malory Weiss syndrome → Boerhaave's syndrome

2. GORD Reflux oesophagitis, oesophageal spasm
   - PPIs/antacid/prokinetic

3. Peptic ulcer (PUD) /Gastric perforation /cholecystitis, pancreatitis

MSK

1. Costochondritis • Analgesics

Psychiatric

- Rule out organic causes → Depression → Psychiatric referral

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: 2.5% MACE over next 6 weeks → Discharge Home **Score 4 – 6:** 20.3% MACE over next 6 weeks → Admit for Clinical Observation **Score 7 – 10:** 72.7% MACE over next 6 weeks → Early Invasive Strategies		

Acute chest pain – Work up 02

Causes of chest pain and distinguishing features

Disease	Differentiative features
ACS	Pain—typically in the chest and/or other areas (e.g. the arms, back, or jaw) lasting longer than 15 minutes. The pain is classically described as a constricting discomfort/tightness. Associated autonomic symptoms—nausea, vomiting, sweating, breathlessness, or a combination of these. Chest pain associated with haemodynamic instability. New onset chest pain or abrupt deterioration in previously stable angina, with recurrent chest pain occurring frequently and with little or no exertion, and with episodes often lasting longer than 15 minutes.
Reflux oesophagitis, oesophageal spasm	Heartburn. Worse in recumbent position. No ECG changes.
Pulmonary embolism	Tachypnoea, hypoxia, hypocarbia. Hyperventilation. May resemble inferior wall infarction on ECG: ST ↑ in II, III, and aVF. Other ECG changes include sinus tachycardia, right ventricular strain, RBBB, 'S1, Q3, T3' pattern. No pulmonary congestion on CXR. PaCO2 ↓, PaO2 ↓
Hyperventilation	Dyspnoea. Often a young patient. Tingling and numbness of limbs and lips; dizziness. PaCO2 ↓, PaO2 ↑ or normal. NB An organic disease may cause secondary hyperventilation (e.g. diabetic ketoacidosis).

Spontaneous pneumothorax Dyspnoea; unilateral pleuritic chest pain.
Often a young patient (typically a tall, slim, male) or older patient with underlying lung pathology (e.g. COPD).
Auscultation of the chest may be normal or reveal decreased air entry on the affected side. The percussion note may be normal or hyper-resonant on the affected side.
CXR confirms the diagnosis.

Aortic dissection Severe pain with changing localization (as dissection extends).
Pain described as tearing and inter-scapular. New aortic regurgitation murmur.
Pulse deficit (asymmetry of pulses or difference of >20 mmHg between arms).
In type A dissections, the coronary ostium may be obstructed resulting in signs of an inferior-posterior infarct on ECG. CXR may reveal a broad mediastinum.

Pericarditis Change of posture and breathing influence pain. Pericardial friction rub may be heard.
ST-elevation (saddle-shaped) but no reciprocal ST-depression.

Pleurisy A jabbing pain when breathing.
Cough is the most common symptom.
CXR may reveal the underlying cause (e.g. pneumonia, lung malignancy, rib fractures, rheumatoid arthritis, and so on).

Costochondritis Palpation tenderness.
Movements of the chest influence pain.

Early herpes zoster No ECG changes. Dermatomal rash.
Localized paraesthesia before rash.

Peptic ulcer, cholecystitis, pancreatitis Clinical examination of the abdomen reveals tenderness (inferior wall ischaemia can resemble an acute abdomen).
Serum biochemistry (LFTs, amylase).

Depression Continuous feeling of heaviness in the chest. No correlation to exercise. Normal ECG.

Chest pain

ACS

Indications for admission

1. Conclusive diagnosis of STEMI/ NSTEMI/UA.
2. Non dynamic ST depression or T inversions/ ECG normal and suggestive pain- HEART score 4 or more.

Indications for discharge

-HEART score 3 or less

Pericarditis

Indications for admission*

Patients with acute pericarditis and 1 or more high risk markers-

-Fever > 38^0C
-Subacute course (without acute onset of chest pain)
-Haemodynamic compromise suggesting cardiac tamponade
-Large pericardial effusion seen on echocardiography
-Immunosuppressed patient
-Treatment with Warfarin or DOAC
-Acute trauma
-Elevated troponin suggesting myopericarditis

*Note- in most cases in the Sri Lankan setting will be admitted for to exclude infective causes; eg TB.

Pulmonary embolism

Indications for admission

Admit all patients except low-risk

PE- Low risk PE-

PESI class less than III or sPESI <1 **and** no RV dysfunction on TTE or CTPA and no social reasons to admit➔ Can be discharged if DOAC affordable.

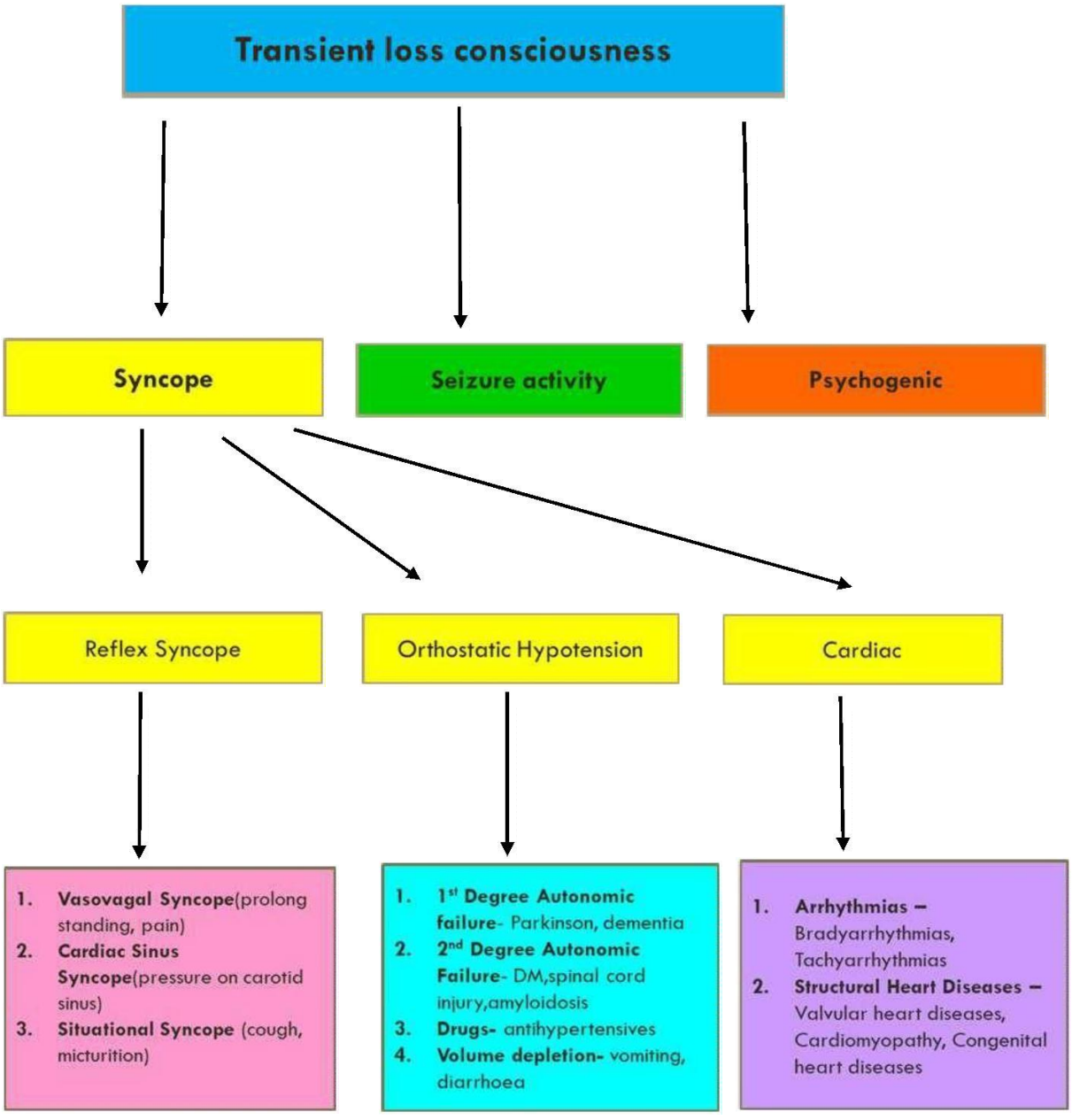
Other causes of chest pain

Aortic dissection-Admit
Cardiac tamponade-Admit
GORD-Treat and discharge with PPI/antacid/prokinetic
Costochondritis-D/C with analgesics
Mallory Weiss-exclude Boerhaave's and D/C with PPI/prokinetic/antacid

Transient loss of Consciousness Workup (TLOC)

Definition- Sudden, spontaneous, complete loss of consciousness with rapid recovery

Pathophysiology



1. Triage – Eyeball triage- DRSABC- cardiac arrest- CAT1/2- Acute stream

Equipment triage- ABCDE- critically ill and non-critically ill- CAT3/4- Fast track

2. Initial Stabilization-

Manage and stabilize airway and breathing for the TLOC workup

A- Airway patent

B- RR/Auscultation- Spo2- O2

C- PR/BP/12 lead ECG- IV Cannula - **TLOC**

D- AVPU/pupils/pain- RBS

E- rash/wounds- Temperature

3. History/Examination

History	
Onset	Sudden or gradual
Preceding Events	Posture (e.g., standing), exertion, emotional stress, pain
Triggers	Coughing, urination, defecation, swallowing, situational triggers
Warning Symptoms	Lightheadedness, nausea, sweating, palpitations, blurred vision
Duration of Loss of Consciousness	Seconds, minutes? Was recovery spontaneous
Associated Symptoms	Chest pain, palpitations, dyspnea, headache, confusion, weakness
Post-episode Symptoms	Fatigue, confusion, tongue biting, incontinence, slow recovery
Frequency	How often has this happened before? First episode or recurrent
Past Medical History	Cardiac disease, stroke, seizures, diabetes, hypertension
Medications	Antihypertensives, diuretics, antiarrhythmics, or other relevant drugs
Family History	Sudden cardiac death, arrhythmias, seizures, syncope
Social History	Alcohol, smoking, drug use (especially illicit drugs)
Examination	
General Appearance	Pale, diaphoretic, signs of trauma (from fall)
Cardiac Examination	Blood pressure, murmurs, gallops, arrhythmias, signs of heart failure
Neurological Examination	Focal neurological deficits, confusion, seizures

Carotid Sinus Massage	Any hypersensitivity or reproduction of symptoms?
Postural Blood Pressure	Orthostatic hypotension
Gait Examination	Postural stability, evidence of weakness or imbalance?

4. Investigations

- ✓ CBS
- ✓ 12 lead ECG
- ✓ FBC
- ✓ Urine hCG- in females
- ✓ Lying and standing blood pressure

Important ECG findings

- ✓ Rate- Tachycardia (HR>100), Ectopic beats Ischemia- ST
- ✓ WPW syndrome
- ✓ Brugada syndrome
- ✓ ARVD
- ✓ Long / short QT
- ✓ Segments/ T wave abnormalities
- ✓ Red flags-
- ✓ Heart blocks → ▪ AV blocks ▪ RBBB/LBBB ▪ Bifascicular block ▪ Trifascicular block
- ✓ ST segments/ T wave abnormalities
- ✓ Ventricular ectopics
- ✓ Bradycardias

5. Problem List

- Major problems – See relevant major presentations workups

- Acute problems- TLOC- if no features of cardiac origin or seizures follow TLOC workup

6. Management plan and Disposition

1. Seizure activity- follow fits and seizures workup

2. Syncope-

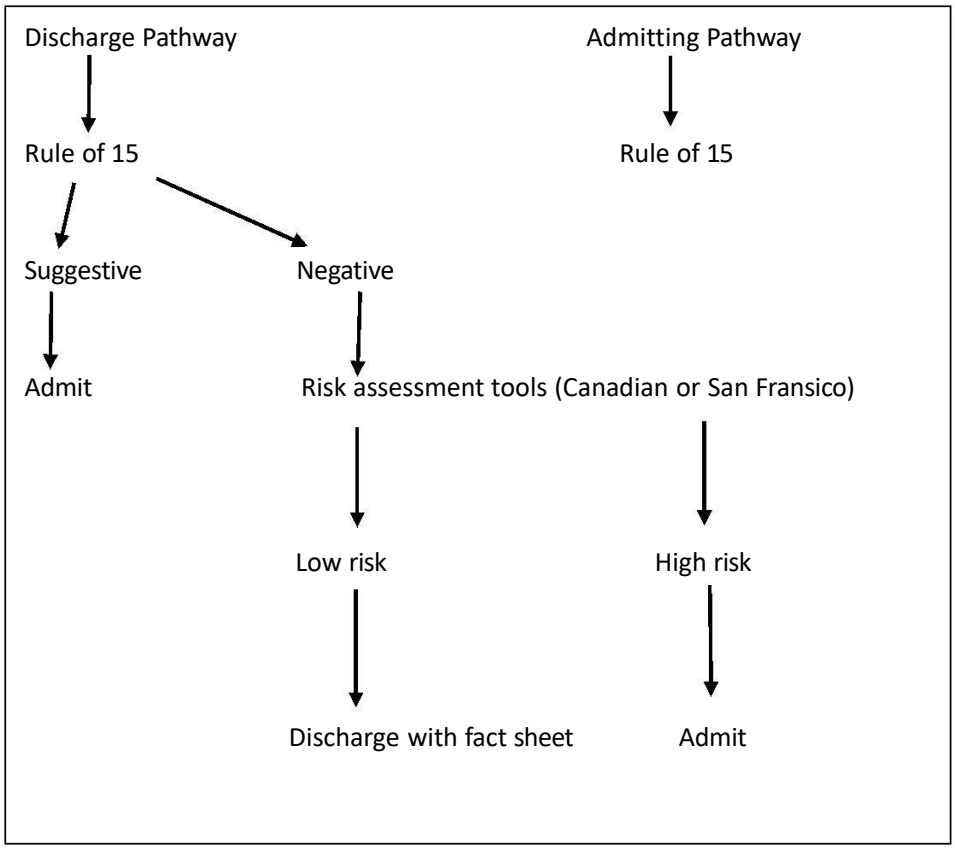
Vasovagal/Situational syncope- if cause found - discharge pathway

Orthostatic hypotension- try to exclude the cause- treat with oral or IV fluids- if cause corrected can discharge, if cause not found admitting pathway

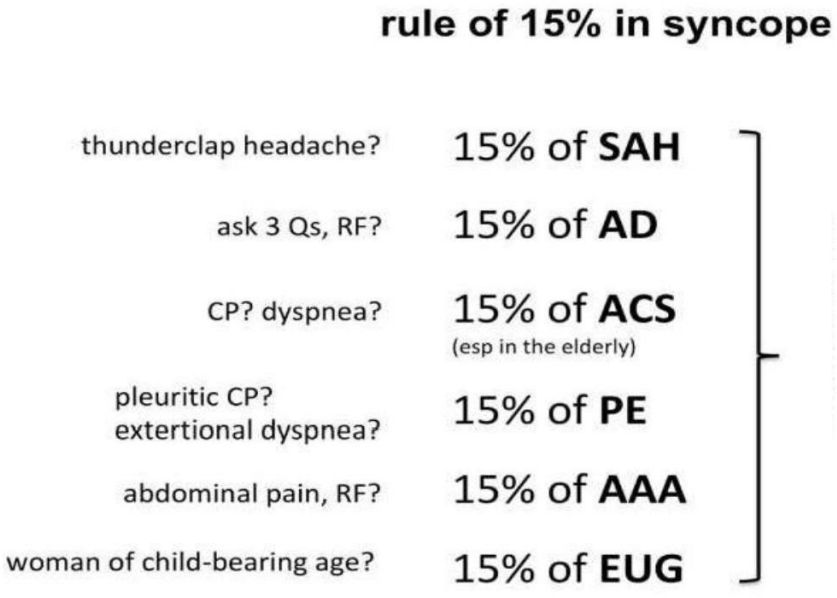
Cardiac syncope- admit pathway

3. Psychogenic – exclude cardiac and seizure activity- if no cardiac or seizure activity consider psychiatry referral

For the patients on the discharge pathway- do the rule of 15



For the patients on the admitting pathway – still apply rule of 15 to exclude any life-threatening presentations



Canadian Syncope Risk Score (CSRS)

Category	Points
Predisposition to Vasovagal Symptoms	-1
History of Heart Disease	1
Any SBP < 90 or >180 mmHg	2
Elevated Troponin (>99th% of Normal)	2
Abnormal QRS Axis (<-30° or >100°)	1
QRS Duration > 130 ms	1
Corrected QT Interval > 480 ms	2
Vasovagal Syncope	-2
Cardiac Syncope	2

Total Score	Estimated Risk of Serious Adverse Event (%)	Risk Category
-3	0.4	Very Low
-2	0.7	
-1	1.2	Low
0	1.9	
1	3.1	Medium
2	5.1	
3	8.1	
4	12.9	High
5	19.7	
6	28.9	Very High
7	40.3	
8	52.8	
9	65.0	
10	75.5	
11	83.6	

REBEL REVIEWS

Thiruganasambandamoorthy V, et al. Duration of Electrocardiographic Monitoring of Emergency Department Patients With Syncope. Circulation. 2019; PMID: 30661373

San Francisco Syncope Rule

Patients with any of the following five "CHESS" predictors* are considered at high risk for serious outcomes† at 7 or 30 days.

1. CHF history
2. Hct <30%
3. ECG or cardiac monitoring abnormal
4. SOB history
5. SBP <90 mm Hg at triage

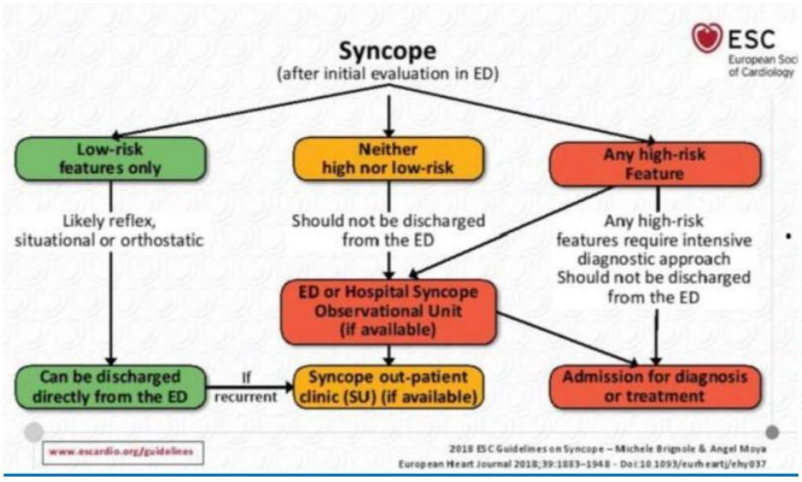
**CHF — congestive heart failure; Hct — hematocrit; ECG — electrocardiogram; SOB — shortness of breath; SBP — systolic blood pressure.*
†Serious outcomes: death, myocardial infarction, arrhythmia, pulmonary embolism, stroke, subarachnoid hemorrhage, significant hemorrhage or return visit to the emergency department or hospital.

Journal WATCH

TLOC

Seizure → refer seizure workup
Psychogenic → OP psychiatry referral if seizure and syncope exluded

Syncope



Indications for admission

1. Definite cardiac syncope on Hx/Ex/Ix
2. Presence of high- risk features (red flags)

High risk features

Major

History and Examination

1. New onset of chest discomfort, breathlessness, abdominal pain or headache
2. Syncope during exertion or when supine
3. Sudden onset palpitations immediately followed by syncope
4. Severe structural or coronary artery disease(heart failure, low LVEF or previous MI)
5. Unexplained SBP in the ED < 90mmHg
6. Suggestion of GI bleed on rectal examination

ECG

1. Persistent bradycardia (< 40bpm) in the awake state in the absence of physical training
2. ECG changes consistent with acute ischameia
3. Mobitz II second and third degree AV block
4. Slow AF (<40bpm)
5. Persistent sinus bradycardia (<40bpm)

6. Bundle branch block or intraventricular conduction defect
7. Q waves consistent with CAD or cardiomyopathy
8. Sustained and non-sustained VT
9. Dysfunction of a pacemaker or ICD
10. Type 1 Brugada pattern
11. Long QT

Minor (high risk only if associated with structural heart disease or abnormal ECG)

History and Examination

1. No warning symptoms or short prodrome (<10s)
2. Family history of SCD at young age
3. Syncope in the sitting position

ECG (only if history suggestive of arrhythmic syncope)

1. Mobitz I second degree AV block and 1st degree AV block with markedly prolonged
2. Asymptomatic inappropriate mild sinus bradycardia or slow AF(rate 40-50bpm)
3. Paroxysmal SVT or AF
4. Pre-excited QRS complex
5. Short QTc interval (less than 340ms)
6. Atypical Brugada patterns
7. Negative T waves suggestive of ARVC

Note

*For all patients warranting admission- Apply rule of 15 to exclude any life-threatening conditions.

Consider discharge from ED

- Vasovagal/ situational syncope- if cause found
- Syncope triggered by pressure on carotids (eg: shaving, tight collars)
- Orthostatic hypotension- treat with oral or IV fluids-can discharge if cause corrected. If cause not found admitting pathway

Note

*For all patients considered for discharge- Apply rule of 15 to exclude any missed life-threatening conditions.

EMERGENCY TREATMENT OF HYPERKALAEMIA

EUROPEAN RESUSCITATION COUNCIL GUIDELINES 2021

- Assess using ABCDE approach
- 12-lead ECG and monitor cardiac rhythm if serum potassium (K+) ≥ 6.5 mmol/L
- Exclude pseudohyperkalaemia
- Give empirical treatment for arrhythmia if hyperkalaemia suspected

Mild
K^+5.5 - 5.9 mmol/L
Consider cause and need for treatment

Moderate
K^+ 6.0 - 6.4 mmol/L
Treatment guided by clinical condition, ECG and rate of rise

Severe
K^+ ≥ 6.5 mmol/L
Emergency treatment indicated

Seek expert help ⚠

ECG Changes?
Peaked T waves | Broad QRS | Bradycardia
Flat/ absent P waves | Sine wave | VT

NO

YES

Protect the heart

IV Calcium
10ml 10% Calcium Chloride IV *OR*
30ml 10% Calcium Gluconate IV
- Use large IV access and give over 5 min
- Repeat ECG
- Consider further dose after 5 min if ECG changes persist

Shift K+ into cells

Insulin-Glucose IV Infusion
Glucose 25g with 10 units soluble insulin over 15 - 30 min IV
(25g = 50ml 50% glucose; 125ml 20% glucose, 250ml 10% glucose)
If pre-treatment BG < 7.0 mmol/L:
Start 10% glucose infusion at 50ml/ hour for 5 hours (25g)

Consider

Risk of hypoglycaemia

Salbutamol 10 – 20 mg nebulised

Consider

Life-threatening hyperkalaemia

Remove K+ from body

***Sodium zirconium cyclosilicate**
10g X3/day oral for 72 HRS *OR*
***Patiromer**
8.4G /day oral *OR*
***Calcium resonium**
15g X3/day oral

*Follow local practice

***Sodium zirconium cyclosilicate**
10g X3/day oral for 72 HRS *OR*
***Patiromer**
8.4G /day oral

Consider Dialysis
Seek expert help ⚠

Monitor K+ and blood glucose

Monitor serum K^+ and blood glucose

K^+ ≥ 6.5 mmol/L despite medical therapy

Prevention

Consider cause of hyperkalaemia and prevent recurrence

Emergency treatment of hyperkalaemia. ECG – electrocardiogram; VT ventricular tachycardia. BG Blood Glucose

Upper GI Bleeding

Resuscitation and initial management

- Transfuse massive bleeding with blood, platelets and clotting factors in line with local protocols
- Platelet transfusion- actively bleeding and plt count < 50 x 10^9/L
- FFP- Actively bleeding and PT/INR/aPTT > 1.5 normal
- Fibrinogen < 1.5 g/L despite FFP- cryoprecipitate
- PCC- patients on warfarin and actively bleeding

Timing of Endoscopy

- Unstable patients with severe acute UGI bleeding- Endoscopy immediately after resuscitation.
- All other patients- Endoscopy within 24 hours of admission.

Non-variceal bleeding

- Medical Management
  - PPI increases gastric pH and stabilize clot, use omeprazole/ pantrapazole loading dose with the infusion
  - Tranexamic acid, no proven benefit
- Endoscopic treatment
  - Mechanical method e.g. clips with or without adrenaline
  - Thermal coagulation with adrenaline
  - Fibrin or thrombin with adrenaline.
  - Endoscopic injection of N-butyl-2-cyanoacrylate to patients with upper gastrointestinal bleeding from gastric varices.
- Offer TIPS if bleeding from gastric varices is not controlled by endoscopic injection of N-butyl-2- cyanoacrylate.
- Offer a repeat endoscopy to patients who re-bleed with a view to further endoscopic treatment or emergency surgery.
- Offer interventional radiology to unstable patients who re-bleed after endoscopic treatment.
- Refer urgently for surgery if interventional radiology is not promptly available.

Variceal bleeding

- Medical Management
  - Vasopressin/ terlipressin- significant relative Risk reduction and mortality benefit
  - Stop treatment after definitive haemostasis has been achieved, or after 5 days.
  - Prophylactic antibiotic therapy at presentation, proven mortality benefit- ceftriaxone or ciprofloxacin
- Endoscopic treatment
  - Band ligation
  - Consider transjugular intrahepatic portosystemic shunts (TIPS) if bleeding not controlled by band ligation.
- Life-threatening bleeding may be controlled with a Sengstaken-Blakemore tube or a Linton-Nachlas tube until haemostasis can be achieved endoscopically, or with TIPS.

patients on NSAIDs, aspirin or clopidogrel

Control of bleeding and prevention of re-bleeding

- Continue low-dose aspirin for secondary prevention of vascular events in patients with UGI bleeding in whom haemostasis has been achieved.
- Stop other non-steroidal anti-inflammatory drugs (including cyclooxygenase-2 [COX-2] inhibitors) during the acute phase
- Discuss the risks and benefits of continuing clopidogrel (or any other thienopyridine antiplatelet agents) in patients with upper gastrointestinal bleeding with the appropriate specialist (for example, a cardiologist or a stroke specialist) and with the patient.

Variceal haemorrhage: management of acute GI bleeding

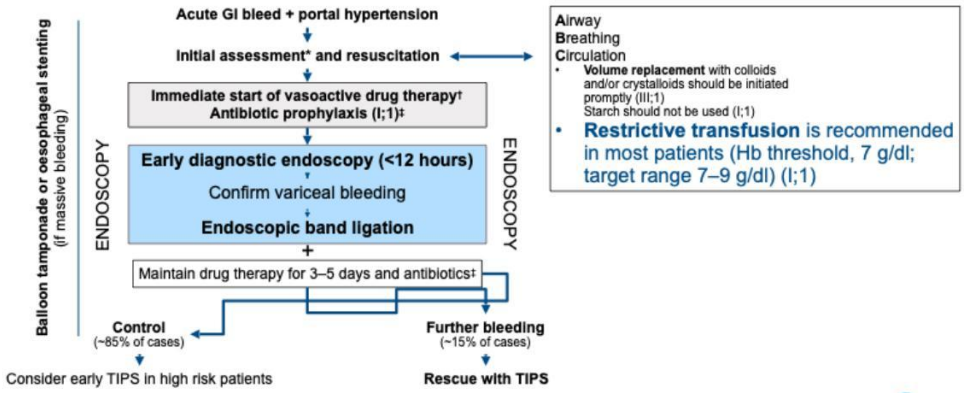
- 5-year mortality – if only VH 20%
  -- if with other complications (HE/Ascites) 80%
- Imaging studies aimed at ruling out HCC and portal vein thrombosis (PVT)
- Antibiotic prophylaxis is recommended in cirrhotic patients with acute GI bleeding because it reduces the incidence of infections and improves control of bleeding and survival.
  - Ceftriaxone (1 g/24 h) is the first choice in patients with decompensated cirrhosis, those already on quinolone prophylaxis, and in hospital settings with high prevalence of quinolone-resistant bacterial infections.
  - Oral quinolones (norfloxacin 400 mg b.i.d) should be used in the remaining patients
  - Total duration 7days
- vasoactive drug therapy should be initiated as soon as AVH is suspected.
  - Starting vasoactive drugs before endoscopy decreases the incidence of active bleeding during endoscopy and facilitates endoscopic therapy, improving the control of bleeding, and potentially survival
  - Continue for up to 5days to reduce re-bleeding
- Proton pump inhibitors (PPIs) have not shown efficacy for the management of AVH. However, a short course therapy with PPI after EBL may reduce the size of post-banding ulcers

EASL
The Home of Hepatology

- Terlipressin, somatostatin or octreotide are accepted options
- Lactulose may be used to prevent encephalopathy, but further studies are needed
- Beta-blockers and vasodilators should be avoided during the acute bleeding episode
- Proton pump inhibitors (PPIs) have not shown efficacy for the management of AVH

EASL
The Home of Hepatology

- **Medical emergency**: high rate of complications and mortality in DC
  - Requires immediate treatment and close monitoring



*History, physical and blood exam, cultures; †Somatostatin/terlipressin; ‡Ceftriaxone (1 g/24 hours) is the first choice in patients with DC, those already on quinolone prophylaxis, and in hospital settings with high prevalence of quinolone-resistant bacterial infections. Oral quinolones (norfloxacin 400 mg BID) should be used in the remaining patients (I;1)
Figure adapted from de Franchis R, et al. J Hepatol 2015;63:743–52;
EASL CPG decompensated cirrhosis. J Hepatol 2018;doi: 10.1016/j.jhep.2018.03.024

EASL
The Home of Hepatology

Treatment	Dose	Duration
Antibiotics		
Ceftriaxone	1 g IV daily	5–7 days
Ciprofloxacin	400 mg IV or 500 mg oral twice daily	5–7 days
Norfloxacin	400 mg oral twice daily	5–7days
Vasoconstrictors		
Octreotide	50 μg IV bolus, then infusion at 50 μg/hr	2–5 days
Terlipressin	2 mg IV every 4 hr $\times$ 48 hr, then 1 mg IV every 4 hr	2–5 days
Somatostatin	250 μg IV bolus, then 250–500 μg/hr	2–5 days

Acute variceal haemorrhage: treatment

- Vasoactive drugs and ligation are the primary options for acute VH
  - There may be a role for TIPS in selected high-risk patients

Recommendation	Grade of evidence	Grade of recommendation
The combination of **vasoactive drugs and ligation is recommended as the first therapeutic option** in acute variceal bleeding	I	1
Early pre-emptive covered TIPS (placed within 24–72 hours) can be suggested in **selected high-risk patients**, such as those with Child–Pugh class C with score <14 • However, the **criteria** for **high-risk** patients, particularly Child–Pugh B with active bleeding, **remains debatable** and needs further study	I	2
Rescue TIPS is indicated in these patients if hemorrhage cannot be controlled or if bleeding recurs despite vasoactive drugs and EVL.		

EASL CPG decompensated cirrhosis. J Hepatol 2018;doi: 10.1016/j.jhep.2018.03.024

Management of persistent bleeding

- Up to 10–15% of patients have persistent bleeding or early re-bleeding
  - Despite treatment with vasoactive drugs and EBL, and prophylactic antibiotics

Recommendation	Grade of evidence	Grade of recommendation
TIPS should be used as the **rescue therapy** of choice in cases of persistent bleeding or early re-bleeding	I	1
With the pre-requisite of expertise, **balloon tamponade** should be used in case of **uncontrolled bleeding** as a temporary "bridge" (max 24 hours) until definitive treatment can be instituted • Removable, covered and self-expanding oesophageal stents can be used as an alternative to balloon tamponade	III I	1 2
In the context of bleeding, where encephalopathy is commonly encountered, prophylactic lactulose may be used to prevent encephalopathy, but further studies are needed	I	2
β-blockers and **vasodilators** should be **avoided** during the acute bleeding episode	III	1

EASL CPG decompensated cirrhosis. J Hepatol 2018;doi: 10.1016/j.jhep.2018.03.024

Variceal haemorrhage: prevention of variceal rebleeding

3.Secondary Prevention

NSBBs and EBL in combination reduces the risk of re-bleeding compared with monotherapy

Recommendation		
Combination therapy of NSBBs + EBL is recommended	I	1
Serial EBL is recom: → 2-4 weekly until eradication , then 3months and 6months		
Covered TIPS placement is recommended in patients who continue to be **intolerant to NSBBs***	III	1

*Provided that there are no absolute contraindications
EASL CPG decompensated cirrhosis. J Hepatol 2018;doi: 10.1016/j.jhep.2018.03.024

Oliguric

Dehydration related, AKI related

Causes for AKI – **DODIVeryHappy**

Dehydration

Obstruction

Drugs

Infection

Vasculitis

Hypertensive emergency

Pre Renal- due to reduced renal blood flow

Renal- due to disease of glomerulus, interstitial or tubule

Post renal- due to obstruction impairing drainage of the kidneys

12.2.2 Staging of acute kidney injury

Acute kidney injury staging can be performed using serum creatinine or urine output criteria (Table 12.1). Patients should be staged according to whichever criterion gives them the highest stage.

Table 12.1 Staging system for acute kidney injury (AKI)

Stage	Serum creatinine (SCr) criteria	Urine output criteria
1	SCr increase ≥ 26 μmol/L or SCr increase ≥ 1.5 to 2-fold from baseline	<0.5 ml/kg/h for >6 consecutive hours
2	SCr increase ≥ 2 to 3-fold from baseline	<0.5mL/kg/h for >12 h
3	SCr increase ≥ 3-fold from baseline or SCr increase ≥ 354 μmol/L or commenced on renal replacement therapy irrespective of stage	<0.3mL/kg/h for >24 h or anuria for 12 h

Data from Acute kidney injury (March 2011). UK Renal Association. www.renal.org/Clinical/GuidelinesSection/AcuteKidneyInjury

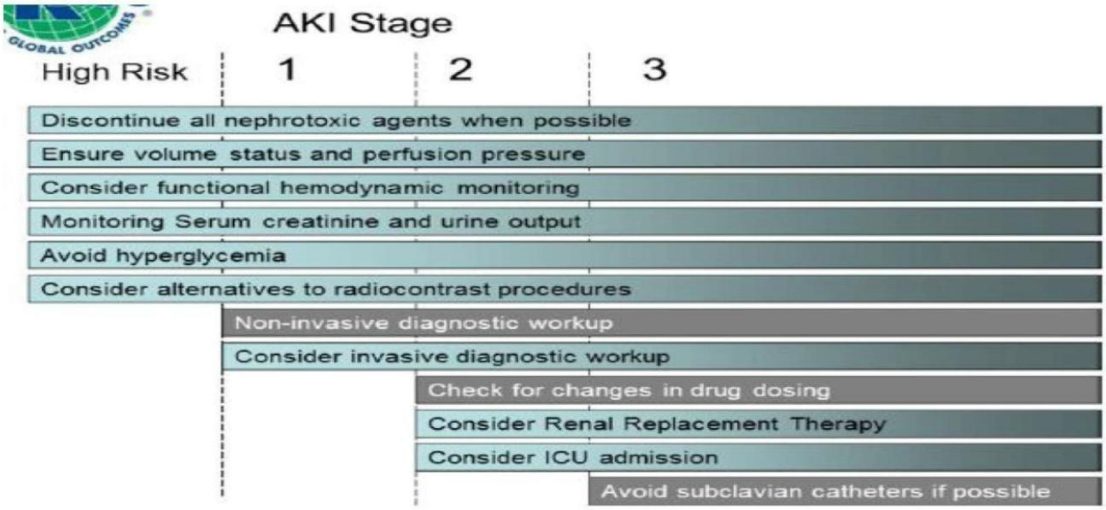
Table 12.2 Causes of intrinsic renal failure

Tubular disease	• Ischaemic acute tubular necrosis • Nephrotoxic drugs (e.g. aminoglycosides, radio-contrast, NSAIDs) • Rhabdomyolysis
Interstitial disease	• Acute interstitial nephritis (usually due to a drug induced allergic reaction, e.g. penicillins, NSAIDs) • Infiltrative disease: sarcoidosis, lymphoma • Autoimmune disease: SLE
Glomerular disease	• Glomerulonephritis
Vascular disease	• Malignant hypertension • Haemolytic uraemic syndrome • Renal vein thrombosis • Thrombotic thrombocytopenic purpura

Table 12.3 Level and causes of obstruction

Urethra and bladder	• Benign prostatic hypertrophy • Cancer of the bladder, prostate, cervix, or colon • Uretheral stricture • Neurogenic bladder (diabetes, spinal cord disease, multiple sclerosis, anticholinergic drugs)
Ureter	• Calculi • Cancer of the ureter, uterus, or colon • Vesicoureteric reflux • Aortic aneurysm • Pregnant uterus • Inflammatory bowel disease • Retroperitoneal fibrosis • Trauma • Papillary necrosis (sickle cell disease, diabetes, pyelonephritis)
Intra-renal	• Crystals: uric acid, aciclovir, sulphonamides • Protein casts: multiple myeloma, amyloidosis

Management


AKI Stage
High Risk
1
2
3
Discontinue all nephrotoxic agents when possible
Ensure volume status and perfusion pressure
Consider functional hemodynamic monitoring
Monitoring Serum creatinine and urine output
Avoid hyperglycemia
Consider alternatives to radiocontrast procedures
Non-invasive diagnostic workup
Consider invasive diagnostic workup
Check for changes in drug dosing
Consider Renal Replacement Therapy
Consider ICU admission
Avoid subclavian catheters if possible

TACHYCARDIA ALGORHYTHM (with pulse)

if sinus tachycardia - correct the cause only
If not sinus tachycardia - follow the algorithm

SVT	VT/Acute AF
100-150 J	150 J
270 J	270 J
270 J	270 J

Assess with ABCDE approach

- Give oxygen if appropriate and obtain IV access
- Monitor ECG, SPO2,12LEAD ECG
- Identify and treat reversible causes in the table

Life threatening features?

1. Shock
2. Syncope
3. Myocardial ischaemia
4. Severe heart failure

YES

Synchronised DC shock up to 3 attempts

- Amiodarone 300mg IV over 10-20min and repeat shock

followed by;

- Amiodarone 900mg over 24hrs

Causes
D-drugs
I-infection
I-ischemia
E-electrolytes
E-endocrine
S-shock
S-sepsis
S- stimulants

UNSTABLE

STABLE
Seek expert help

NO

Is the QRS narrow (< 0.12 s)?

BROAD QRS
Is QRS regular?

IRREGULAR

Possibilities include:

- **Atrial fibrillation with bundle branch block** treat as for irregular narrow complex
- **Polymorphic VT** (e.g. torsades de pointes) give magnesium 2 g over 10 min

REGULAR

If VT (or uncertain rhythm):

- Amiodarone 300 mg IV over 10–60 min
- then 900mg over 24hrs

If previously confirmed **SVT with bundle branch block**: give adenosine as for regular narrow complex tachycardia

NARROW QRS
Is QRS regular?

REGULAR

Vagal manoeuvres

If ineffective:

- Give Adenosine (if no pre-excitation)
  - 6 mg rapid IV bolus
  - If unsuccessful, give 12 mg
  - If unsuccessful, give 18 mg
- Monitor ECG continuously

Normal sinus rhythm restored??

YES

Probable re entry PSVT

- Record 12 lead ECG
- If recurs give adenosine again and consider choice of antiarrhythmic prophylaxis

NO

Seek expert help

- Possible atrial flutter Control rate eg. beta blocker

IRREGULAR

Probable atrial fibrillation:

- Beta blockers or diltiazem
- Consider digoxin or amiodarone if evidence of heart failure
- Anticoagulated if duration>48hrs

❖ *In acute AF before electrical cardioversion, give iv heparin 5000 U bolus*
❖ *In stable SVT/VT if failed chemical cardioersion, go for electrical cardioversion*

Indications for Admission

1. SVT/ AF/Atrial flutter rate not controlled (>110) medically and needs anticoagulation before DC cardioversion.
2. Untreated underlying cause; eg: ischaemia/ electrolyte imbalances/ severe dehydration.
3. Ventricular tachycardias/ frequent ectopics eg: bigeminy/trigemini.

When to discharge

1. Known AF/SVT/Atrial flutter- rate controlled medically or DC cardioversion in an anticoagulated patient and excluded ischemia/ corrected electrolyte imbalances and dehydration.

Vaginal Bleeding in Pregnancy
(1st / 2nd Trimesters)

Common Causes

- Normal/delayed period
- Threatened miscarriage
- Incomplete mc
- Complete mc
- Missed mc
- Ectopic pregnancy
- Molar pregnancy
- Bleeding disorder
- Trauma
- Blood thinners

Initial investigations

Pregnancy Test (β-hCG)	CBC (Complete Blood Count)	Pelvic Ultrasound (Transvaginal)
Confirm pregnancy if not already confirmed	Assess for anemia, infection	• Rule out ectopic pregnancy • Assess for miscarriage, molar pregnancy or retained products

Further Investigations

Serial β-hCG Levels	Rh Factor and Antibody Screen	Coagulation Profile (If significant bleeding)
Monitor pregnancy progression or diagnose ectopic pregnancy	Consider Rh immunoglobulin (Anti-D) if Rh-negative	Rule out coagulation disorders

Management

Stabilization	Expectant Management	Medical Management	Surgical Management	Rh Immunoglobulin (Anti-D)
• IV fluids if significant blood loss • Monitor vitals and provide supportive care • Prepare for surgical intervention if necessary	For stable cases of threatened miscarriage	• Miscarriage: Misoprostol for medical evacuation • Ectopic Pregnancy: Methotrexate if stable and unruptured	• D&C for incomplete miscarriage or molar pregnancy • Laparoscopy for ectopic pregnancy • Emergency surgery for ruptured ectopic pregnancy	Administer if Rh-negative to prevent isoimmunization

Red Flags

Hemodynamic Instability (shock)	Severe Abdominal Pain	Heavy Vaginal Bleeding
Suspect ruptured ectopic pregnancy	Suggestive of ectopic pregnancy or miscarriage	Consider incomplete miscarriage or molar pregnancy

Vaginal Bleeding in Pregnancy (3rd Trimester)

Common Causes

- Placenta Previa
- Placental Abruption
- Labor (Bloody show)
- Vasa Previa (Rare but life-threatening)
- Bleeding disorder
- Trauma
- Blood thinners

Initial investigations

Pelvic Ultrasound (Transvaginal)

- Assess fetal well-being and placental position
- Rule out placenta previa or abruption
- Assess for polyhydramnios or oligohydramnios

CBC (Complete Blood Count)

Assess for anemia, infection

Further Investigations (If Required)

- CTG
- Coagulation Profile
- Kleihauer-Betke Test

Management

Stabilization

- IV fluids and blood transfusion if necessary
- Continuous fetal monitoring
- Prepare for urgent delivery if needed

Medical Management

- Corticosteroids for fetal lung maturity (if preterm)
- Tocolytics if indicated to delay preterm labor (with caution)

Surgical Management

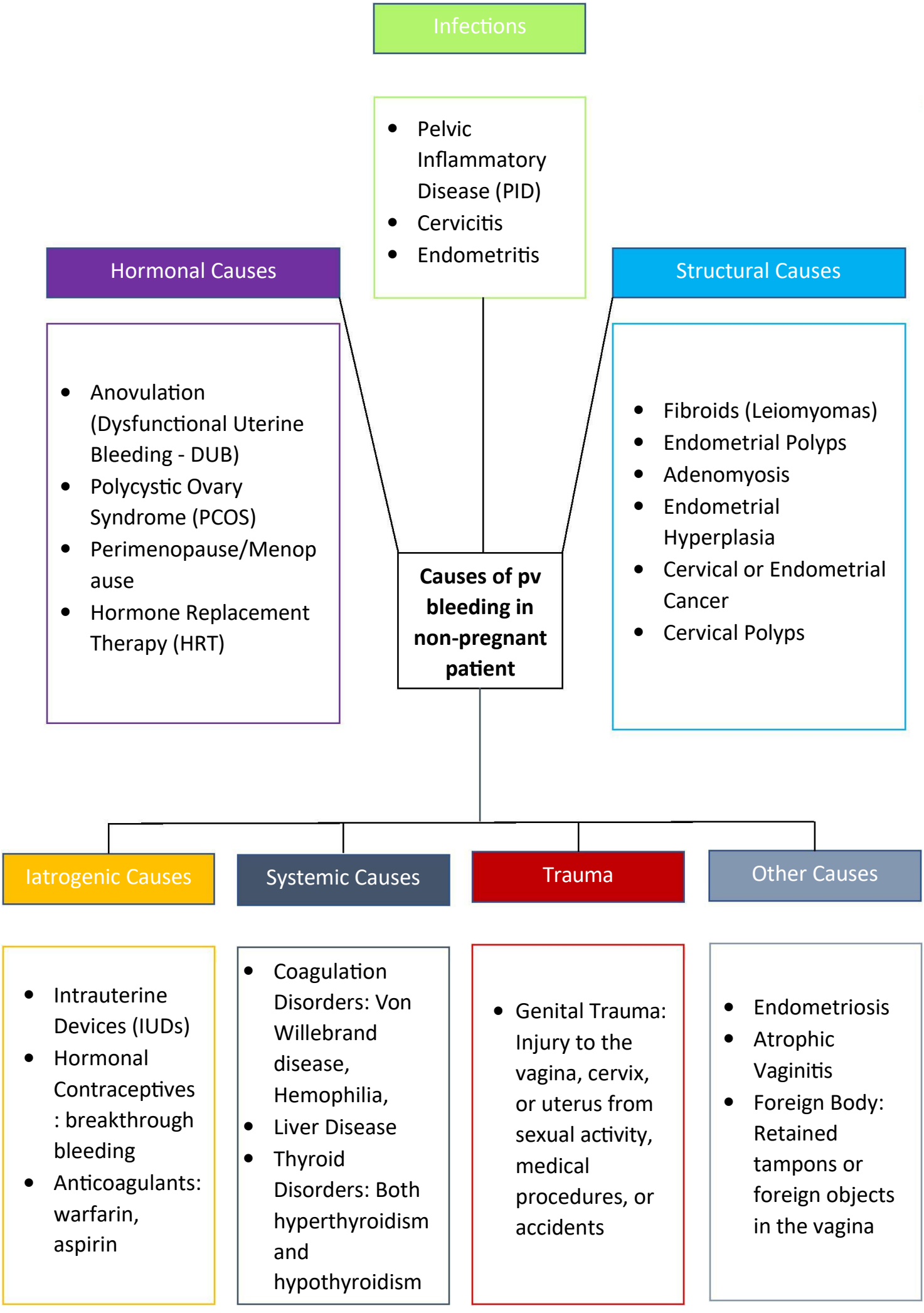
- Cesarean section for placenta previa or abruption
- Emergency delivery for vasa previa or fetal distress

Rh Immunoglobulin (Anti-D)

Administer if Rh-negative to prevent isoimmunization

Red Flags

Heavy Vaginal Bleeding	Severe Abdominal Pain with Bleeding	Abnormal Fetal Heart Rate	Labor Signs with Heavy Bleeding
Suspect placenta previa or placental abruption	Consider placental abruption (painful bleeding)	Consider fetal distress from vasa previa or abruption	Urgent evaluation for placenta previa or placental abruption


Infections
Pelvic Inflammatory Disease (PID)
Cervicitis
Endometritis
Hormonal Causes
Anovulation (Dysfunctional Uterine Bleeding - DUB)
Polycystic Ovary Syndrome (PCOS)
Perimenopause/Menopause
Hormone Replacement Therapy (HRT)
Structural Causes
Fibroids (Leiomyomas)
Endometrial Polyps
Adenomyosis
Endometrial Hyperplasia
Cervical or Endometrial Cancer
Cervical Polyps
Causes of pv bleeding in non-pregnant patient
Iatrogenic Causes
Intrauterine Devices (IUDs)
Hormonal Contraceptives : breakthrough bleeding
Anticoagulants: warfarin, aspirin
Systemic Causes
Coagulation Disorders: Von Willebrand disease, Hemophilia,
Liver Disease
Thyroid Disorders: Both hyperthyroidism and hypothyroidism
Trauma
Genital Trauma: Injury to the vagina, cervix, or uterus from sexual activity, medical procedures, or accidents
Other Causes
Endometriosis
Atrophic Vaginitis
Foreign Body: Retained tampons or foreign objects in the vagina

Vaginal Discharge

Types

Normal Physiological Discharge	Bacterial Vaginosis (BV)	Candidiasis (Candida albicans & glabrata)	Trichomonas Vaginalis (Protozoan)	Other causes
Increased cervical mucus production Milky white or clear mucoid No odor or pruritus Vaginal PH<4.7	Thin, grey-white discharge, fishy Odor Watery, profuse, bubbly Irritation PH 5-6	Thick, white, "cottage cheese-like" discharge, intense itching, soreness, redness No odor PH<4.5	Frothy, green-yellow discharge, vaginal irritation Fishy, malodorous PH 5-6 Sexually transmitted	Cancer of vagina, cervix, uterus STI PID Fistula Foreign body Atrophic Vaginitis

Initial Investigations

- High vaginal swab for microscopy & culture, STIs (PCR)
- Low vaginal swab if suspects BV
- Endocervical swab if suspects PID
- PH test of vaginal discharge
- Amine or whiff test for BV- release of fishy odor with 10% KOH
- Wet film microscopy for candidiasis, clue cells in BV only
- Cervical screening co-test- HPV DNA test + LBC in unexplained, persistent, blood-stained discharge
- USS for endometrial thickness if suspects endometrial malignancy

Management

Reassurance and explain	• Oral Metronidazole 7 days or 0.75% vaginal gel • Oral Clindamycin 7 days or cream (safe in pregnancy or resistance infections) Not STI, treating male partner not recommended	1st ep- Clotrimazole/ miconazole vaginal cream 1-7 days • Cant tolerate v.cream- Nystatin pessary • Failed local therapy- oral Fluconazole 150mg as a single dose Recurrent- Longer course of vaginal azole cream + oral Fluconazole 150mg 3 doses 3 days apart followed by oral 100mg weekly for 6 months	• Metronidazole 2g oral single dose or 400mg bd 5 days if recurrent • Tinidazole 2g oral as a single dose • Treat sexual partners simultaneously • No sexual contact for 7 days after treatment	Atrophic Vaginitis- estrogen cream or pessary Treat STI/PID

Red Flags

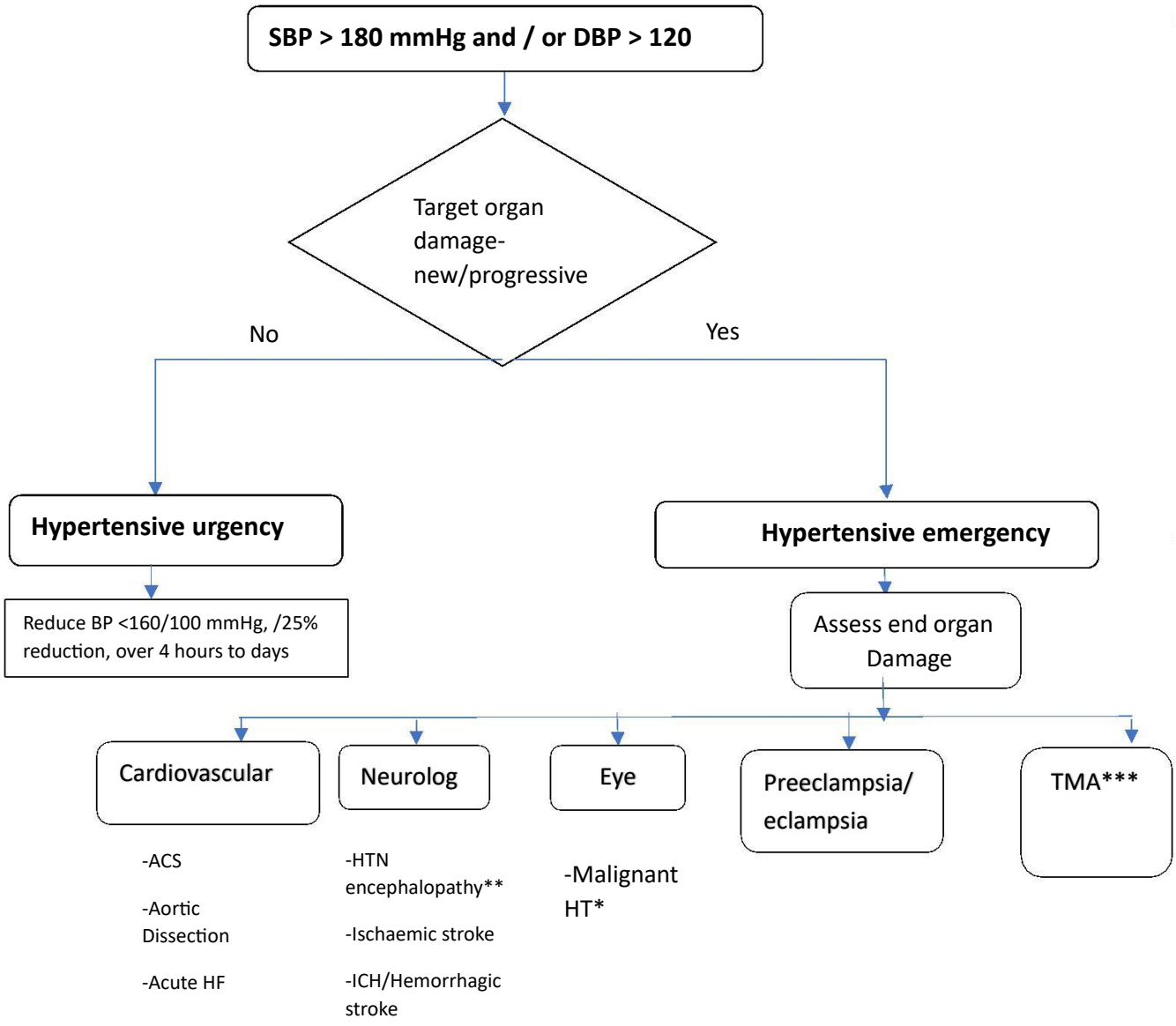
- Rule out cervical insufficiency or labor (preterm or term)
- Suspect premature rupture of membranes (PROM) with watery discharge
- Blood-Stained Discharge
- Malodorous, Purulent Discharge with fever

HYPERTENSIVE EMERGENCIES

Definition

Situations where very high BP values are associated with **acute** hypertension- mediated organ damage, and therefore require immediate BP reduction to limit extension/ promote regression of target organ damage

No specific BP threshold to define HT emergencies



* Malignant hypertension: Severe BP elevation (commonly >200/120 mm Hg) associated with advanced bilateral retinopathy (hemorrhages, cotton wool spots, papilledema).

**Hypertensive encephalopathy: Severe BP elevation associated with lethargy, seizures, cortical blindness and coma in the absence of other explanations.

***Hypertensive thrombotic microangiopathy: Severe BP elevation associated with hemolysis and thrombocytopenia in the absence of other causes and improvement with BP-lowering therapy.

If severe hypertension urgent assessment (target organ/causative factors)

- Secondary causes can be found in 20%–40% of patients presenting with malignant hypertension

- **Heart-**
    - **MI**- inquire about chest pain, ECG, troponin I
    - **Dissection**- check BP both upper limbs, ECG, bedside echo, CXR, CT aortogram
    - **Heart failure**- lung crepitations, elevated JVP, gallop rhythm- ECG, 2D echo, CXR, BNP levels
- **Eye**- Fundoscopy- papilledema, HTN changes – exudates/ flame hemorrhage
- **Neurology**- **Encephalopathy**: General- Headache, Fluctuation of consciousness, visual disturbances, seizures
- **Haematology**- **MAHA/DIC**- FBC(Hb, Plt), blood picture, fibrinogen level, Coagulation profile, LDH
- **Renal**- **AKI**- check UOP, uremic features- RFT, UFR/UPCR, SE, Renal Ultrasound & Renal doppler

If severe hypertension Look for causative factors/precipitants

- Medical history: preexisting hypertension, onset and duration of symptoms, potential causes (nonadherence with prescribed antihypertensive drugs)
- Toxins and medications- Cocaine, medications- amphetamines, NSAIDS, steroids, immunosuppressants
- Medication withdrawal- clonidine, beta blockers. Medication related- serotonin syndrome/NMS- Drugs levels, toxicology studies
- Endocrine- Thyrotoxicosis, pheochromocytoma, Cushing's, Cons- SE, TSH, Metanephrines, cortisol
- Renal- AGN, CKD, renovascular
- Raised ICP-nausea/vomiting, head injury, drugs, SOL, meningitis, vascular events- NCCT brain, MRI brain

- Autonomic disturbances- GBS, spinal cord pathology

MANAGEMENT

Hypertensive Urgency

Target- around <160/100 mmHg, in very high pressures target- 25 % reduction
Time duration- over 4 hours to days. (Individual targets- those with risk of imminent CV event lower and faster blood pressure reduction).
Drugs- oral drugs preferred:

- captopril (start 25 mg daily up to 150mg/day
- amlodipine (2.5 mg/day up to 10 mg/day)
- other first line drugs (combinations are preferred)

Other measures: explain to the patient, keep in a quiet environment, salt restriction

Monitoring:

For symptoms of target organ involvement, blood pressure, heart rate, lung auscultation, fluid balance.
In the long term the blood pressure should be further reduced to achieve the target (140/90 or 130/80)

Plan on discharge-

1) Antihypertensive-
    a. Those on treatment- Reinstitution of prior medications (avoid drugs causing rebound hypertension in non-adherents), increase the dose of existing medications, addition of diuretics.
    b. Untreated hypertension- depending on intrinsic and extrinsic factors start- CCB/ACEI/ARB/diuretics etc. Combination of two drugs preferred.
2) Diet- low salt diet
3) Other lifestyle measures

Hypertensive emergency

Key considerations in defining the treatment strategy

1. Establishing the target organs that are affected, whether they require any specific interventions other than BP lowering, and whether there is a precipitating cause for the acute rise in BP that might affect the treatment plan (e.g. pregnancy,thrombolysis)

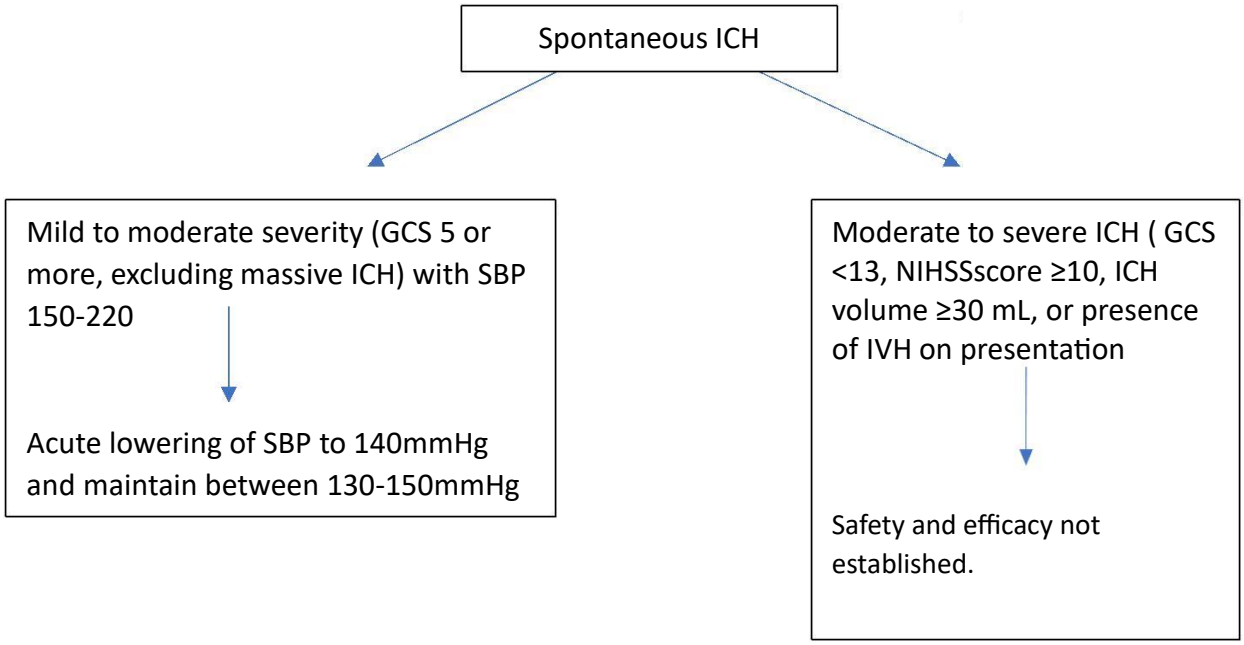
2. The recommended timescale and magnitude of BP lowering required for safe BP reduction
3. The type of BP-lowering treatment required

- Managed in HDU/ICU
- Labetalol and nicardipine safe for all generally

Clinical presentation	**Target BP**	**Treatment**
Malignant hypertension with or without acute renal failure	Several hours Reduce MAP 20-25%	Labetalol, Nicardipine Nitroprusside
Hypertensive encephalopathy	Immediately reduce MAP by 20-25%	Labetalol, nicardipine Nitroprusside
Acute coronary syndrome	Immediately reduce SBP <140 mmHg	Nitroglycerine, Metoprolol / esmolol, Clevidipine, Nicardipine. (Avoid – hydralazine)
Acute cardiogenic pulmonary edema	Immediately reduce SBP <140 mmHg	Nitroglycerine, loop diuretics, Sodium nitroprusside (Avoid- BB, Hydralazine)
Acute aortic dissection	Immediately reduce SBP < 120 mmHg and heart rate 60 bpm	BB- Labetalol, metoprolol, esmolol Vasodilator- nitroglycerine, hydralazine, Clevidipine
Eclampsia and severe preeclampsia/HELP	Reduce MAP by no more than 25 % over two hours to achieve target blood pressures of 130 to 150 mmHg systolic and 80 to 100 mmHg diastolic. Immediately reduce SBP to < 160 mmHg and DBP to < 105 mmHg (ESC)	IV: Hydralazine, labetalol, Nicardipine Magnesium sulfate Oral- Nifedipine, Methyldopa Give oral drugs (nifedipine 10 mg) until IV access is secured (avoid- Atenolol, ACEI/ARB, MRA and Nitroprusside) Delivery
Ischaemic Stroke	For thrombolysis <185/110 & maintain at <180<105 mmHg Non-reperfusion < 220/120	Nicardipine, Labetalol, Clevidipine
Intracranial Hemorrhage/ Hemorrhagic stroke	See below	Nicardipine, Labetalol

Intracranial haemorrhage

Sustained acute BP lowering avoiding large variations in SBP
Initiating treatment within 2h of onset and achieving control in 1 hour is beneficial



ICH+ SBP >220→ no sufficient data on acute BP lowering

Eclampsia and severe preeclampsia/HELLP:

(1) SBP> 140 mm Hg /DBP> 90 mm Hg or higher, on two occasions at least 4 hours apart
(2) SBP >170 mm Hg systolic and/or >110 mm Hg diastolic: immediate hospitalization is indicated (emergency)

Preeclampsia

In addition to the blood pressure criteria, proteinuria,

1) > 0.3 grams in a 24-hour urine specimen,

2) UPCR> 0.3 or higher, or
3) Urine dipstick protein of 1+

Severe when SBP > 160 / DBP> 110 mmHg, impaired renal, hepatic function, PLT<100, impaired visual or neurological function and pulmonary edema, abdominal pain, nausea vomiting or low UOP

Treatment

- Intravenous labetalol (alternative intravenous nicardipine, esmolol, hydralazine, urapidil) oral methyldopa or DHP-CCBs (nifedipine [not capsular] nicardipine)
- Add magnesium (hypertensive crisis to prevent eclampsia)
- In pulmonary edema: nitroglycerin intravenous infusion
- Sodium-nitroprusside -avoid due to the danger of fetal cyanide poisoning with prolonged treatment
- Immediately reduce SBP to < 160 mmHg and DBP to < 105 mmHg (ESC)
- Monitor fetal HR, To prevent foetal bradycardia, the cumulative dose of labetalol should not exceed 800 mg/24 h
- Expedite delivery in women with visual disturbances, hemostatic disorders, asymptomatic at 37 weeks

Suspect sympathetic overactivity

1. alfa 2 agonist/beta blocker withdrawal
2. ingestion of sympathomimetic (methamphetamine, cocaine)
3. pheochromocytoma
4. autonomic disturbance

- Avoid betablockers alone (except beta blocker withdrawal).
- Use alfa blockers first such as- (Phentolamine- 5 mg IV repeat if necessary q2-4hr up to 15 ml),or use labetalol or nitroprusside.

Annex

Drug types, doses, and characteristics for treatment of hypertension emergencies

Labetalol: IV 2mg/min (max 2.4 g/day) or 10-20 mg dose over 1 min, repeated in 5 min, with increasing the dose (max 200)

Nicardipine: 3-5 mg/hour, increase 1mg every 15 min (max-15mg/hour)

Nitroprusside- 0.5-1.5 mcg/kg/min, adjust 0.5 mcg/kg/min every 5 min

Nitroglycerine- 10-200mcg/min (max per dose- 400 mcg/min)

Loop diuretics- bolus 50-100 mg, infusion start 5mg/hour, (max-1.5 g/day)

Metoprolol- 5 mg over 5 min. repeated every 5 min to a max dose of 10-15 mg

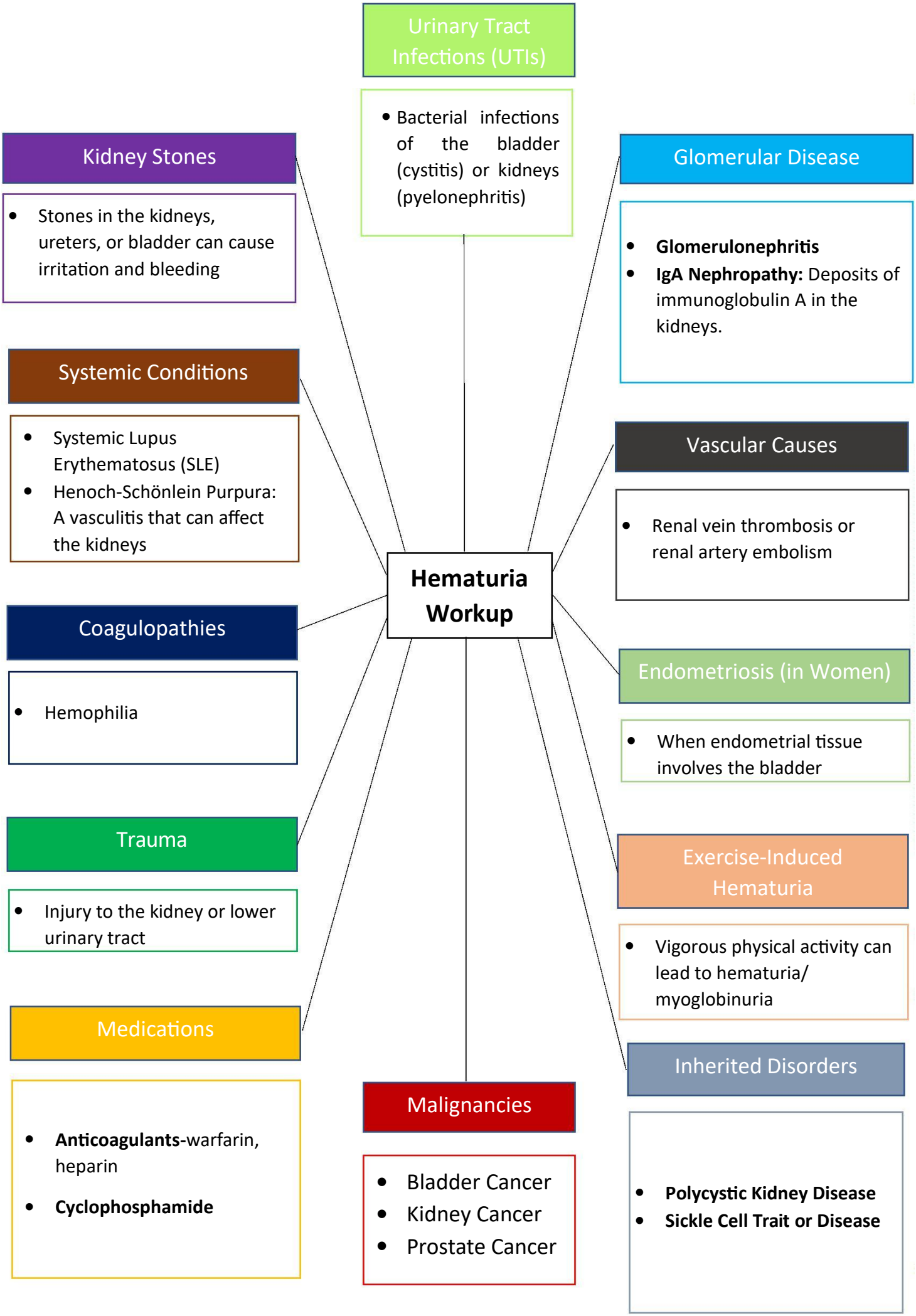
Magnesium sulfate: for prevention of seizures in preeclampsia
4g (diluted in 250 mL NS/D5W) IV loading dose & 1-2 g/hr IV; may administer 4hrly as necessary

Drug	Onset of action	Duration of action	Dose	Contraindications	Adverse effects
Esmolol	1–2 min	10–30 min	0.5–1 mg/kg as i.v. bolus; 50–300 lg/kg/min as i.v. infusion	Second or third-degree AV block, systolic heart failure, asthma, bradycardia	Bradycardia
Metoprolol	1–2 min	5–8 h	2.5–5mg i.v. bolus over 2 minutes - may be repreated every 5 minutes to a maximum dose of 15mg	Second or third-degree AV block, systolic heart failure, asthma, bradycardia	Bradycardia
Labetalol	5–10 min	3–6 h	0.25–0.5 mg/kg i.v. bolus; 2–4 mg/min infusion until goal BP is reached, thereafter 5–20 mg/h	Second or third-degree AV block; systolic heart failure, asthma, bradycardia	Bronchoconstriction, foetal bradycardia
Fenoldopam	5–15 min	30–60 min	0.1 mg/kg/min i.v. infusion, increase every 15 min with 0.05 - 0.1 lg/kg/min increments until goal BP is reached	Caution in glaucoma	
Clevidipine	2–3 min	5–15 min	2 mg/h i.v. infusion, increase every 2 min with 2 mg/h until goal BP		Headache, reflex tachycardia
Nicardipine	5–15 min	30–40 min	5–15 mg/h i.v. infusion, starting dose 5 mg/h, increase every 15–30 min with 2.5 mg until goal BP, thereafter	Liver failure	Headache, reflex tachycardia

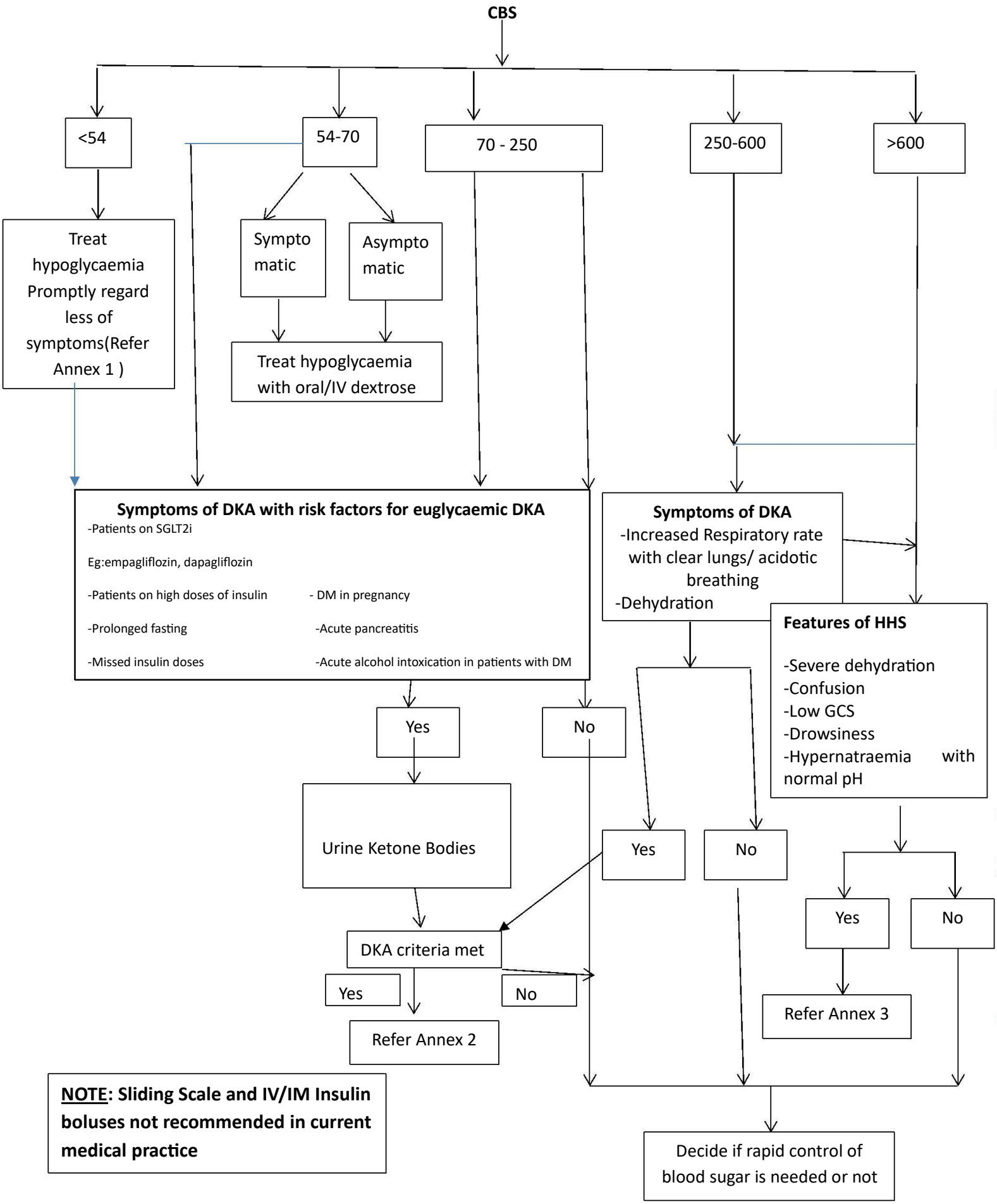
			decrease to 3 mg/h		
Nitroglycerine	1–5 min	3–5 min	5–200 lg/min i.v. infusion, 5 lg/min increase every 5 min		Headache, reflex tachycardia
Nitroprusside	Immediate	1–2 min	0.3–10 lg/kg/min i.v. infusion, increase by 0.5 lg/kg/min every 5 min until goal BP	Liver/kidney failure (relative)	Cyanide intoxication
Enalaprilat	5–15 min	4–6 h	0.625–1.25 mg i.v. bolus	History of angioedema	
Urapidil	3–5 min	4–6 h	12.5–25 mg as bolus injection; 5–40 mg/h as continuous infusion		
Clonidine	30 min	4–6 h	150–300 mg i.v. bolus over 5–10 min		Sedation, rebound hypertension
Phentolamine	1–2 min	10–30 min	0.5–1 mg/kg i.v. bolus OR 50–300 mg/kg/min as i.v. infusion		Tachyarrhythmias, chest pain

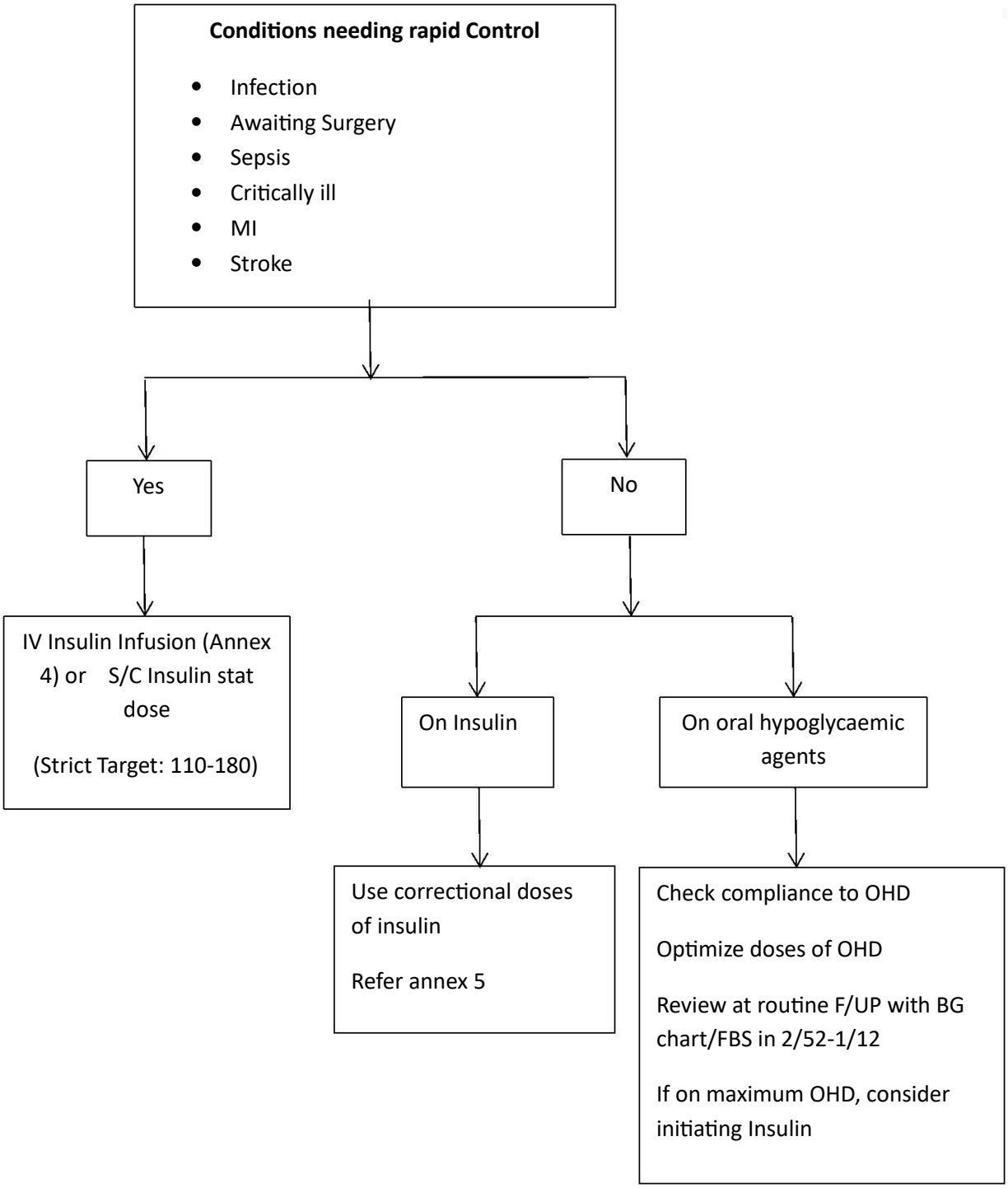
References

1) 2020 AHA guideline- Global Hypertension Practice Guideline
2) 2018 ESC/ESH Guidelines for the management of arterial hypertension
3) 2020 Hypertension guideline on American College of Obstetricians and Gynecologists
4) 2022 Guideline for the Management of Patients with Spontaneous Intracerebral Hemorrhage: American Heart Association/American Stroke Association


Hematuria Workup
Urinary Tract Infections (UTIs)
• Bacterial infections of the bladder (cystitis) or kidneys (pyelonephritis)
Kidney Stones
• Stones in the kidneys, ureters, or bladder can cause irritation and bleeding
Glomerular Disease
• Glomerulonephritis
• IgA Nephropathy: Deposits of immunoglobulin A in the kidneys.
Systemic Conditions
• Systemic Lupus Erythematosus (SLE)
• Henoch-Schönlein Purpura: A vasculitis that can affect the kidneys
Vascular Causes
• Renal vein thrombosis or renal artery embolism
Coagulopathies
• Hemophilia
Endometriosis (in Women)
• When endometrial tissue involves the bladder
Trauma
• Injury to the kidney or lower urinary tract
Exercise-Induced Hematuria
• Vigorous physical activity can lead to hematuria/ myoglobinuria
Medications
• Anticoagulants-warfarin, heparin
• Cyclophosphamide
Inherited Disorders
• Polycystic Kidney Disease
• Sickle Cell Trait or Disease
Malignancies
• Bladder Cancer
• Kidney Cancer
• Prostate Cancer

Management of Hypo/Hyperglycaemia





Rough guide for S/C Insulin Stat dose -

- CBS: 180-250 - S/C Insulin 4-6 units
- CBS: 250-350 - S/C Insulin 6-10 units
- CBS: 350-450 - S/C Insulin 8-15 units
- CBS: 450-HI – S/C Insulin 15-20 units

Annex 1

Hypoglycaemia in patients with DM

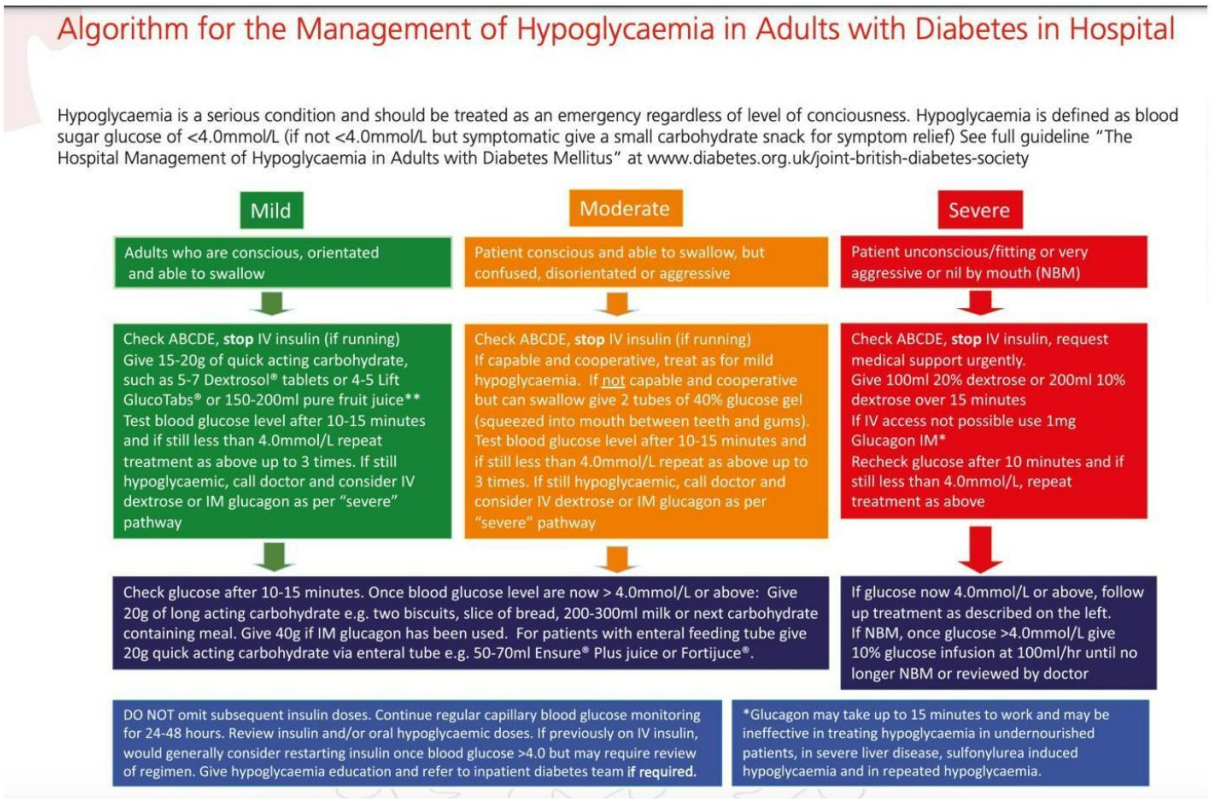
Table 6.4—Classification of hypoglycemia	
	Glycemic criteria/description
Level 1	Glucose <70 mg/dL (<3.9 mmol/L) and ≥54 mg/dL (≥3.0 mmol/L)
Level 2	Glucose <54 mg/dL (<3.0 mmol/L)
Level 3	A severe event characterized by altered mental and/or physical status requiring assistance for treatment of hypoglycemia, irrespective of glucose level

Warrants urgent treatment

Onset of neuroglycopaenic symptoms

Symptoms of hypoglycemia include, but are not limited to, shakiness, irritability, confusion, tachycardia, sweating, and hunger.

Because many people with diabetes experience impaired hypoglycemia awareness, a measured glucose level <70 mg/dL (<3.9 mmol/L) is considered clinically important, regardless of symptoms.



Level 1 and 2 hypoglycaemia Management (mild-mod)-

Rapid acting Carbohydrate 15-20 g in Sri Lankan setting-

- 15-20 g of pure glucose preferred

Alternatives-

- 150-200ml pure fruit juice (e.g. orange juice), do not use if following a low potassium diet (e.g. to treat chronic kidney disease) in view of its potassium content.
- 3-4 heaped teaspoons of sugar dissolved in water.
- In moderate hypoglycaemia, glucose dissolved in water can be applied to buccal mucosa as an alternative to dextrose gel.
- Once blood glucose is above 4.0mmol/L and the person has recovered, give a long acting carbohydrate snack (20g) of their choice where possible, taking into consideration any specific dietary requirements.
- People given glucagon require a larger portion of long-acting carbohydrate (40g) to replenish glycogen stores (double the suggested amounts below) although nausea associated with glucagon injections may be an issue.
  Examples include: a. Two biscuits b. One slice of bread/toast c. 200-300ml glass of milk (not soya or other forms of 'alternative milk, e.g. almond or coconut) d. Normal meal if due (must contain carbohydrate).

Level 3 hypoglycaemia-

- Immediate treatment with 25g of 25-50% glucose solution administered IV.
- No IV access-
  If no IV access is available then give 1mg Glucagon IM. Glucagon is only licensed for insulin induced hypoglycaemia and may be less effective in people prescribed sulfonylurea therapy (may take up to 15 minutes to take effect).
  Glucagon mobilises glycogen from the liver and will be less effective in those who are chronically malnourished (including those who have had a prolonged period of starvation), abuse alcohol or have chronic liver disease.
  In this situation IV glucose is the preferred option. If no IV access is available initially, continue trying to achieve IV access as IM glucagon is less likely to be successful if required for a second time.

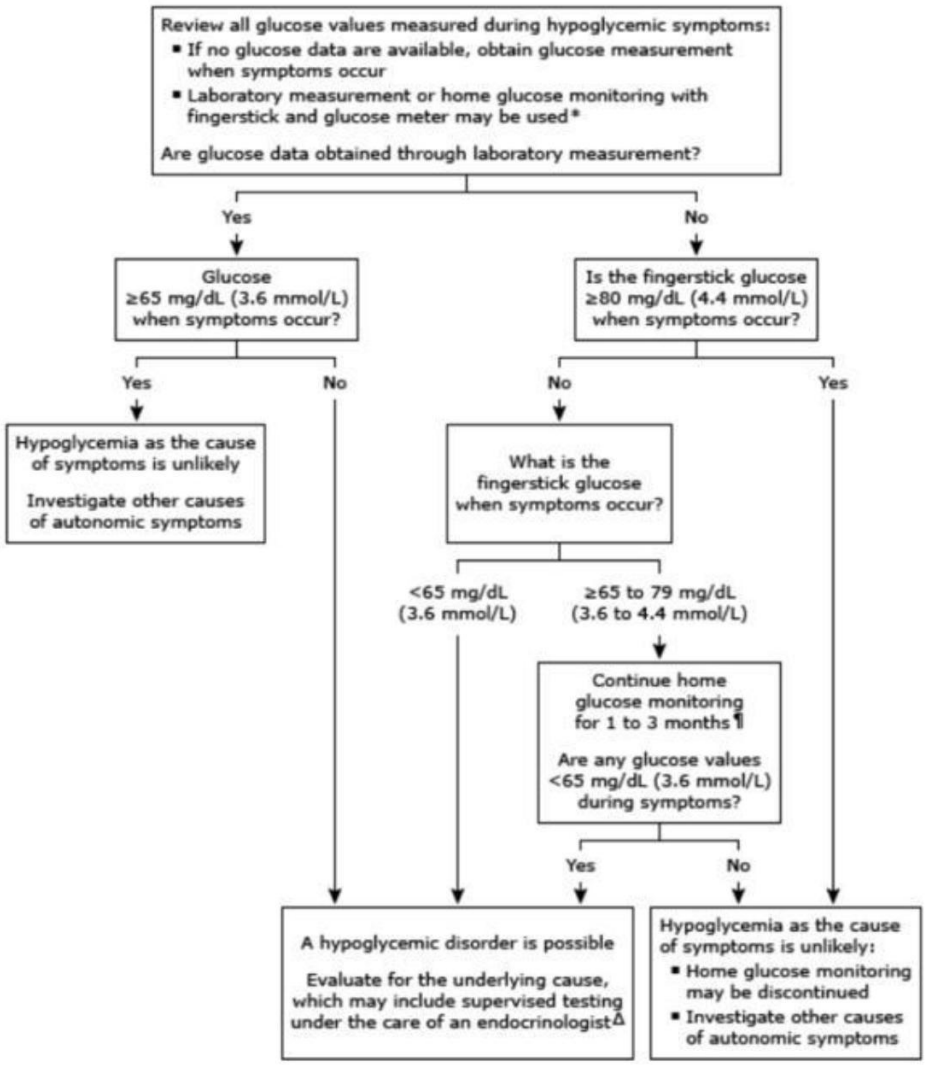
References

1. Joint British Diabetes Societies guideline on The Hospital Management of Hypoglycaemia in Adults with Diabetes Mellitus, January 2023 Revision
2. American Diabetes Association **Glycemic Goals and Hypoglycemia: *Standards of Care in Diabetes—2024***
3. Upto date

Hypoglycaemia in patients without DM

Management of hypoglycaemia according to severity similar to patients with DM and hypoglycaemia.

Evaluation of hypoglycemic symptoms in adults without diabetes mellitus

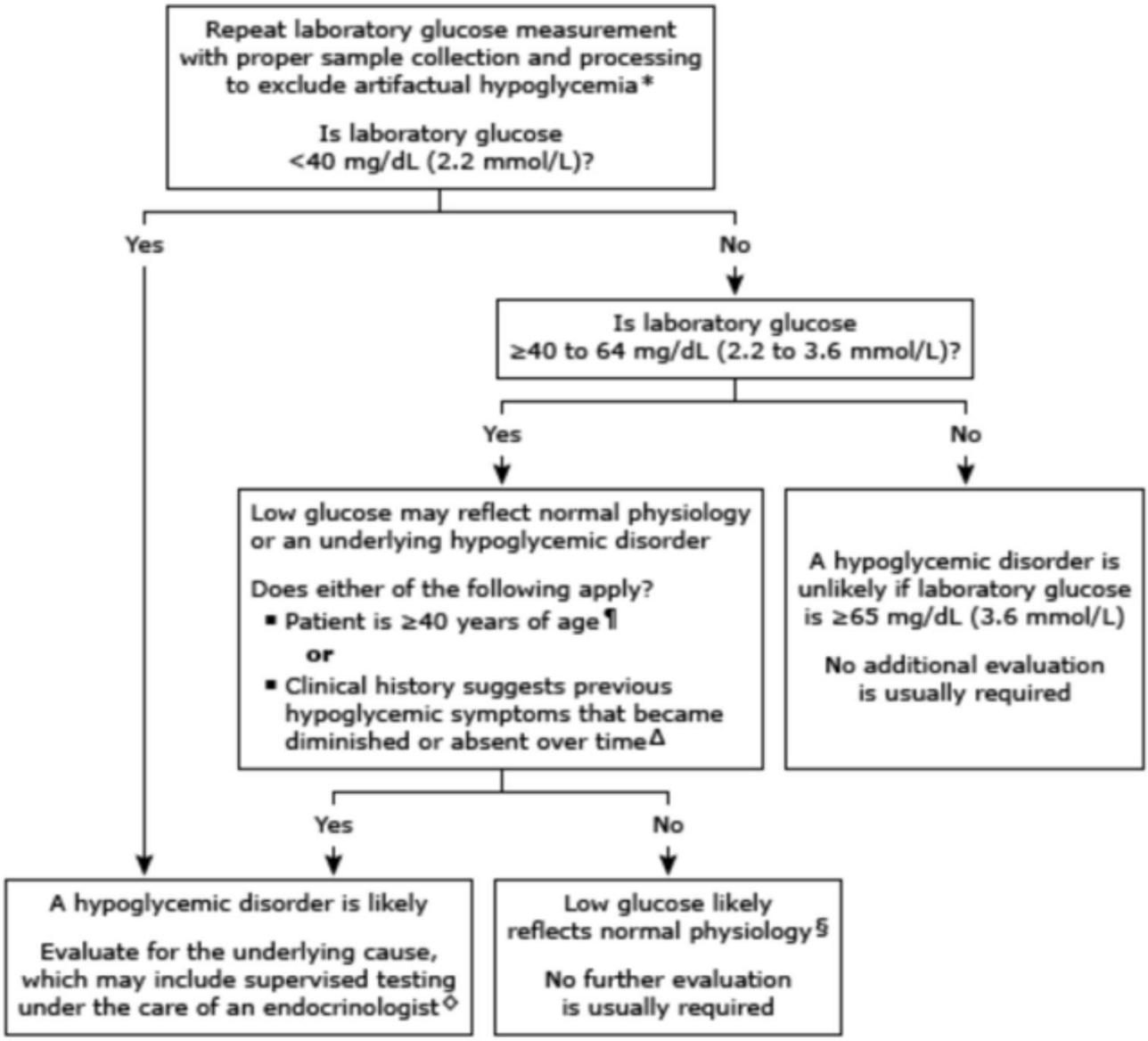


* If laboratory glucose measurement is pursued, insulin, C-peptide, and proinsulin levels should be obtained concurrently at the time of hypoglycemic symptoms. A detailed approach to home blood glucose monitoring with fingersticks and a glucose meter is described in other UpToDate content. Continuous glucose monitoring should **not** be used in the evaluation of hypoglycemic symptoms in individuals without diabetes.

¶ The duration of continued monitoring depends on factors including frequency of hypoglycemic symptoms and clinical suspicion for an underlying hypoglycemic disorder.

Δ Supervised testing can entail a supervised fast or mixed meal test, or evaluation may be performed during a spontaneous episode of hypoglycemia. Selection of a supervised test when hypoglycemia is not fortuitously observed depends on the timing of symptoms in relation to meals.

Evaluation of hypoglycemia in asymptomatic adults without diabetes mellitus



* Artifactual hypoglycemia can occur if an antiglycolytic agent (eg, fluoride) is not present in the blood collection tube and sample processing is delayed. Artifactual hypoglycemia also may be seen in individuals with leukocytosis, erythrocytosis, or hemolysis.

¶ A low glucose value is less likely to reflect normal physiology in individuals aged ≥40 years and usually warrants further evaluation.

△ Individuals who report the loss of a symptomatic response to hypoglycemia over time should undergo additional evaluation as this history could reflect the evolution of impaired awareness of hypoglycemia that can occur with recurrent episodes of hypoglycemia.

◇ Supervised testing can entail a supervised fast or mixed meal test, or evaluation may be performed during a spontaneous episode of hypoglycemia. Selection of a supervised test when hypoglycemia is not fortuitously observed depends on the timing of symptoms in relation to meals.

§ In young (aged <40 years), healthy individuals, glucose values ≥40 to 64 mg/dL (2.2 to 3.6 mmol/L) can reflect normal physiology in the fasting state.

Causes of hypoglycemia in adults

Ill or medicated individual
1. Drugs
Insulin or insulin secretagogue
Alcohol
Others (refer to UpToDate table on drugs that cause hypoglycemia)
2. Critical illnesses
Hepatic, renal, or cardiac failure
Sepsis (including malaria)
Inanition
3. Hormone deficiency
Cortisol
Glucagon and epinephrine (in insulin-deficient diabetes mellitus)
4. Nonislet cell tumor
Seemingly well individual
5. Endogenous hyperinsulinism
Insulinoma
Functional beta cell disorders (nesidioblastosis)
Noninsulinoma pancreatogenous hypoglycemia
Post-gastric bypass hypoglycemia
Insulin autoimmune hypoglycemia
Antibody to insulin
Antibody to insulin receptor
Insulin secretagogue
Other
6. Accidental, surreptitious, or malicious hypoglycemia

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Drugs other than antihyperglycemic agents and alcohol reported to cause hypoglycemia

Moderate quality of evidence
Cibenzoline
Gatifloxacin
Pentamidine
Quinine
Indomethacin
Glucagon (during endoscopy)
Low quality of evidence
Chloroquineoxaline sulfonamide
Artesunate/artemisin/artemether
IGF-1
Lithium
Propoxyphene/dextropropoxyphene
Very low quality of evidence
Drugs with >25 cases of hypoglycemia identified
Angiotensin-converting enzyme inhibitors
Angiotensin receptor antagonists
Beta-adrenergic receptor antagonists
Levofloxacin
Mifepristone
Disopyramide
Trimethoprim-sulfamethoxazole
Heparin
6-mercaptopurine

IGF-1: insulin-like growth factor-1.

Reference

Upto date section on hypoglycaemia in adults without Diabetes.

Annex 2 – DKA Management

The Management of Diabetic Ketoacidosis in Adults

Where individuals aged 16-18 are managed by paediatric teams, the paediatric guidelines should be followed: BSPED IBSPED DKA Guidelines

Diagnostic criteria: **all three of the following must be present**

- capillary blood glucose above 11 mmol/L
- capillary ketones above 3 mmol/L or urine ketones ++ or more
- venous pH less than 7.3 and/or bicarbonate less than 15 mmol/L

BOX 1: Immediate management: time 0 to 60 minutes
(T=0 at timeintravenous fluids are commenced)
If intravenous access cannot be obtained request critical care support immediately

Action 1: Commence 0.9% sodium chloride solution (use a large bore cannula) via an infusion pump
See Box 2 for rate of fluid replacement
Action 2: Commence a fixed rate intravenous insulin infusion (FRII). (0.1unit/kg/hr based on estimate of weight) 50 units human soluble insulin (Actrapid® or Humulin S®) made up to 50ml with0.9% sodium chloride solution. If patient normally takes long acting insulin analogue (glargine, detemir, degludec) continue at usual dose and time
Action 3: Assess patient
- Respiratory rate; temperature; blood pressure; pulse; oxygensaturation
- Glasgow Coma Scale
- Full clinical examination

Action 4: Further investigations
- Capillary and laboratory glucose
- Venous BG
- U&E and FBC
- Blood cultures
- ECG
- CXR
- MSU

Action 5: Establish monitoring regimen
- Hourly capillary blood glucose
- Hourly capillary ketone measurement if available
- Venous bicarbonate and potassium at 60 minutes, 2hours and 2 hourly thereafter
- 4 hourly plasma electrolytes
- Continuous cardiac monitoring if required
- Continuous pulse oximetry if required

Action 6: Consider and precipitating causes and treat appropria

HDU/level 2 facility and/or insertion of central line may be required in following circumstances (request urgent senior review)

- Young people aged 18-25 years
- Elderly
- Pregnant
- Heart or kidney failure
- Other serious co-morbidities
- Severe DKA by following criteria
  - Blood ketones above 6 mmol/L
  - Venous bicarbonate below 5 mmol/L
  - Venous pH below 7.0
  - Hypokalaemia on admission (below 3.5 mmol/L)
  - GCS less than 12
  - Oxygen saturation below 92% on air (Arterial blood gases required)
  - Systolic BP below 90 mmHg
  - Pulse over 100 or below 60 bpm
  - Anion gap above16 [Anion Gap = $(Na^+ + K^+) - (Cl^- + HCO_3^-)$]

litre of fluid
Systolic BP on admission 90 mmHg and over
- Give 1L 0.9% sodium chloride over the first 60 minutes

Potassium replacement Potassium level (mmol/L)	Potassium replacement mmol/L of infusion solution
> 5.5	Nil
3.5-5.5	40 mmol/L
< 3.5	senior review – additional potassium required

BOX 3: 60 minutes to 6 hours
Aims of treatment:
- Rate of fall of ketones is at least 0.5 mmol/L/hr OR bicarbonate rise 3 mmol/L/hrand blood glucose fall 3 mmol/L/hr
- Maintain serum potassium in normal range
- Avoid hypoglycaemia

Action 1: Re-assess patient, monitor vital signs
- Hourly blood glucose (as blood glucose if meter reading 'HI')
- Hourly blood ketones if meter available
- Venous blood gas for pH, bicarbonate and potassium at 60 minutes, 2 hours and 2 hourly thereafter
- If potassium is outside normal range, re-assess potassium replacement and checkhourly. If abnormal after further hour seek immediate senior medical advice

Action 2: Continue fluid replacement via infusion pump as follows:
- 0.9% sodium chloride 1L with potassium chloride over next 2 hours
- 0.9% sodium chloride 1L with potassium chloride over next 2 hours
- 0.9% sodium chloride 1L with potassium chloride over next 4 hours
- Add 10% glucose 125ml/hr if blood glucose falls below 14 mmol/L
- **Consider** reducing the rate of intravenous insulin infusion to 0.05 units/ kg/hour when glucose falls below 14 mmol/L

More cautious fluid replacement in young people aged 18-25 years, elderly,pregnant, heart or renal failure. (Consider HDU and/or central line)

Action 3: Assess response to treatment
Insulin infusion rate may need review if
- Capillary ketones not falling by at least 0.5 mmol/L/hr
- Venous bicarbonate not rising by at least 3 mmol/L/hr
- Plasma glucose not falling by at least 3 mmol/L/hr
- Continue FRII until ketones less than 0.6 mmol/L, venous pH > 7.3 and/or venous bicarbonate over 18 mmol/L

If ketones and glucose are not falling as expected always check the insulin infusion pump is working and connected and that the correct insulin residualvolume is present (to check for pump malfunction).
If equipment working but response to treatment is inadequate, increase insulin infusionrate by 1 unit/hr increments hourly until targets achieved.
Additional measures
- Regular observations and Early Warning Score (NEWS2)
- Accurate fluid balance chart, minimum urine output 0.5ml/kg/hr
- Consider urinary catheterisation if incontinent or anuric (not passed urine) by 60 minutes
- Nasogastric tube with airway protection if patient obtunded or persistently vomiting
- Measure arterial blood gases and repeat chest radiograph if oxygen saturation lessthan 92%
- Thromboprophylaxis with low molecular weight heparin
- Consider ECG monitoring if potassium abnormal or concerns about cardiac status

BOX 4: 6 to 12 hours
Aims:
- Ensure clinical and biochemical parameters improving
- Continue IV fluid replacement
- Avoid hypoglycaemia
- Assess for complications of treatment e.g. fluid overload, cerebral oedema
- Treat precipitating factors as necessary

Action 1: Re-assess patient, monitor vital signs
- If patient not improving by criteria in Box 3, seek senior advice
- Continue IV fluid via infusion pump at reduced rate
  - 0.9% sodium chloride 1L with KCl over 4 hours
  - 0.9% sodium chloride with KCl over 6 hours
- Add 10% dextrose 125mls/hr if the glucose falls below 14 mmol/L
- **Consider** reducing the rate of intravenous insulin infusion to 0.05 units/ kg/hour when glucose falls below 14 mmol/L

Reassess cardiovascular status at 12 hours; further fluidmay be required

Check for fluid overload

Action 2 – Review biochemical and metabolic parameters
- At 6 hours check venous pH, bicarbonate, potassium, capillary ketones and glucose
- Resolution of DKA is defined at ketones <0.6 mmol/L **AND** venous pH >7.3 (do not use bicarbonate as a marker at this stage)
- Ensure a referral has been made to the diabetes team
- **If DKA not resolved review insulin infusion (see BOX 3Action 3)**
- **If DKA resolved go to BOX 6**

BOX 5: 12 to 24 HOURS

Expectation: By 24 hours the ketonaemia and acidosis should have resolved. Request senior review is not improving
Aim:
- Ensure that clinical and biochemical parameters are continuing to improve or are normal
- Continue IV fluid replacement if not eating and drinking
- If ketonaemia has cleared and the person is not eating or drinking, move to a variable rate intravenous insulin infusion (VRIII) as per local guidelines
- Reassess for complications of treatment, e.g. fluid overload, cerebral oedema
- Continue to treat precipitating factors
- Transfer to subcutaneous insulin if the person is eating and drinking normally and biochemistry is normal

Action 1 – Re-assess patient, monitor vital signs
Action 2 – Review biochemical and metabolic parameters
- At 12 hours check venous pH, bicarbonate, potassium, capillary ketones and glucose
- Resolution is defined as ketones <0.6 mmol/L, venous pH>7.3
- If not resolved review and **Box 4 Action 1** and insulin infusion **Box 3 Action 3**

If DKA resolved go to Box 6

BOX 6: Resolution of DKA

Expectation: Patient should be eating and drinking and back on normal insulin
If DKA not resolved identify and treat the reasons for failure to respond.
This situation is unusual and requires senior and specialist input

Transfer to subcutaneous insulin
Convert to subcutaneous regime when biochemically stable (capillary ketones less than 0.6 mmol/l) **AND** pH over 7.3) and the patient is ready and able to eat. **Do not discontinue intravenous insulin infusion until 30 minutes after subcutaneous short acting insulin has been given** Conversion to subcutaneous insulin should be managed by the Specialist Diabetes Team. If the team is not available use local guidelines. If the patient is newly diagnosed it is essential they are seen by a member of the specialist team prior to discharge
Arrange follow up with specialist team

DIABETES UK CARE. CONNECT. CAMPAIGN.
DISN UK GROUP
ABCD
WEDS
NHS SCOTLAND
Diabetes Network
Royal College of Physicians
The Association for Clinical Biochemistry & Laboratory Medicine
Royal College of Nursing

Represented: Association of British Clinical Diabetologists; British Society for Endocrinology and Diabetes and Association of Children's Diabetes Clinicians; Diabetes Inpatient Specialist Nurse (DISN) Group; Diabetes UK; Diabetes Network Northern Ireland; Society of Acute Medicine; Welsh Endocrine andDiabetes Society, Scottish Diabetes Group.

Annex 3 – HHS Management

Hyperosmolar Hyperglycaemic State (HHS) care pathway in adults

JBDS-IP Joint British Diabetes Societies for Inpatient care

Clinical features (all the below)		Aims of therapy	Criteria for resolution of HHS: Holistic assessment of the following:
1) Marked hypovolaemia	**A mixed picture of HHS and DKA occurs relatively frequently**	1) Improvement in clinical status and replacement of all estimated fluid losses by 24 hours	1) Clinical and cognitive status is back to the pre-morbid state
2) Osmolality ≥320 mOsm/kg		2) Gradual decline in osmolality: drop of 3-8 mOsm/kg/hr	2) Osmolality <300 mOsm/kg
3) Marked hyperglycaemia (≥30 mmol/L)		3) Blood glucose: aim to keep to 10-15 mmol/L in the first 24 hours	3) Hypovolaemia has been corrected (urine output ≥0.5 ml/kg/hr)
4) Without significant ketonaemia (≤3.0 mmol/L)		4) Avoid hypoglycaemia and hypokalaemia	4) Blood glucose <15 mmol/L
5) Without significant acidosis (pH ≥7.3) and bicarbonate ≥15 mmol/L		5) Prevent harm: VTE, osmotic demyelination, fluid overload, foot ulceration	

Theme / Time	0-60 minutes	60 minutes - 6 hours	6-12 hours	12-24 hours	24-72 hours
Clinical assessment and monitoring					
Clinical status / NEWS	History/Examination, NEWS, cardiac monitoring, urine output Establish adequate intravenous lines (preferably 2 large bore IV cannulas) Discuss with outreach/ICU team early if there are markers of high severity **(see Table 1 overleaf)**			Check for continuing improvement	Expect steady recovery, patient eating and drinking, and biochemistry as it was prior to HHS Ongoing management of the precipitating cause(s) Replacement of all estimated fluid losses by 24 hours Individual BG target 6-10 mmol/L
Precipitating cause(s)	Assess for precipitating cause(s): sepsis, diabetic foot infection, treatment omissions, vulnerable adult, vascular event (myocardial infarction, stroke)			Ongoing management of the precipitating cause(s)	
Osmolality (VBG/blood) **Measure/calculate (2xNa⁺) + Glucose + Urea** **Aim for gradual decline of 3-8 mOsm/kg/hr**	Check every hour for 6 hours Until the urea is available, calculate using (2 x Na^+ + glucose). Recalculate osmolality once urea is available, and then use (2 x Na^+ + glucose + urea)		Check every 2 hours	Check every 4 hours (if no clinical improvement then check every 2 hours)	
How to interpret osmolality results	**Check Figure 1 overleaf**	**Check Figure 1 overleaf**	**Check Figure 1 overleaf**	**Check Figure 1 overleaf**	
Blood glucose (BG) **(Aim for 10-15 mmol/L in the first 24 hours)**	Check every hour Fall in BG should be up to 5.0 mmol/L per hour **(check Figure 2 overleaf for details)**		**Check every hour (check Figure 2 overleaf for details)**	**Check every hour (check Figure 2 overleaf for details)**	
Interventions					
Intravenous fluids (0.9% saline) **(In IV line 1)** **(caution in HF/CKD/BW <50 kg)**	1 litre over 1 hour (caution in HF/CKD/BW <50 kg)	Aim for 2-3 litres positive balance by 6 hours	Aim for up to 6 litres positive balance by 12 hours	Reassess fluid balance to plan fluids replacement for the next 12 hours	Can be stopped if patient is eating and drinking
Insulin infusion **(FRIII 0.05 units/kg/hr using Actrapid®)** **(In IV line 2)**	Use DKA guidelines if ketonaemia (>3.0 mmol/L) or ketonuria (≥2+) Start FRIII if ketonaemia (>1.0 - ≤3.0 mmol/L) or ketonuria (<2+)	Only commence if positive fluid balance and BG plateaued on repeated measurements (>2 occasions)		Rate may need adjustment to 1 unit/hr to achieve BG target 10-15 mmol/L	VRIII if not eating and drinking Otherwise convert to subcutaneous insulin
Glucose infusion: 5% or 10% @ 125ml/hr **(In IV line 2)**	Not required at this stage	Only initiate if BG <14 mmol/L		Continue infusion at 125 ml/hr	Can be stopped if patient is eating and drinking
Potassium	Senior review / ICU outreach if potassium <3.5 or >6.0 mmol/L	**Check Table 2 overleaf for potassium replacement guidelines**	**Check Table 2 overleaf for potassium replacement guidelines**	**Check Table 2 overleaf for potassium replacement guidelines**	Check U&Es daily
Assessments and prevention					
Prevent harm	VTE prophylaxis (low molecular weight heparin) Assess for complications e.g. fluid overload, cerebral oedema, osmotic demyelination (deteriorating conscious level)				VTE prophylaxis until discharge Daily feet checks
Prevent hypoglycaemia	Glucose 5% or 10% at 125 ml/hr if BG <14 mmol/L				Target BG 6-10 mmol/L
Prevent foot ulceration	Daily foot checks				Daily foot checks
Refer to the inpatient diabetes team early. **Escalate management if there is clinical deterioration.**					Review by inpatient diabetes team before discharge

Abbreviations: BG=blood glucose; BW=body weight; CKD=chronic kidney disease; FRIII=fixed rate intravenous insulin infusion; HF=heart failure; hr=hour; ICU=intensive care unit; IV=intravenous; kg=kilograms; NEWS=national early warning score; U&Es=urea and electrolytes; VBG=venous blood gas analysis; VRIII=variable rate intravenous insulin infusion; VTE=venous thromboembolism

Hyperosmolar Hyperglycaemic State (HHS) care pathway in adults

JBDS-IP Joint British Diabetes Societies for inpatient care

Figure 1: Managing osmolality changes during treatment of HHS

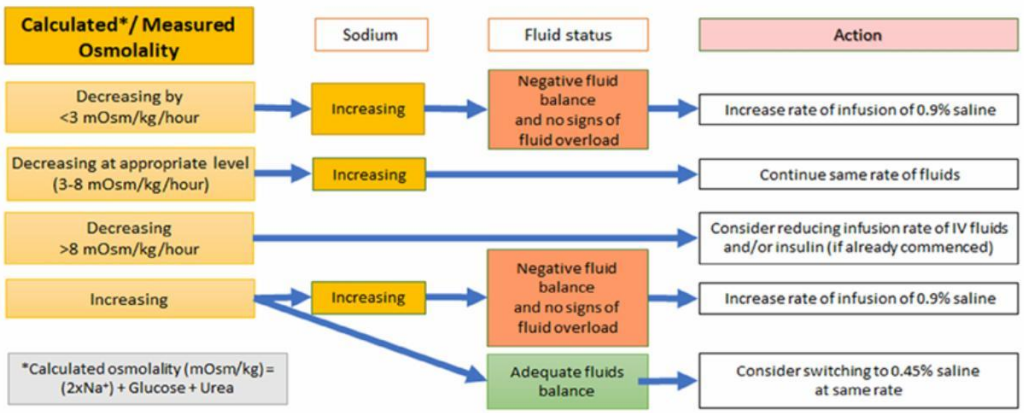
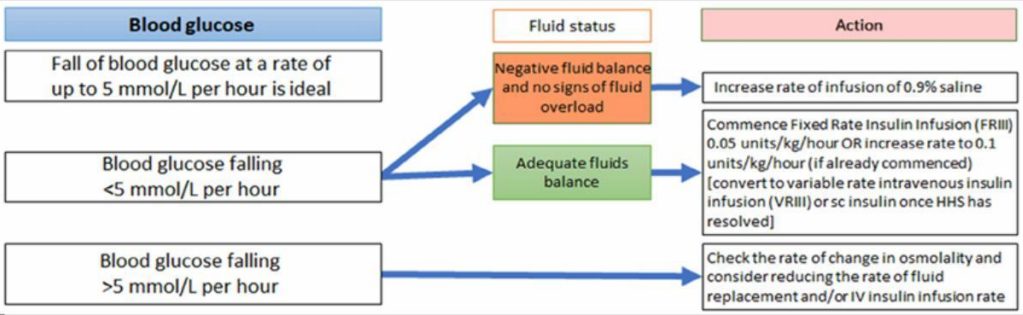


Figure 2: Managing glucose changes during treatment of HHS



If the parameters in Figures 1 and 2 above are not met, seek specialist input early to help tailor the management according to the individual's need

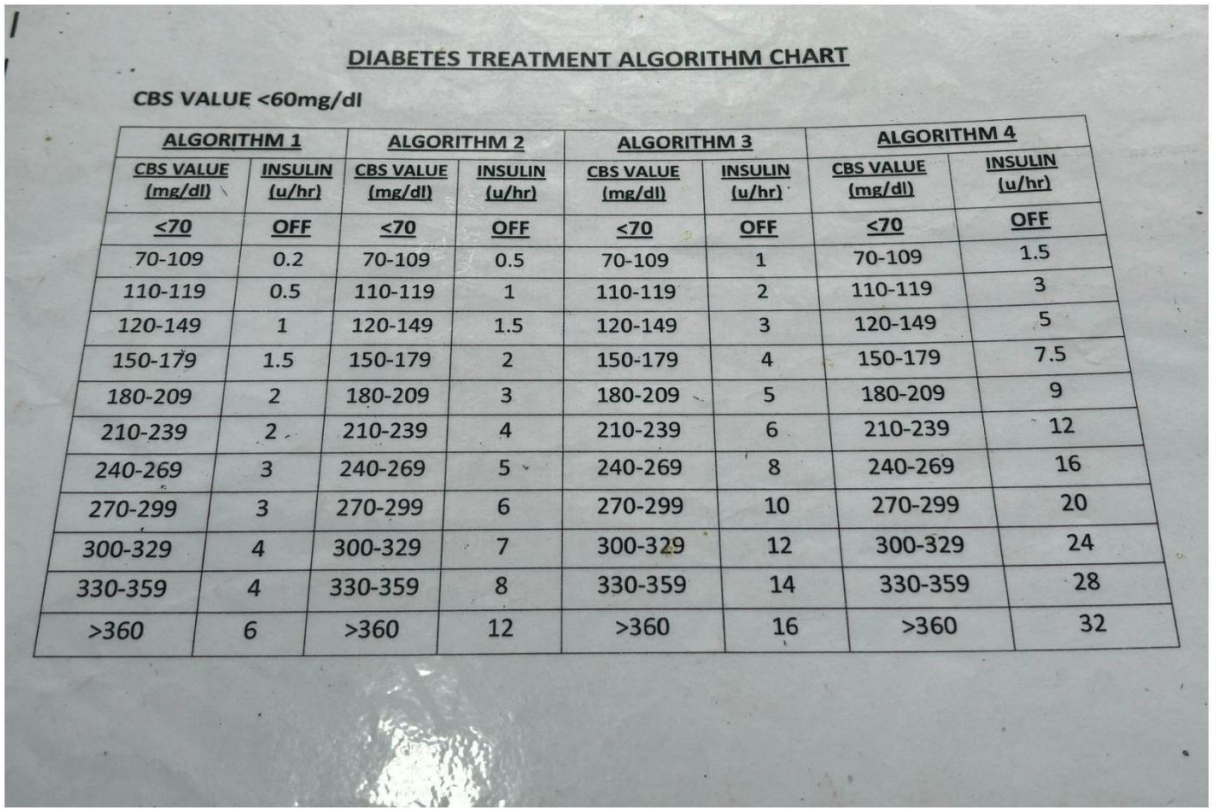
Table 1: Escalate to ICU/outreach if any of the following is present:

- Osmolality >350 mOsm/kg
- Sodium >160 mmol/L
- Venous/arterial pH <7.1
- Hypokalaemia (<3.5 mmol/L) or hyperkalaemia (>6 mmol/L) on admission
- Glasgow Coma Scale (GCS) <12 or abnormal AVPU (Alert, Voice, Pain, Unresponsive) scale
- Oxygen saturation <92% on air (assuming normal baseline respiratory function)
- Systolic blood pressure <90 mmHg
- Pulse >100 or <60 beats per minute
- Urine output <0.5 ml/kg/hour
- Serum creatinine >200 µmol/L and/or Acute kidney injury
- Hypothermia
- Macrovascular event such as myocardial infarction or stroke
- Other serious co-morbidity

Table 2: Potassium replacement guidelines

Potassium level in first 24 hours (mmol/L)	Potassium replacement in infusion solution
≥6.0	Senior review ICU/outreach
5.5-5.9	Nil
3.5-5.5	40 mmol/L
<3.5	Senior review ICU/Outreach. Additional potassium is required

Annex 4



DIABETES TREATMENT ALGORITHM CHART

CBS VALUE <60mg/dl

ALGORITHM 1		ALGORITHM 2		ALGORITHM 3		ALGORITHM 4	
CBS VALUE (mg/dl)	INSULIN (u/hr)	CBS VALUE (mg/dl)	INSULIN (u/hr)	CBS VALUE (mg/dl)	INSULIN (u/hr)	CBS VALUE (mg/dl)	INSULIN (u/hr)
<70	OFF	<70	OFF	<70	OFF	<70	OFF
70-109	0.2	70-109	0.5	70-109	1	70-109	1.5
110-119	0.5	110-119	1	110-119	2	110-119	3
120-149	1	120-149	1.5	120-149	3	120-149	5
150-179	1.5	150-179	2	150-179	4	150-179	7.5
180-209	2	180-209	3	180-209	5	180-209	9
210-239	2	210-239	4	210-239	6	210-239	12
240-269	3	240-269	5	240-269	8	240-269	16
270-299	3	270-299	6	270-299	10	270-299	20
300-329	4	300-329	7	300-329	12	300-329	24
330-359	4	330-359	8	330-359	14	330-359	28
>360	6	>360	12	>360	16	>360	32

Annex 5 – Correctional Dose

3 components of insulin required for a patient in hospital.

1.Basal Insulin and 2. Bolus insulin

Pre-admission dose or 0.5u/kg – > 50% as basal and 50% as bolus insulin.
Can be given as Mixtard Insulin or basal insulin (eg NPH/ glargine) and bolus insulin (eg soluble insulin/ rapid acting analogue) with meals .

+

3.Correctional dose

Provides real time adjustment of insulin dosing based on insulin sensitivity.

In a normal patient 1 unit of pre-meal soluble insulin will reduce the next pre-meal CBS by 10mg/dL.

Correctional dose needs to be calculated to relate this to patients with impaired insulin sensitivity.

Correctional dose calculation

Correctional factor (CF)= 1700/TDD (Total Daily Insulin)

Or

3000/Body weight (kg)

Correction Bolus Formula

$$\frac{\text{Current BG} - \text{Ideal BG}}{\text{Glucose correction factor}}$$

Example for correctional dose calculation

Blood sugar pre- lunch: 200mg/dL
Pre- meal goal: 140mg/dL
200-140=60mg/dL

Total Daily Insulin = 50 U
CF= 1700/50=34

Extra dose of Insulin needed to cover 60mg/dL= 60/ 34=1.8
Give extra 2 units of Insulin for pre-lunch dose

Acute Confusion workup (GCS 14/15)

- Before applying this, exclude acute urinary retention and severe pain

Causes for delirium.

Mnemonic- **I WATCH DEATH**

Potential causes	Differential diagnosis
Infectious	Sepsis, encephalitis, meningitis, syphilis, central nervous system abscess
Withdrawal	Alcohol, barbiturates, sedative-hypnotics
Acute metabolic	Acidosis, electrolyte disturbance, hepatic/ renal failure, other metabolic disturbances (glucose, magnesium, calcium)
Trauma	Head, burns
CNS disease	Hemorrhage, cerebrovascular accident, vasculitis, seizures, tumor
Hypoxia	Acute hypoxia, chronic lung disease, hypotension
Deficiencies	Vitamin B_{12}, hypovitaminosis, niacin, thiamine
Environmental	Hypo/hyperthermia, endocrinopathies, diabetes, adrenal, thyroid
Acute vascular	Hypertensive emergency, subarachnoid hemorrhage, sagittal vein thrombosis
Toxins/drugs	Medications, street drugs, alcohols, pesticides, industrial poisons, carbon monoxide, cyanide, solvents, etc
Heavy metals	Lead, mercury

* The above table was adapted from Table 102–1 of Smith and Seirafi,[16] which the authors modified from Wise MG.

Acute Back pain

1. Exclude red flags for acute back pain – **MIMICS**

Massive abdominal aortic aneurysm

Infective cause

Malignancy

Inflammatory cause

Cauda equina syndrome

Spinal trauma

2. Pain Management- Pharmacotherapy (systemic and local), Adjuvant therapy (Physiotherapy)

- If there are red flags- need further evaluation
- If there is neuropathic pain without red flags - add gabapentin
- If no red flags assess yellow flags with socio-demographic history
- If no yellow flags consider discharge with pharmacotherapy and adjuvant
- therapy If there are yellow flags +/- admission and VP OPD referral

Table 5.2 Red flags for back pain

Possible diagnosis	Red flags
Vertebral fracture	History of trauma (this may be minimal in the elderly or those with osteoporosis) Prolonged steroid use
Tumour	Age <20 or >50 History of malignancy Non-mechanical pain Thoracic pain Systemically unwell Weight loss
Spinal infection	Fever Systemically unwell IVDU Immunosuppression HIV Recent bacterial infection Non-mechanical pain Pain worse at night
Cauda equina syndrome	Saddle anaesthesia Bladder or bowel dysfunction Gait disturbance Widespread or progressive motor weakness Bilateral sciatica
AAA	Systemically unwell Cardiovascular compromise Pulsatile abdominal mass
Inflammatory rheumatic disease (e.g. ankylosing spondylitis)	Age <20 Structural deformity of the spine Systemically unwell

Acute back pain

Indications for admission

1. Presence of red flag symptoms; Cauda equina syndrome and paravertebral abscess are neurosurgical emergencies
2. Presence of yellow flags (can consider discharge with VPOPD referral)

Red flags

- Severe or progressive neurologic deficits (e.g., bowel or bladder function, saddle parasthesia)
- Fever
- Sudden back pain with spinal tenderness (especially with history of osteoporosis, cancer, steroid use)
- Trauma
- Serious underlying medical condition (e.g., cancer)

Yellow flags

- a belief that back pain is harmful and potentially severely disabling
- a tendency to lowered mood and withdrawal from social activity
- an expectation that passive treatments will help more than active participation (passive coping strategies)
- fear avoidance behaviour (avoiding activities for fear of damaging the back)
- past history of chronic pain (anywhere in the body)
- negative attitudes and outlook
- somatisation and preoccupation with health

Indications for X ray of the spine

-Chronic back pain lasting more than 6 weeks
-Back pain < 6 weeks with red flags
-history of cancer
-significant trauma
-unexplained weight loss (4.5 kg in < 6 months)
-temperature 37.8°C
-risk factors for infection
-neurological deficit
-minor trauma in patients – over 50 years of age – known to have osteoporosis – taking corticosteroids

Discharge planning

1. Pain relief

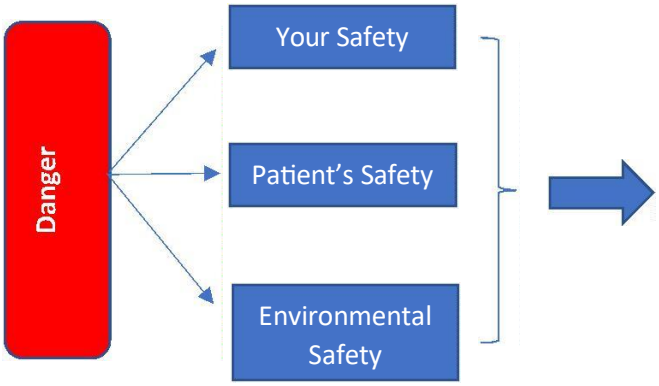
Mechanical pain

-First line: paracetamol 500–1000 mg every 4 hours up to 4 g per daynonsteroidal anti-inflammatory drug (NSAID) in addition to paracetamol where there is inflammation. History of peptic ulcer disease – consider COX-2 selective drug.
-Third line – add codeine 30–60 mg 4 hourly or tramadol 50 mg 6 hourly. Use for 2 weeks to assist activation. Warn about constipation.
- Avoid the use of muscle relaxants including diazepam (significant incidence of side effects compared to placebo and their effectiveness is lost)
-Heat compress for 48h

Neuropathic pain

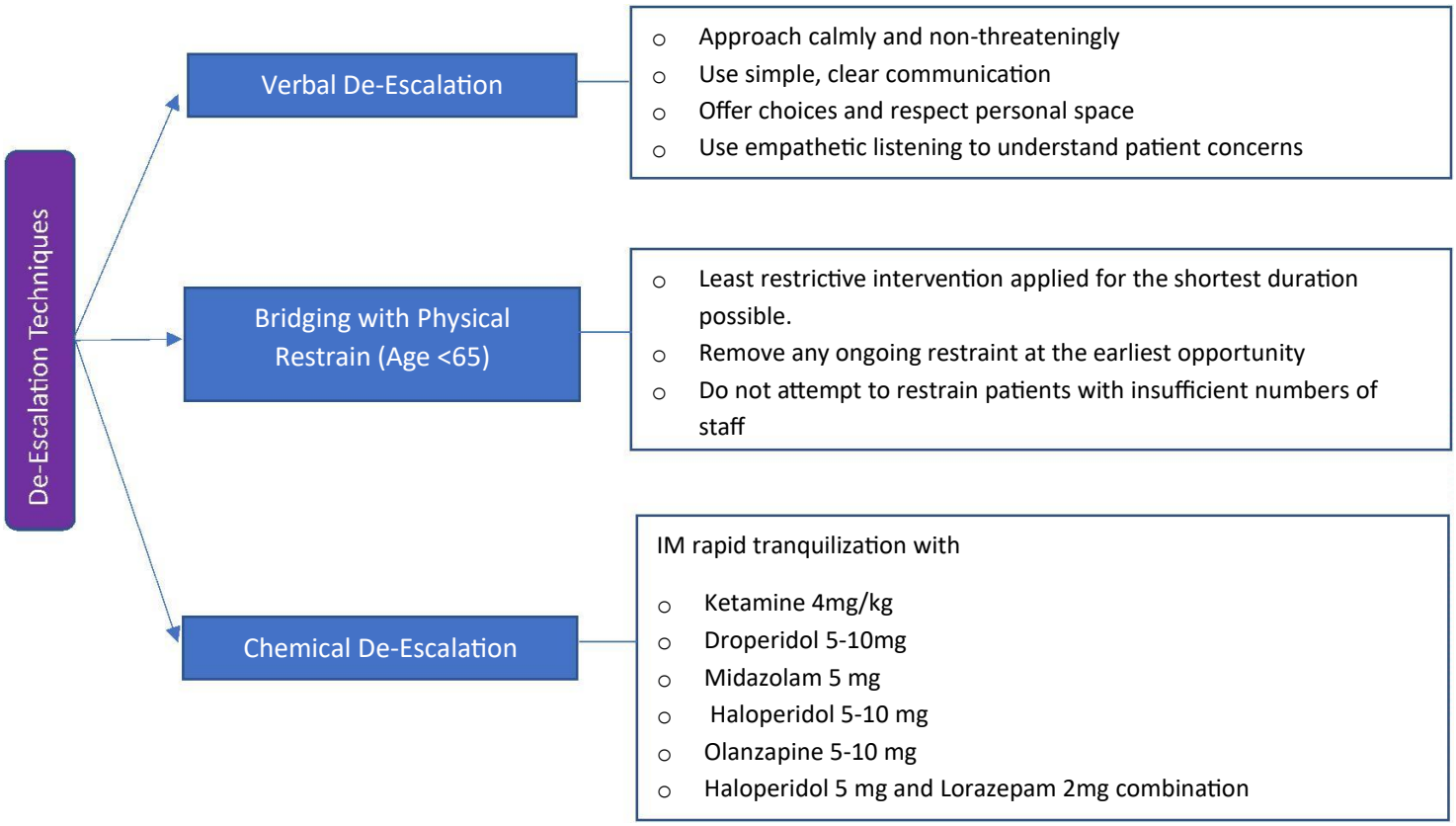
1. -Gabapentin/Pregabalin/Amitriptyline
2. Rescue therapy at home-Tramadol limited prescription to be used PRN.
3. Address fears and patient education.
4. Review in 4 weeks, refer to VPOPD clinic.
5. If no response in 6 weeks, consider pain clinic referral.

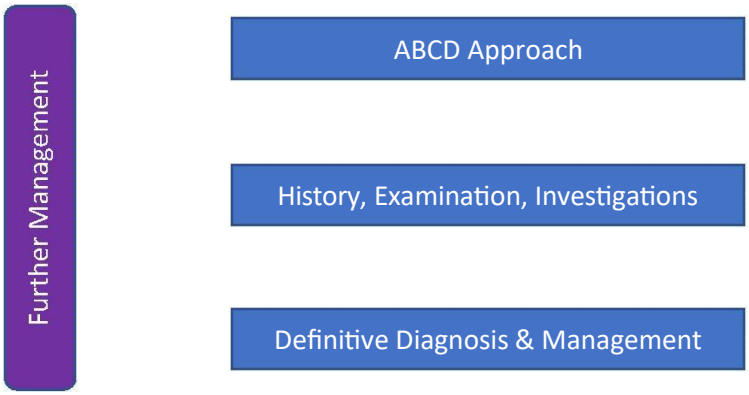
Aggressive/Disturbed Behavior



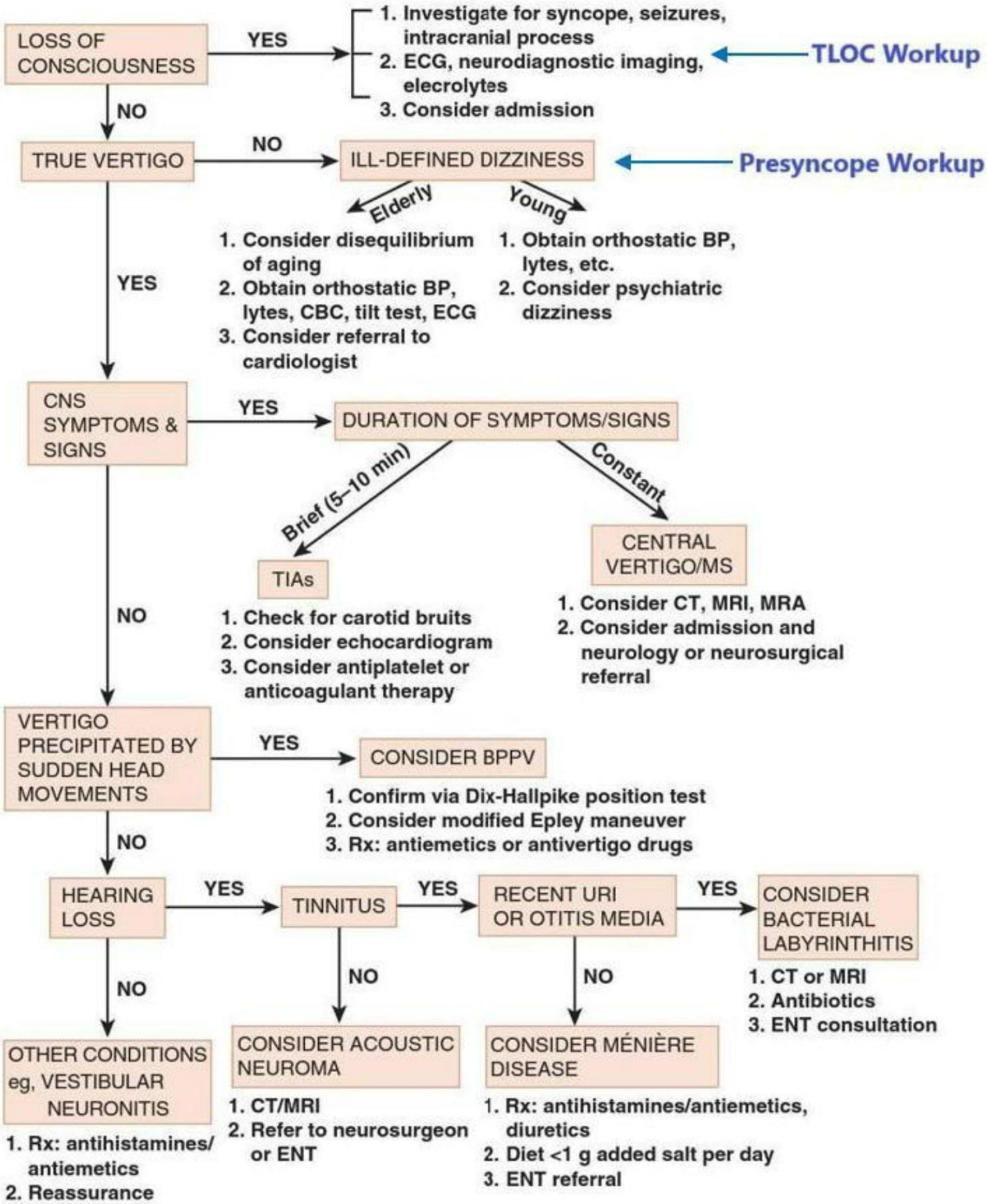
Assess for Immediate Danger

- Risk to Others
  - Assess for threats of violence, aggression toward others
  - Assess for Weapon Possession
  - Ensure safety of healthcare staff, and other patients
- Risk to Self
  - Assess for suicidal ideation, self-harm
- Environmental Adjustments
  - Remove dangerous objects
  - Ensure the room is quiet and free from excessive stimuli
  - Ensure there are enough staff present to maintain safety
  - If necessary, remove other patients or bystanders.





Acute Vertigo - Workup



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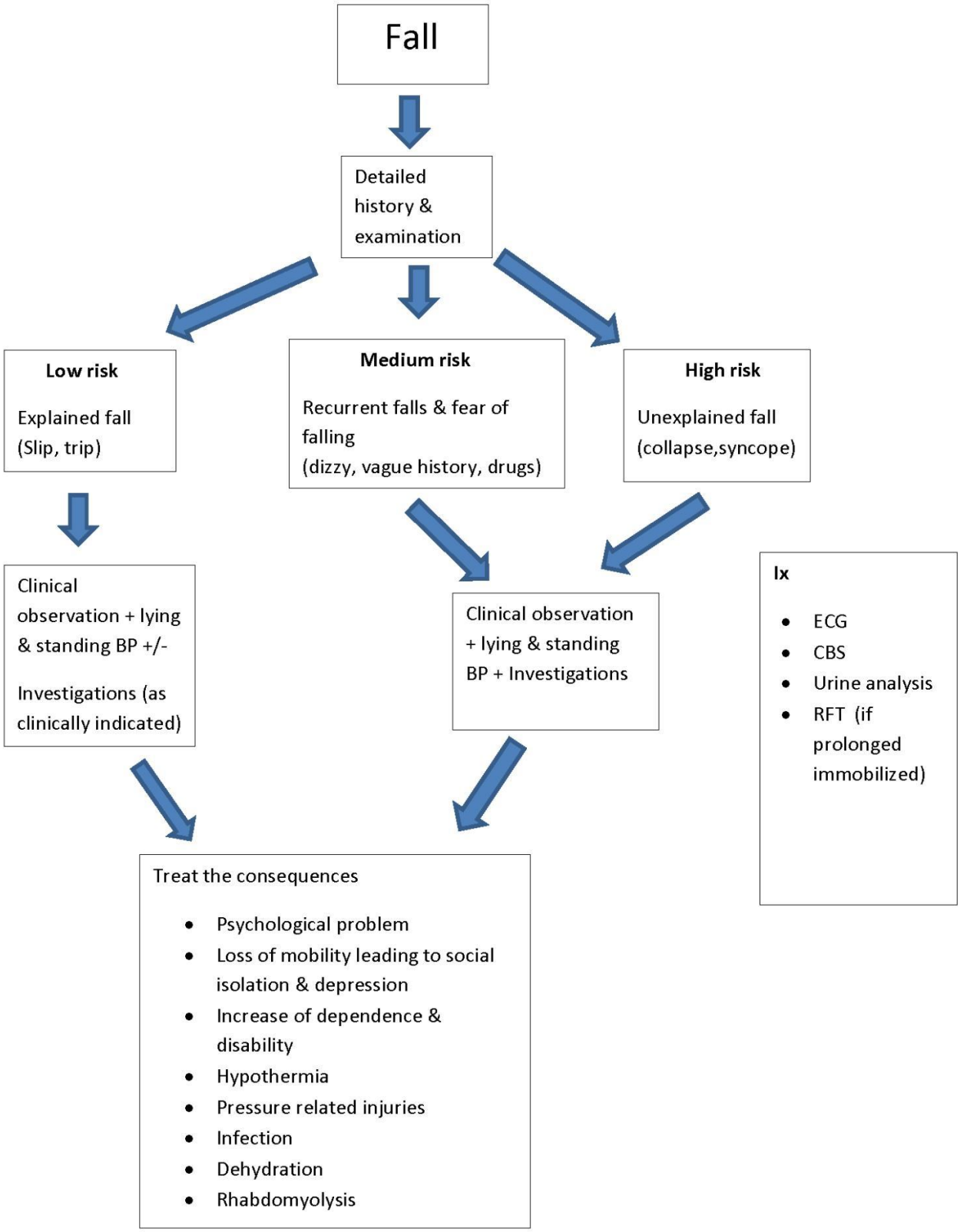
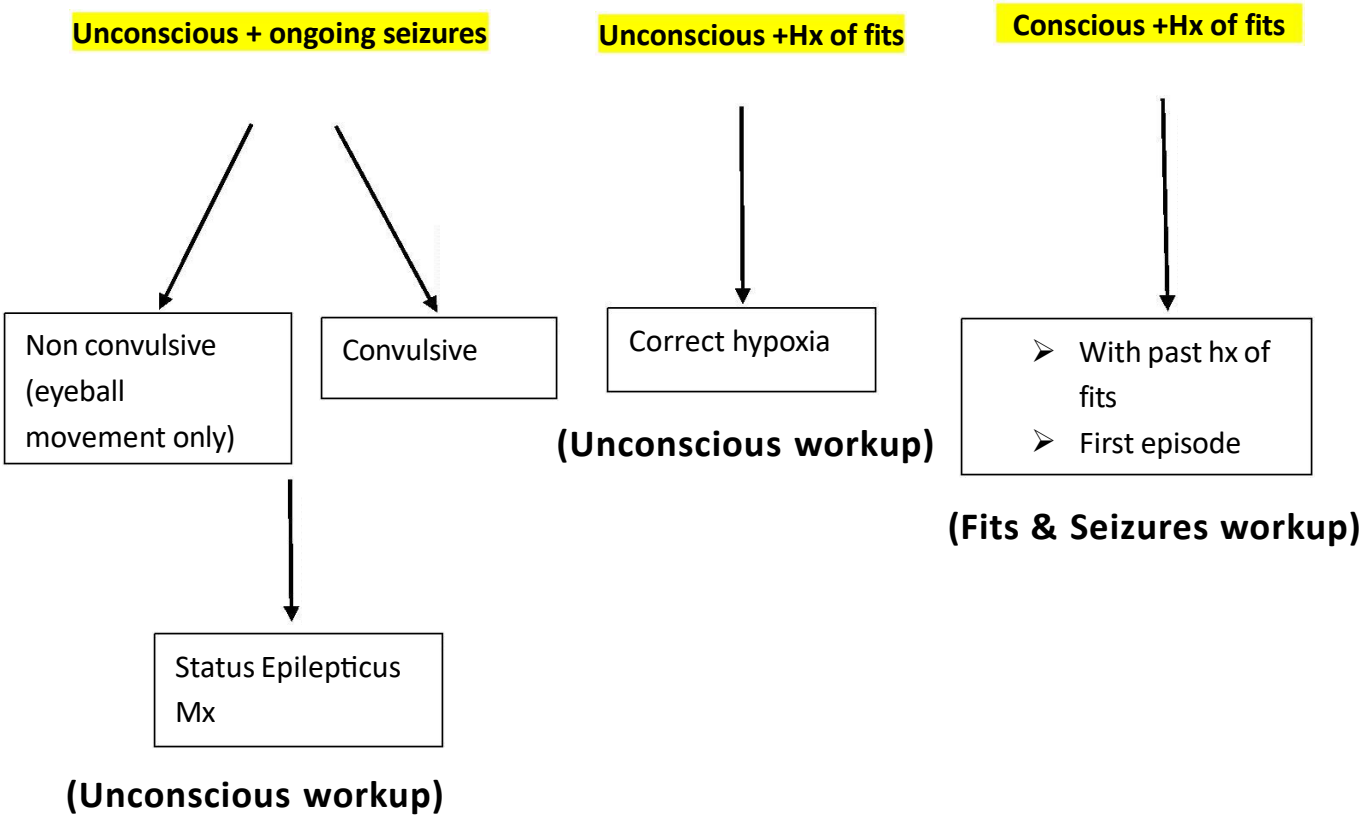
1. Goldman, B. and Johns, P. (2020) 'Vertigo', In *Tintinalli's Emergency Medicine A Comprehensive Study Guide*. 9th edn. McGraw-Hill Education, pp. 1145–1152.


Fall
Detailed history & examination
Low risk
Explained fall (Slip, trip)
Medium risk
Recurrent falls & fear of falling (dizzy, vague history, drugs)
High risk
Unexplained fall (collapse,syncope)
Clinical observation + lying & standing BP +/-
Investigations (as clinically indicated)
Clinical observation + lying & standing BP + Investigations
Ix
ECG
CBS
Urine analysis
RFT (if prolonged immobilized)
Treat the consequences
Psychological problem
Loss of mobility leading to social isolation & depression
Increase of dependence & disability
Hypothermia
Pressure related injuries
Infection
Dehydration
Rhabdomyolysis

Fits and Seizures

Follow the basic acute care workup

1. Triage and Re-traige
2. Initial stabilization
    - A- patent airway
    - B– Look, Listen, Feel- RR, SpO2
    - C- PR, BP, CRFT- IV canula, ECG
    - D- AVPU/GCS, Blood sugars
    - E-Rashes, Temperature
3. Focused History
4. Focused Examination
5. Focused investigations
6. Management and disposition plan



Acute management of ongoing seizures (1)

After >5 minutes seizure activity (adult)

- Treat the cause
- Obtain IV access
- Start benzodiazepine

IV Midazolam 10mg/ IV Diazepam 10mg

↓

Fits settled

- Loading antiepileptics

IV levetiracetam 60 mg/kg up to 4500 mg

Or

IV sodium valproate 40 mg/kg up to 3000 mg

Or

IV phenytoin sodium 20 mg/kg

Fits not settled

↓

Status epilepticus algorithm

Causes

metabolic disorders

- hypoglycaemia
- hyponatraemia
- hypocalcaemia
- kidney failure

intoxication with some drugs or poisons

drug or alcohol withdrawal

stroke (ischaemic or haemorrhagic)

brain trauma (including neurosurgery)

intracranial infection

- meningitis (nonviral)
- encephalitis
- cerebral abscess

autoimmune encephalitis

hypertensive encephalopathy

severe cerebral hypoxia (eg cardiac arrest)

eclampsia

Immediate follow up after seizure (1)

no history of previous seizures	**has a history of previous seizures but is not being treated with an antiepileptic drug**	**has a history of previous seizures and is being treated with an antiepileptic drug**
take a detailed history from the patient and witnesses to classify the seizure and explore causes. If not already done, check the blood glucose concentration and send blood for a full	investigate as above unless the results of previous investigations are known. Antiepileptic drug therapy is usually required	explore common seizure triggers (eg sleep deprivation, febrile illness, non concordance with therapy). Measure the plasma concentration of

biochemical panel and blood count. Consider performing a urine drug screen. Perform computed tomography. Perform a lumbar puncture if intracranial infection is suspected. If an acute treatable cause is suspected, see acute symptomatic seizures. If an acute treatable cause is not found, suspect epilepsy.		antiepileptic drug(s) if this is readily available.

First ever seizure (2)

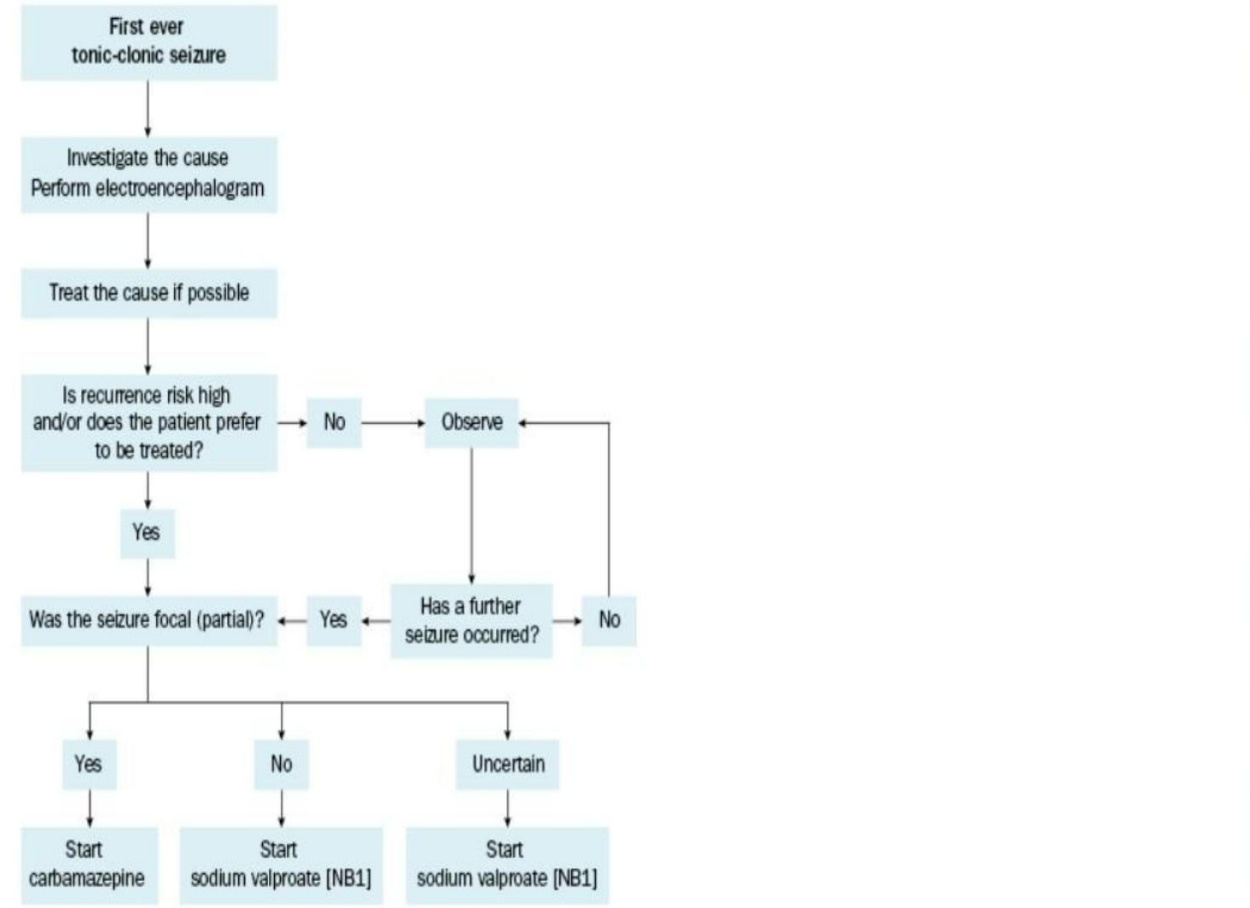
Evaluate the potential cause of the seizure.

- CNS:
  - Infections - meningitis, encephalitis
  - Strokes (bleed, embolism, thrombosis)
  - Traumatic ICH
  - Space occupying lesions
  - Encephalopathies – Uraemic, hepatic, hypertensive
- Metabolic: Disorders of glucose, sodium, calcium, tonicity (hyper/hypo), acid base
- Withdrawal states – alcohol, benzodiazepine, barbiturate
- Toxins – TCA, propanolol, theophylline, anticonvulsants, tramadol, organophosphates
- Illicit drugs – cocaine, MDMA, other stimulants
- Environmental – hyperthermia/heatstroke

Investigations- BSL; CT brain + /- contrast; ECG (note QT interval); FBE; U&E(full electrolyte panel incluging Mg); LFT

Management (3)

Figure 7.4 Initial management of tonic-clonic seizures



NB1: If possible, avoid sodium valproate in females of childbearing potential. If sodium valproate is the drug of choice, ensure reliable contraception (see advice).

Generalized tonic clonic (3)

Adults/ females with contraception- sodium valproate 500 mg orally, once daily for 1 week, then increase to initial target dose of 500 mg twice daily. If needed, increase up to 1500 mg twice daily.

Females without contraception- levetiracetam 250 mg orally, twice daily for 1 week, then increase to initial target dose of 500 mg twice daily. If needed, increase by 500 mg daily up to 1500 mg twice daily.

Children- sodium valproate , child older than 2 years, 5 mg/kg orally, twice daily for 5 days, then increase to 10 mg/kg twice daily; usual maintenance dose 10 to 20 mg/kg twice daily; maximum 2500 mg daily.

Focal seizures (3)

Adult- carbamazepine modified-release 100 mg orally, at night for 1 to 2 weeks, then every week increase the daily dose by 100 to 200 mg to initial target dose of 200 mg twice daily. If needed, increase up to 600 mg twice daily

Children - carbamazepine (preferably modified-release) 2.5 mg/kg orally, twice daily for 5 days, then increase to initial target dose of 5 mg/kg twice daily. If needed, increase up to 10 mg/kg twice daily

Note- loading dose of phenytoin/phenobarbital following initial management is beneficial to prevent further seizure attacks

Febrile fits – last more than 5 minutes (3)

midazolam 0.2 to 0.3 mg/kg (up to 10 mg) buccally or intranasally. Repeat once 10 minutes later if the seizure continues

OR

midazolam 0.15 to 0.2 mg/kg (up to 10 mg) intramuscularly. Repeat once 10 minutes later if the seizure continues

Disposition (2)

Admit if:

- Multiple seizures or status epilepticus
- Prolonged post ictal confusion, or focal neurological deficit
- Investigations reveal underlying condition that requires treatment

Discharge if:

- Patient has normal physical examination and investigation results and is observed for a period of time determined by a senior ED staff determined by circumstances.
  - ❖ Arrange specialist referral/ neurology clinic before discharge

Known patient with seizures with recurrent fits

Evaluate the precipitating factors (3)

- poor concordance with antiepileptic drug therapy or lifestyle advice
- wrong diagnosis of epilepsy (eg psychogenic nonepileptic events, convulsive syncope)
- wrong diagnosis of epilepsy syndrome (focal seizures mistaken for generalised seizures, or vice versa)

- suboptimal choice or use of antiepileptic drug
- drug-resistant epilepsy

Management – as above depending on the epilepsy type

Disposition

Known patient with epilepsy and known precipitating factors – can discharge, increase routine antiepileptic dosage, advice on avoiding triggers

All others- admit for further evaluation

Fits/Seizures

Indications for admission

1. Admit all patients with status epileptcus
2. History of seizure and presenting with unconsciousness observe until fully awake and if the cause of unconsciousness is likely to be post-ictal phase, consider discharge with seizure workup.
3. Patient with history of seizure but now conscious, follow seizure workup.

Patients presenting with first seizure/ new onset seizures

1. Presentation with status epilepticus
2. History/examination or investigations reveal underlying condition that requires treatment (eg. CNS infection, intracranial lesions, electrolyte imbalances)
3. Pregnant patients
4. New focal neurological abnormality
5. Prolonged post ictal confusion, or focal neurological deficit
6. Social circumstances preventing reliable observation at home/ difficult access to hospital/ living alone.

Known patient with epilepsy presenting with breakthrough fits

1. Presentation with status epilepticus
2. Wrong diagnosis of epilepsy syndrome (focal seizures mistaken for generalised seizures, or vice versa)
3. Seizure precipitant requiring treatment (eg: CNS infection, intracranial lesions, electrolyte imbalances) or unidentified cause
4. Different semiology to previous seizures.
5. Social circumstances preventing reliable observation at home/ difficult access to hospital/ living alone.

Discharge from ED

Note- arrange neurology followup prior to discharge

Patients presenting with first seizure/ new onset seizures

Note-Usually will require admission as complete initial workup difficult in the ED setting

1. Patient with normal basic investigations including electrolytes, basic imaging and normal neurology
2. Seizure secondary to a reversible cause(ex: Hypoglycemia if blood sugar has stabilized)

Known patient with epilepsy presenting with breakthrough fits

1. Clear precipitant; eg: missed drug dose/ sleep deprivation
2. Wrong diagnosis of epilepsy ; eg: Psychogenic non epileptic attack disorder/convulsive syncope

Headache Workup

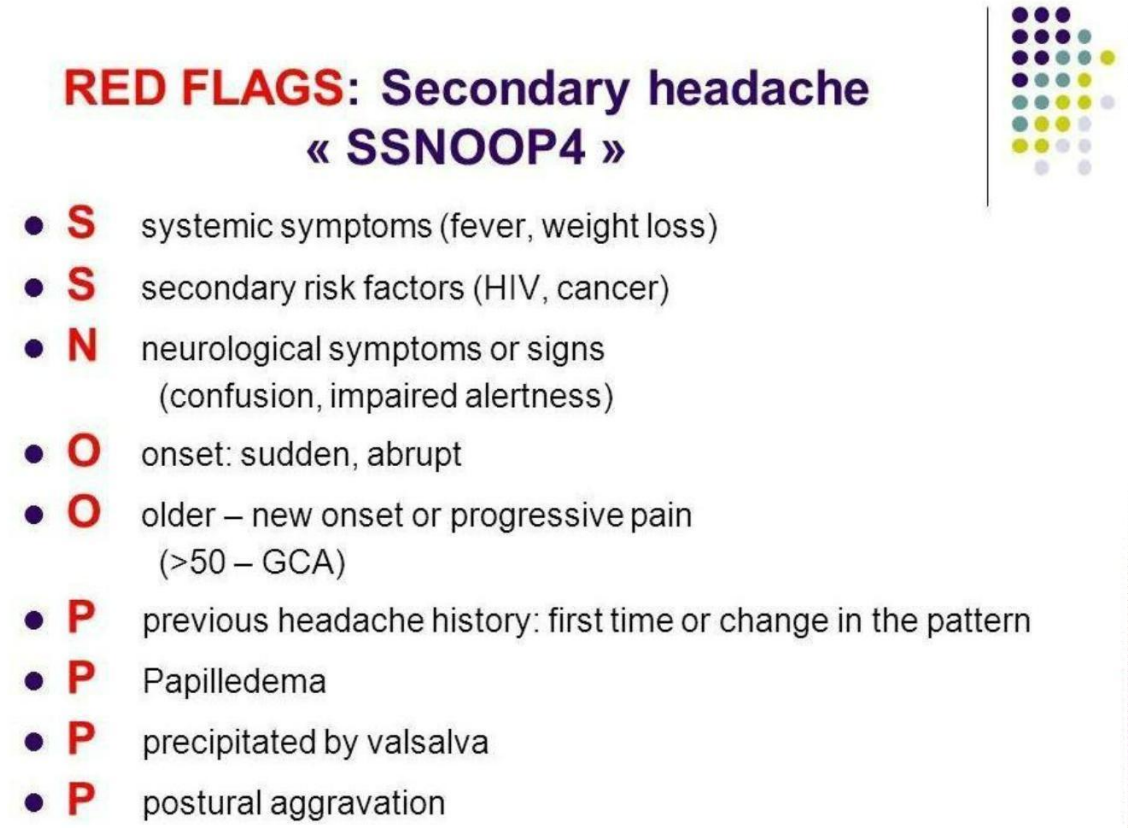
Follow the basic acute care workup

1. Triage and Retraige
2. Initial stabilization
    - A- patent airway
    - B– Look, Listen, Feel- RR, SpO2
    - C- PR, BP, CRFT- IV canula, ECG
    - D- AVPU/GCS, Blood sugars
    - E-Rashes, Temperature
3. Focused History
4. Focused Examination
5. Focused investigations
6. Management and disposition plan

1)History

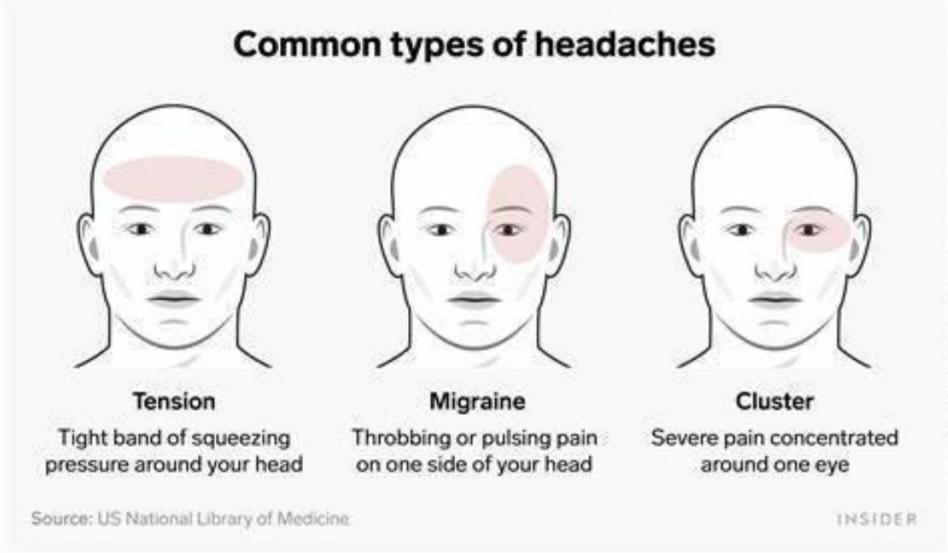
Exclude Red Flags in the history

Mnemonic- SSNOOP4



Classification of headache (According to Therapeutic Guidelines, Australia) (Therapeutic Guidelines, 2021)

1. Primary headache - (migraine, tension-type headache, trigeminal autonomic cephalgia, other primary headache disorders)
2. Secondary headache - due to structural causes (occupying lesion, subarachnoid haemorrhage, venous sinus thrombosis) or disease (giant cell arteritis, meningitis, systemic infection)
3. Painful cranial neuropathies (trigeminal neuralgia) and other facial pains and headaches.



Primary Headaches

Type of headache	Features in the history	Examination findings
Migraine without or with aura	Typically one-sided, can be bilateral) Pulsating moderate to severe intensity aggravated by routine physical activity associated with nausea and/or photophobia, phonophobia Aura symptoms can affect vision, senses, speech and/or language, motor function, brainstem and retina.	
Tension-type headache	Lasts from 30 minutes to 7 days.	

	Usually bilateral feels like pressure or tightness in head- band like Mild to moderate intensity Not associated with nausea	
Cluster headache	Severe unilateral pain around trigeminal distribution (around the eye) conjunctival irritation, lacrimation, nasal congestion, Episodes may last 1−3 hours and occur in clusters with periods of remission in between	eyelid swelling or drooping facial sweating and miosis
Trigeminal autonomic cephalgia	Unilateral usually follow the distribution of first division of trigeminal nerve) with, fullness of the ear, tinnitus, facial flushing or sweating The patient is often agitated and restless.	unilateral autonomic features- tearing, conjunctival injection/irritation, ptosis, nasal stuffiness/rhinorrhoea
Miscellaneous (cough headache, exertional headache, headache associated with sexual activity)	Associated with specific triggers- cough, exercise, sexual activity	

Source (Therapeutic Guidelines, 2021) and (Somani, 2016)

Secondary headaches

Type of headache	Features in the history	Examination findings
Subarachnoid haemorrhage (SAH)	Sudden onset Worst ever headache Occipital May be associated with vomiting, neck pain, photophobia May have a loss of consciousness or fits	Fundoscopy- sub hyaloid retinal haemorrhage Focal neurological signs- 3rd nerve palsy
Meningitis	Generalized headache Photophobia +/- Fever +/-	Drowsy patient Neck stiffness+ Meningococcal rash +/-
Temporal arteritis	Diffuse, throbbing headache Age > 50yrs	Scalp tenderness

	Jaw claudication Visual disturbance	Tender temporal artery with reduced pulsation
Space occupying lesion (raised ICP)	Headache exacerbated by lying down/ Valsalva manoeuvre Transient change in vision Headache may wake up the patient from sleep, and improve upright Worse in morning	Papilledema Focal neurological sings
Acute angle closure glaucoma	Unilateral Eye pain+ Red eye+, mildly dilated Halos around light	Red eye Reduced visual acuity

Source (Banerjee, 2017) and (Somani, 2016)

Facial pains (Therapeutic Guidelines, 2021)

Type of headache	Features in the history	Examination findings
Trigeminal neuralgia	Mainly women 40-70 yrs Unilateral Recurrent Shock-like pain in trigeminal nerve distribution Triggered by touch or cold winds	

Past medical history- alcohol, illicit drugs, cyclosporin, exogenous hormones (to exclude drug-induced headache)

2)Examination (Banerjee, 2017)

- Check blood pressure, Pulse rate, blood sugars
- Fundoscopy
- GCS/ AVPU
- Pupillary size and movements
- Cranial nerve examination
- Assess tone, power, reflexes and coordination of all four limbs
- Plantar response
- Assess gait including heel-toe walking

3) Investigations (Banerjee, 2017)

Neuroimaging

Not indicated- patients with a clear history of migraine, no red flags, normal neurological examination

Indications for CT Brain-

1. Suspected SAH
2. Suspected stroke
3. Unexplained abnormal neurological signs
4. Reduced level of consciousness
5. Signs and symptoms suggestive of increased ICP

MRI- more sensitive than CT to identify secondary causes, needs neurology opinion

Lumbar puncture with CSF analysis

use for patients with thunderclap headaches with normal neuroimaging to exclude SAH

perform after 12 hours

Features of LP suggesting SAH- Xanthochromia, RBC> 50, elevated protein, normal glucose and gram stain

ESR, CRP- increased in temporal arteritis

4) Management- depends on the possible diagnosis

Migraine

Pharmacological management

Step 1- oral nonopioid analgesic- 1st line- Aspirin 900-1000mg or Ibuprofen 400-600mg, 2nd line diclofenac 50mg/ paracetamol 1g (wait for 4-6 hours before the second dose)

If nausea/vomiting- oral antiemetics- metoclopramide 10 mg (max30mg) /domperidone 10-20mg/ ondansetron 4-8mg

Step 2- triptans- eletriptan 40-80mg orally, sumatriptan 50-100mg orally

Step 3- Intractable migraine- sumatriptan 6 mg subcutaneously

Acute migraine in pregnancy- oral paracetamol 1g, avoid aspirin and NSAID

If acute migraine episodes 2-4 times a month- migraine prophylaxis

Migraine prophylaxis - amitriptyline 10 mg orally once daily at night /candesartan 4 mg orally, once daily/pizotifen 0.5 mg orally, once daily at night for 8-12 weeks

Non-pharmacological management of migraine-

- cold packs over the forehead or back of the skull (targeting the supraorbital and greater occipital nerves)
- hot packs over the neck and shoulders (targeting the innervation of the scalp)
- neck stretches and self-mobilisation
- rest in a quiet dark room

Source- (Therapeutic Guidelines, 2019)

Subarachnoid Haemorrhage

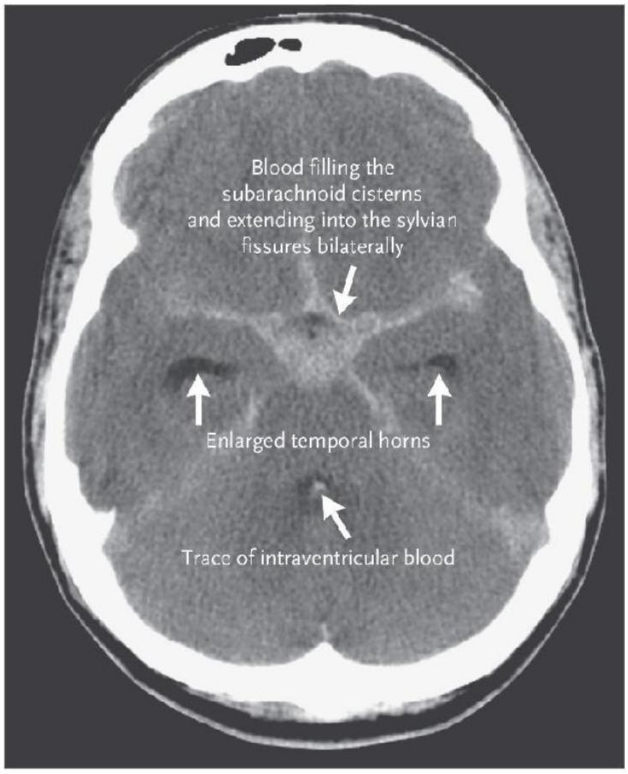


Image source (Lawton & Vates, 2017)

Supportive management at ED

Table 11.4 Supportive management of a patient with a SAH

A and B	Ensure adequate oxygenation (aim for oxygen saturations >94%) Aim for $PaCO_2$ in normal range Intubate and ventilate as required to achieve these aims and protect the airway Tape the endotracheal tube in place rather than tie it to avoid increases in ICP Avoid excessive intrathoracic pressures to prevent rises in ICP
C	Maintain end organ perfusion (aim for MAP≥80 mmHg) Use urine output as indicator of adequate renal perfusion
D	Maintain normoglycaemia Treat seizures (benzodiazepines, prophylactic phenytoin) Position—30° head-up tilt to help reduce ICP Avoid cervical collars/compression if possible to avoid increased ICP Monitor for signs of neurological deterioration
E	Pain management to avoid increases in ICP (if the patient has severe pain titrate morphine IV in 1-mg increments) Temperature control (aim for normothermia)

Source (Banerjee, 2017)

Specific management- manage on the advice of the neurology team and interventional neuroradiology team (Nimodipine and IV Mannitol)

Tension headache- non-opioid analgesics (similar to migraine management)

E.g. Aspirin/Diclofenac/paracetamol (Therapeutic Guidelines, 2021)

Cluster headache- Subcutaneous triptans (Sumatriptan 6mg s/c) (Therapeutic Guidelines, 2021)

Headache/ facial pain

Indications for admission

Primary headaches (Migraine/ Tension/Cluster/ Trigeminal autonomic cephalalgias)

Severe symptoms despite initial treatment; eg uncontrolled vomiting/ nausea/ inability to maintain oral intake.
New onset cluster headache in a patient> 40y.

Discharge plan

1.Avoid precipitants/ triggers
2.Migraine:
Pain relief- Paracetamol, NSAIDS, Triptans (oral/subcut/nasal)
Antiemetics
Prophylaxis-
Normal weight: Amitriptyline 12.5mg nocte/ Propanolol 20mg bd/Flunarizine 10mg nocte/Pizotifen
Obese: Amitriptyline still first line. Consider Topiramate 25mg nocte If concerns for weight gain. Gradual escalation.

	Cluster headache	Paroxysmal hemicrania	SUNCT
Prevalence	0.06–0.3%	0.02%	Very rare
Sex ratio F/M	1:3	2.4:1	1:1.3–2
Mean age at onset	29	37	48
Attack duration (mean)	15–180 min (70–160 min)	2–30 min (17 min)	5 s to 4 min (58 s)
Attack frequency (mean)	1–8 day (5)	5–40 day (11)	3–200 day (59)
Chronic/episodic	Episodic (85%)	Chronic (80%)	Chronic (70%)
Pain quality	Boring, pressing, burning	Sharp, stabbing, throbbing	Stabbing, electric shock, sharp
Pain location	Retro-orbital, temporal	Temporal, orbital	Eye, retro-orbital
Triggers	Alcohol, nitroglycerin	Usually not triggered	Cutaneous stimuli
Autonomic features	Yes	Yes	Yes (Cl & T)
Migrainers features	Yes	Yes	No
Indomethacin effects	–	++	–
Abortive treatment	Oxygen Sumatriptan s.c.	Indomethacin	Lidocain i.v.
Prophylactic treatment	Verapamil lithium	–	Lidocain i.v. Lamotrigine

Secondary headaches/presence of red flag symptoms

Indications for admission

All need admission for evaluation

Head Injury Workup Children (< 16 years)

CT head scan within 1 hour

Any of these risk factors identified

- Suspicion of non-accidental injury
- Post-traumatic seizure
- On initial emergency department assessment, GCS less than 14, or for children under 1 year GCS (paediatric) less than 15
- At 2 hours after the injury, GCS less than 15
- Suspected open or depressed skull fracture or tense fontanelle
- Any sign of basal skull fracture (haemotympanum, 'panda' eyes, cerebrospinal fluid leakage from the ear or nose, Battle's sign)
- Focal neurological deficit
- For children under 1 year, presence of bruise, swelling or laceration of more than 5 cm on the head

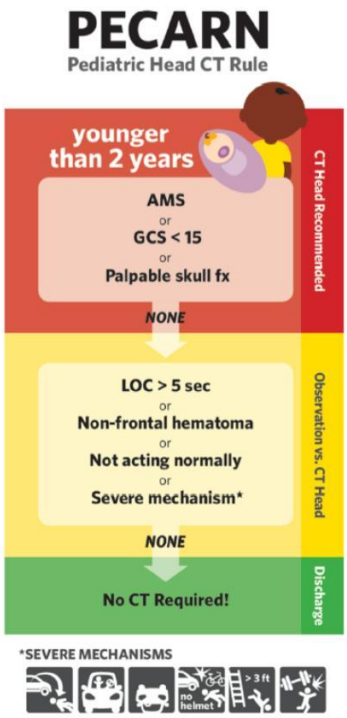
More than one of these risk factors identified

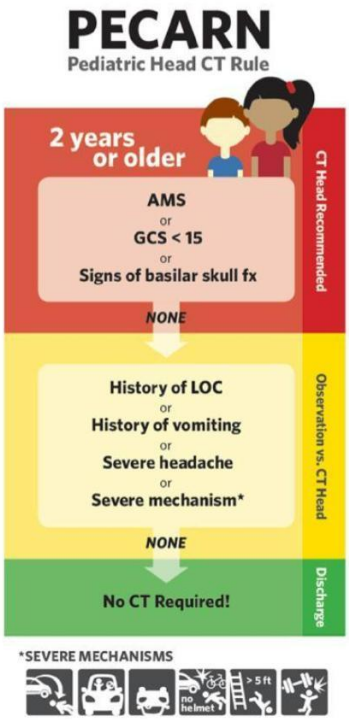
- Loss of consciousness lasting more than 5 minutes (witnessed)
- Abnormal drowsiness
- Three or more discrete episodes of vomiting
- Dangerous mechanism of injury (high-speed road traffic accident either as pedestrian, cyclist or vehicle occupant, fall from a height of greater than 3m, high-speed injury from a projectile or other object)
- Amnesia (antegrade or retrograde) lasting more than 5 minutes
- Any current bleeding or clotting disorder

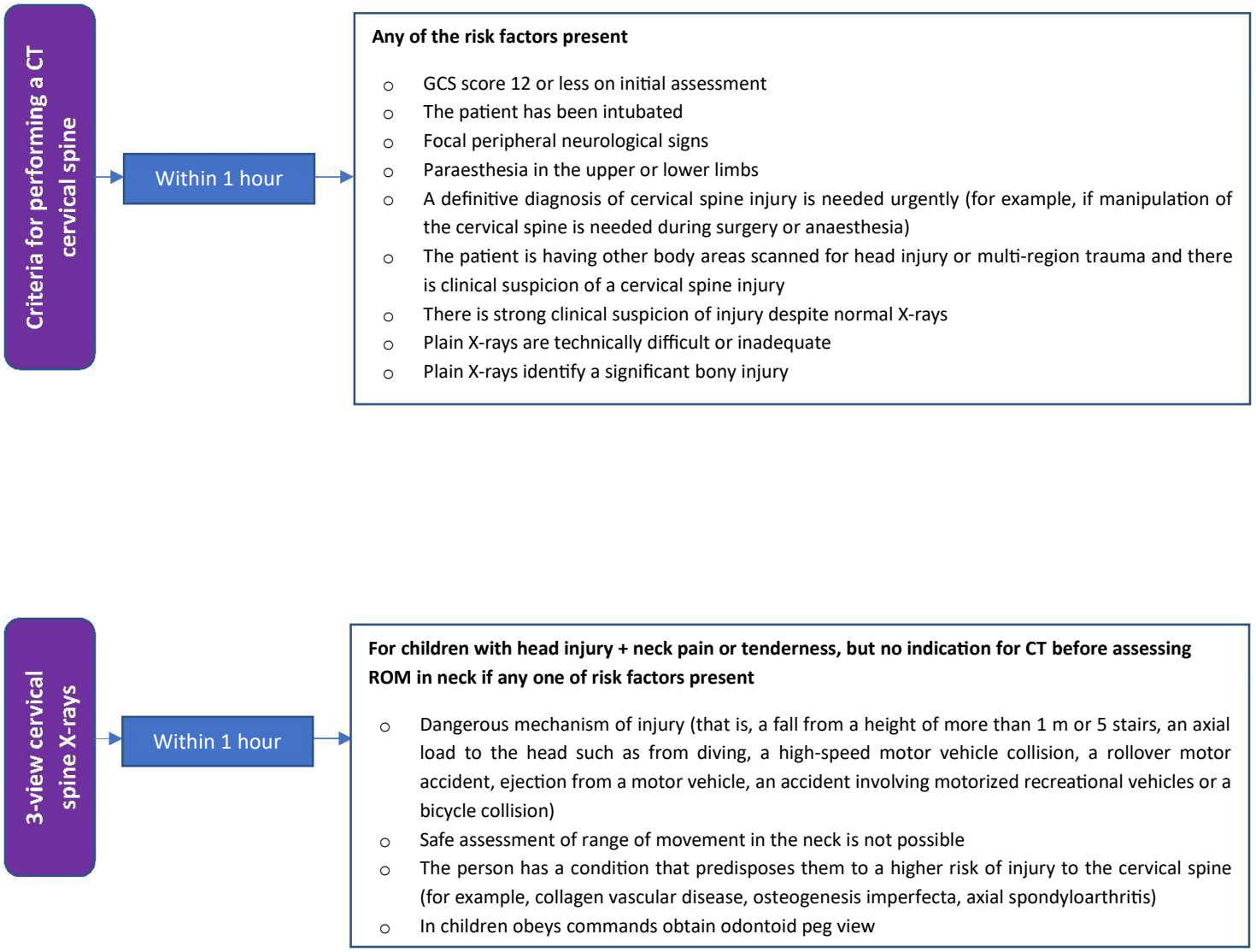
One risk factor observe for minimum of 4 hours
During observation if any of the following risk factors identified do CT

- A GCS score less than 15
- Further vomiting
- A further episode of abnormal drowsiness

If there are no identifiable risk factors, apply PECARN

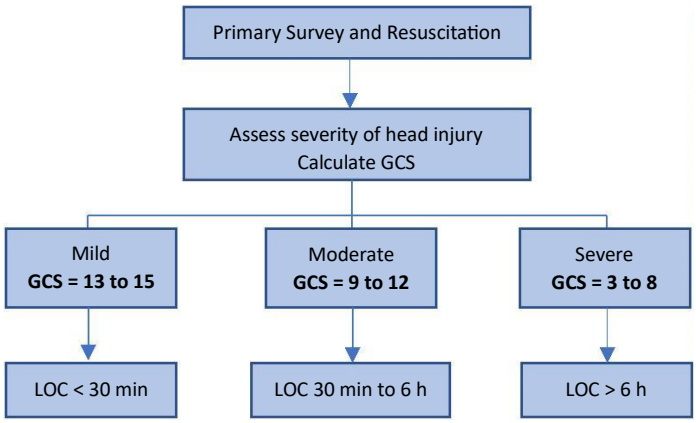





Criteria for performing a CT cervical spine
Within 1 hour
Any of the risk factors present
GCS score 12 or less on initial assessment
The patient has been intubated
Focal peripheral neurological signs
Paraesthesia in the upper or lower limbs
A definitive diagnosis of cervical spine injury is needed urgently (for example, if manipulation of the cervical spine is needed during surgery or anaesthesia)
The patient is having other body areas scanned for head injury or multi-region trauma and there is clinical suspicion of a cervical spine injury
There is strong clinical suspicion of injury despite normal X-rays
Plain X-rays are technically difficult or inadequate
Plain X-rays identify a significant bony injury
3-view cervical spine X-rays
Within 1 hour
For children with head injury + neck pain or tenderness, but no indication for CT before assessing ROM in neck if any one of risk factors present
Dangerous mechanism of injury (that is, a fall from a height of more than 1 m or 5 stairs, an axial load to the head such as from diving, a high-speed motor vehicle collision, a rollover motor accident, ejection from a motor vehicle, an accident involving motorized recreational vehicles or a bicycle collision)
Safe assessment of range of movement in the neck is not possible
The person has a condition that predisposes them to a higher risk of injury to the cervical spine (for example, collagen vascular disease, osteogenesis imperfecta, axial spondyloarthritis)
In children obeys commands obtain odontoid peg view

Head Injury Workup Adults

Initial Assessment of Severity



Glasgow Coma Scale		
Response	**Scale**	**Score**
Eye Opening Response	Eyes open spontaneously	4 Points
	Eyes open to verbal command, speech, or shout	3 Points
	Eyes open to pain (not applied to face)	2 Points
	No eye opening	1 Point
Verbal Response	Oriented	5 Points
	Confused conversation, but able to answer questions	4 Points
	Inappropriate responses, words discernible	3 Points
	Incomprehensible sounds or speech	2 Points
	No verbal response	1 Point
Motor Response	Obeys commands for movement	6 Points
	Purposeful movement to painful stimulus	5 Points
	Withdraws from pain	4 Points
	Abnormal (spastic) flexion, decorticate posture	3 Points
	Extensor (rigid) response, decerebrate posture	2 Points
	No motor response	1 Point
Minor Brain Injury = 13-15 points; **Moderate Brain Injury** = 9-12 points; **Severe Brain Injury** = 3-8 points		

CT head scan

Within 1 hour any of the risk factors

- GCS of 12 or less on initial assessment in the emergency department.
- GCS less than 15 at 2 hours after the injury on assessment in the emergency department.
- Suspected open or depressed skull fracture.
- Any sign of basal skull fracture (hemotympanum, 'panda' eyes, cerebrospinal fluid leakage from the ear or nose, Battle's sign).
- Post-traumatic seizure.
- Focal neurological deficit.
- More than 1 episode of vomiting.

Within 8 hours

For who had some LOC or amnesia since the injury if they have any one of these risk factors

- Age 65 years or older.
- Any current bleeding or clotting disorders.
- Dangerous mechanism of injury (a pedestrian or cyclist struck by a motor vehicle; an occupant ejected from a motor vehicle or a fall from a height of greater than 1m or 5 stairs).

People taking anticoagulant or antiplatelet excluding aspirin monotherapy

- Within 8 hours of the injury (for example, if it is difficult to do a risk assessment or if the person might not return to the emergency department if they have signs of deterioration) or
- Within the hour if they present more than 8 hours after the injury

Involving the neurosurgical department

- New surgically significant abnormalities on imaging
- Persisting coma (GCS 8 or less) after initial resuscitation.
- Unexplained confusion which persists for more than 4 hours.
- Deterioration in GCS score after admission (greater attention should be paid to motor response deterioration).
- Progressive focal neurological signs.
- A seizure without full recovery.
- Definite or suspected penetrating injury.
- A cerebrospinal fluid leak.

Indications for intubation and ventilation

- Coma - not obeying commands, not speaking, not eye opening (that is, GCS 8 or less).
- Loss of protective laryngeal reflexes.
- Ventilatory insufficiency as judged by blood gases: hypoxaemia (Pa02 < 13 kpa on oxygen) or hypercarbia (PaCO2 > 6 kpa).
- Irregular respirations.

Use intubation and ventilation before transfer in the following circumstances:

- Significantly deteriorating conscious level (1 or more points on the motor score), even if not coma.
- Unstable fractures of the facial skeleton.
- Copious bleeding into mouth (for example, from skull base fracture).
- Seizures.

Neck Pain workup

Exclude Red Flags – **TUNA FISH**

T = Trauma
U = Unexplained Weight Loss
N = Neurologic Symptoms
A = Age > 50
F = Fever
I = IVDU
S = Steroid Use
H = History of Cancer (Prostate, Renal, Breast, Lung)

If red flags +

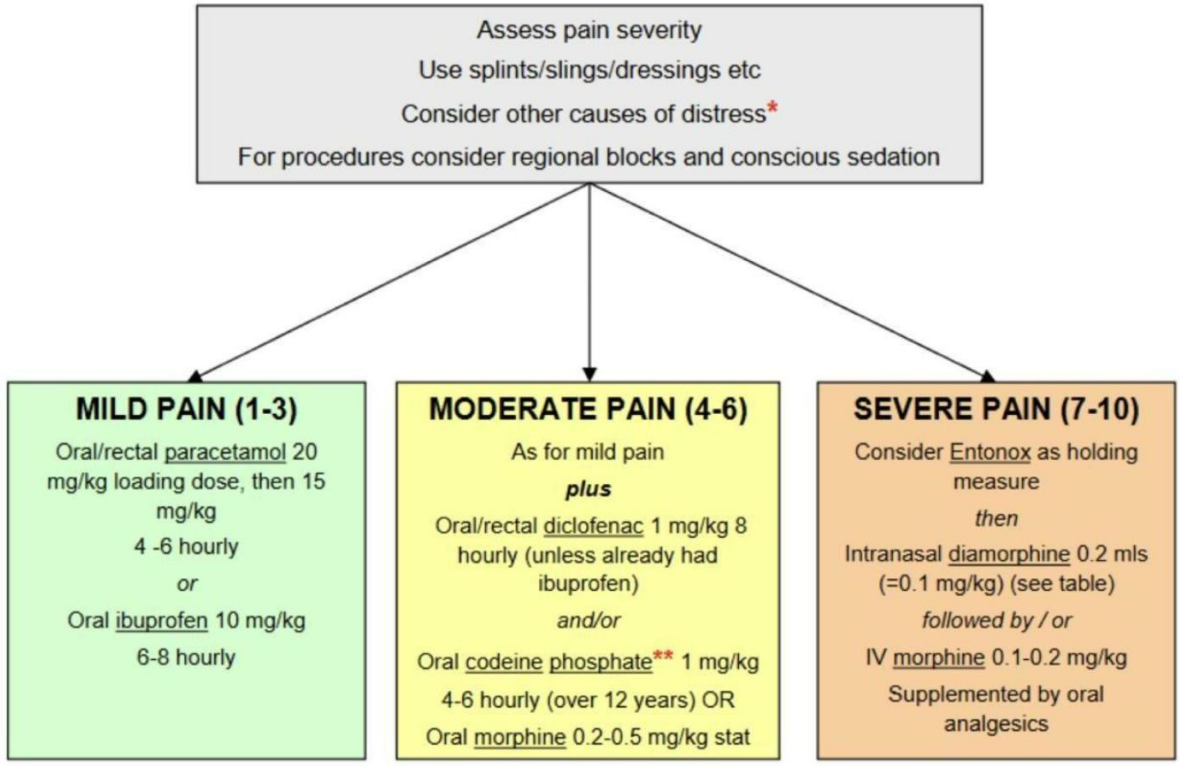
Need further Evaluation.

No red flags

Pain Management- Pharmacotherapy and Adjuvant therapy

Pain Management

	No Pain Pain score: 0	Mild Pain 1 - 3	Moderate Pain 4 - 6	Severe Pain 7 - 10
Suggested route & type of analgesia	No action	Oral analgesia	Oral analgesia	IV Opiates or PR NSAID
Initial Assessment	Within 20 mins of arrival	Within 20 mins of arrival	Within 20 mins of arrival	Within 20 mins of arrival
Re-evaluation	Within 60mins of initial assessment	Within 60mins of analgesia	Within 60mins of analgesia	Within **30 mins** of analgesia



Weakness and Paralysis workup

(Stroke workup)

Approach

↓

Triage

↓

Category 2

↓

Unilateral weakness

↓

FAST scale - Face/Arm/Leg weakness and Time

Component	Description
Face	Face numbness or weakness, especially on one side
Arm	Arm numbness or weakness, especially on one side of body
Speech	Slurred speech or difficulty speaking or understanding
Time	Time to call 9-1-1 if these signs occur suddenly or are accompanied by the loss of vision, the loss of balance with dizziness, or the worst headache of your life, with no known cause, both sudden and severe

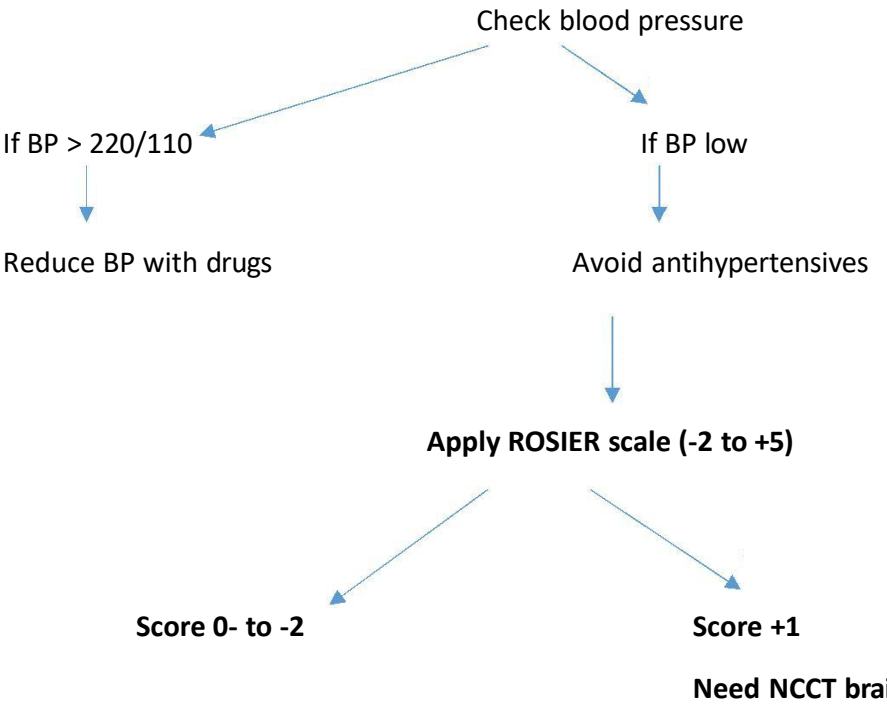
↓

ABC assessment

↓

Check CBS

↓



Has there been loss of consciousness or syncope?

Y (-1) ☐ N (0) ☐

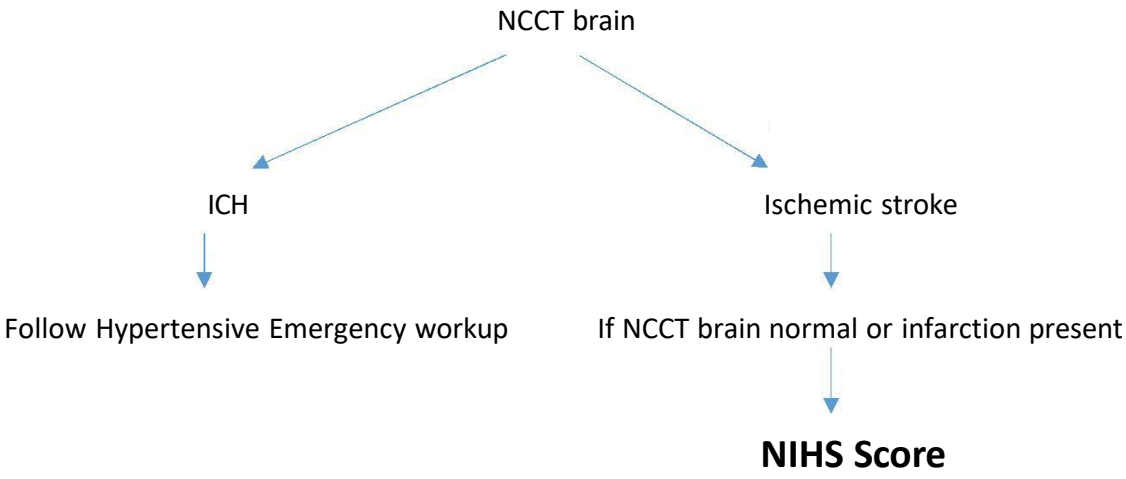
Has there been seizure activity?

Y (-1) ☐ N (0) ☐

Is there a NEW ACUTE onset (or on awakening from sleep)?

I.	Asymmetric facial weakness	Y (+1) ☐	N (0) ☐
II.	Asymmetric arm weakness	Y (+1) ☐	N (0) ☐
III.	Asymmetric leg weakness	Y (+1) ☐	N (0) ☐
IV.	Speech disturbance	Y (+1) ☐	N (0) ☐
V.	Visual field defect	Y (+1) ☐	N (0) ☐

*Total Score _____ (-2 to +5)



NIH Stroke Scale Score	Stroke Severity
0	No stroke symptoms
1-4	Minor stroke
5-15	Moderate stroke
16-20	Moderate to severe stroke
21-42	Severe stroke

Category	Score/Description		Date/Time Initials	Date/Time Initials	Date/Time Initials	Date/Time Initials	Date/Time Initials
1a. Level of Consciousness (Alert, drowsy, etc.)	0 = Alert 1 = Drowsy 2 = Stuporous 3 = Coma						
1b. LOC Questions (Month, age)	0 = Answers both correctly 1 = Answers one correctly 2 = Incorrect						
1c. LOC Commands (Open/close eyes, make fist/let go)	0 = Obeys both correctly 1 = Obeys one correctly 2 = Incorrect						
2. Best Gaze (Eyes open - patient follows examiner's finger or face)	0 = Normal 1 = Partial gaze palsy 2 = Forced deviation						
3. Visual Fields (Introduce visual stimulus/threat to pt's visual field quadrants)	0 = No visual loss 1 = Partial Hemianopia 2 = Complete Hemianopia 3 = Bilateral Hemianopia (Blind)						
4. Facial Paresis (Show teeth, raise eyebrows and squeeze eyes shut)	0 = Normal 1 = Minor 2 = Partial 3 = Complete						
5a. Motor Arm - Left **5b. Motor Arm - Right** (Elevate arm to 90° if patient is sitting, 45° if supine)	0 = No drift 1 = Drift 2 = Can't resist gravity 3 = No effort against gravity 4 = No movement X = Untestable (Joint fusion or limb amp)	Left					
		Right					
6a. Motor Leg - Left **6b. Motor Leg - Right** (Elevate leg 30° with patient supine)	0 = No drift 1 = Drift 2 = Can't resist gravity 3 = No effort against gravity 4 = No movement X = Untestable (Joint fusion or limb amp)	Left					
		Right					
7. Limb Ataxia (Finger-nose, heel down shin)	0 = No ataxia 1 = Present in one limb 2 = Present in two limbs						
8. Sensory (Pin prick to face, arm, trunk, and leg - compare side to side)	0 = Normal 1 = Partial loss 2 = Severe loss						
9. Best Language (Name item, describe a picture and read sentences)	0 = No aphasia 1 = Mild to moderate aphasia 2 = Severe aphasia 3 = Mute						
10. Dysarthria (Evaluate speech clarity by patient repeating listed words)	0 = Normal articulation 1 = Mild to moderate slurring of words 2 = Near to unintelligable or worse X = Intubated or other physical barrier						
11. Extinction and Inattention (Use information from prior testing to identify neglect or double simultaneous stimuli testing)	0 = No neglect 1 = Partial neglect 2 = Complete neglect						
	TOTAL SCORE						

INITIAL	SIGNATURE	INITIAL	SIGNATURE	INITIAL	SIGNATURE

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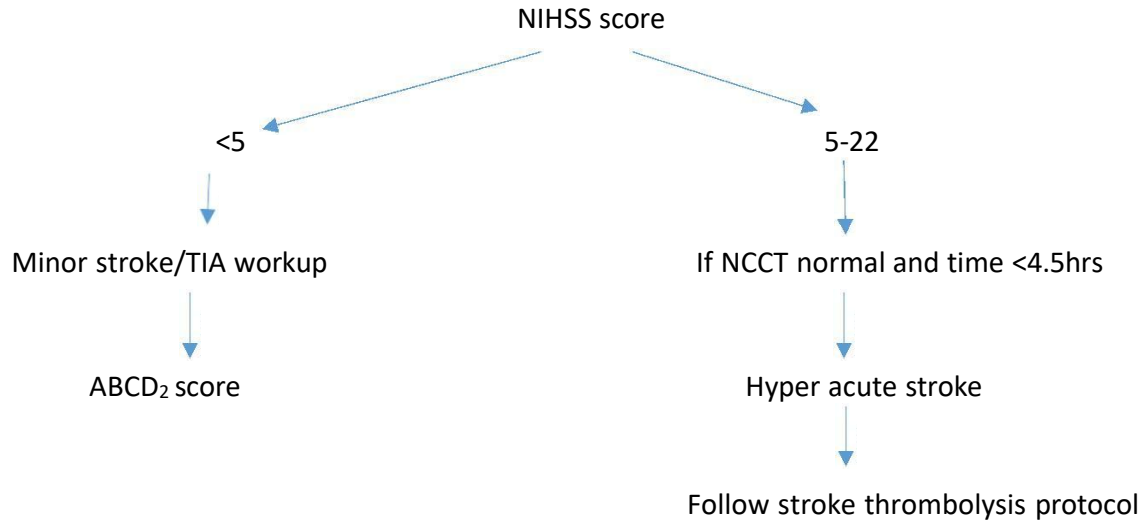
Source: J Neurosci Nurs © 2006 American Association of Neuroscience Nurses



		Parameter	Score	Maximum score
A	Age	≥60 years	1	1
B	Blood pressure	Systolic ≥140 mm Hg or diastolic ≥90 mm Hg	1	1
C	Clinical	Unilateral weakness	2	2
		Speech problem, no weakness	1	
		Any other	0	
D	Duration	≥60 min	2	2
		10–59 min	1	
		<10 min	0	
D	Diabetes	Yes	1	1

*Data derived from Johnston *et al.*[13]
TIA, transient ischaemic attack.

Weakness and paralysis (Stroke workup)

Indications for admission

1. All TIAs (regardless of ABCD2 score) need admission for urgent evaluation.
2. All haemorrhagic strokes.
3. All ischaemic strokes with residual deficit impairing function; eg: residual hemiparesis/swallowing difficulty.
4. All ischaemic strokes needing initiation of anticoagulation/ urgent treatment; eg:detection of new AF, polycythaemia.

Discharge criteria

1. Subacute presentation of ischaemic stroke (>24h) with no disabling neurological deficit and no uncontrolled hypertension, diabetes, new/untreated AF and normal FBC and haematocrit.

May discharge with urgent referral to VPOPD clinic if patient is reliable. (within 48h)

PSYCHIATRIC EMERGENCIES

Psychiatric emergencies require immediate and skilled intervention to manage acute mental health crises and ensure the safety of both patients and healthcare providers. Effective assessment and de-escalation are critical, involving tools and techniques designed to evaluate mental status, assess risks, and communicate empathetically. By using established assessment tools and communication protocols, healthcare providers can navigate these critical moments with empathy and precision, aiming to support patient well-being and minimize potential harm.

1. MMSE (Mini-Mental State Examination)
2. SAVE mnemonic for verbal de-escalation
3. Capacity Assessment
4. SADPERSONS scoring
5. Broset violence checklist
6. SPIKES protocol

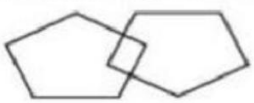
MMSE (Mini-Mental State Examination)

A brief 30-point questionnaire used to screen for cognitive impairment. It is commonly used to assess mental status in various settings, including emergency departments, to evaluate memory, attention, language, and visuospatial skills.

Mini-Mental State Examination (MMSE)

Patient's Name: _____ Date: _____

Instructions: Score one point for each correct response within each question or activity.

Maximum Score	Patient's Score	Questions
5		"What is the year? Season? Date? Day? Month?"
5		"Where are we now? State? County? Town/city? Hospital? Floor?"
3		The examiner names three unrelated objects clearly and slowly, then the instructor asks the patient to name all three of them. The patient's response is used for scoring. The examiner repeats them until patient learns all of them, if possible.
5		"I would like you to count backward from 100 by sevens." (93, 86, 79, 72, 65, ...) Alternative: "Spell WORLD backwards." (D-L-R-O-W)
3		"Earlier I told you the names of three things. Can you tell me what those were?"
2		Show the patient two simple objects, such as a wristwatch and a pencil, and ask the patient to name them.
1		"Repeat the phrase: 'No ifs, ands, or buts.'"
3		"Take the paper in your right hand, fold it in half, and put it on the floor." (The examiner gives the patient a piece of blank paper.)
1		"Please read this and do what it says." (Written instruction is "Close your eyes.")
1		"Make up and write a sentence about anything." (This sentence must contain a noun and a verb.)
1		"Please copy this picture." (The examiner gives the patient a blank piece of paper and asks him/her to draw the symbol below. All 10 angles must be present and two must intersect.) 
30		TOTAL

SAVE mnemonic for verbal de-escalation

A tool to guide effective verbal de-escalation techniques during a behavioral emergency.

Components:

- **S**upport: “Let’s work together…”
- **A**cknowledge: “I see this has been hard for you.”
- **V**alidate: “I’d probably be reacting the same way if I was in your shoes.”
- **E**motion naming: “You seem upset.”

Capacity Assessment

Determines an individual's ability to make informed decisions about their own care and treatment.

Components:

a. **Understanding** - able to receive the information (verbal or text)
b. **Appreciation** – able to retain the information so that a choice can be made
c. **Reasoning** – able to process the information themselves
d. **Expression** of a choice – able to express their choice (verbal , writing or signs)

A suicide risk assessment tool used to identify individuals at higher risk of suicide.

SAD PERSONS Assessment Scale	
Factor	Points
Sex (male)	1
Age < 19 or > 45	1
Depression or hopelessness	1
Previous suicide attempts or psychiatric hospitalization	1
Excessive alcohol or drug use	1
Rational thinking loss	2
Single, divorced, or widowed	1
Organized or serious suicide attempt	2
No social support	1
Stated future intent	2

Scoring:
< 6 = Outpatient management
6-9 = Emergency psychiatric evaluation
> 9 = Inpatient hospitalization

Broset violence checklist

A tool to predict the likelihood of violent behavior in patients over the next 24 hours.

Interpretation of scoring:

Score = 0 The risk of violence is small.

Score = 1-2 The risk of violence is moderate. Preventive measures should be taken.

Score = >2 The risk of violence is very high. Preventive measures should be taken. In addition, plans should be developed to manage the potential violence.

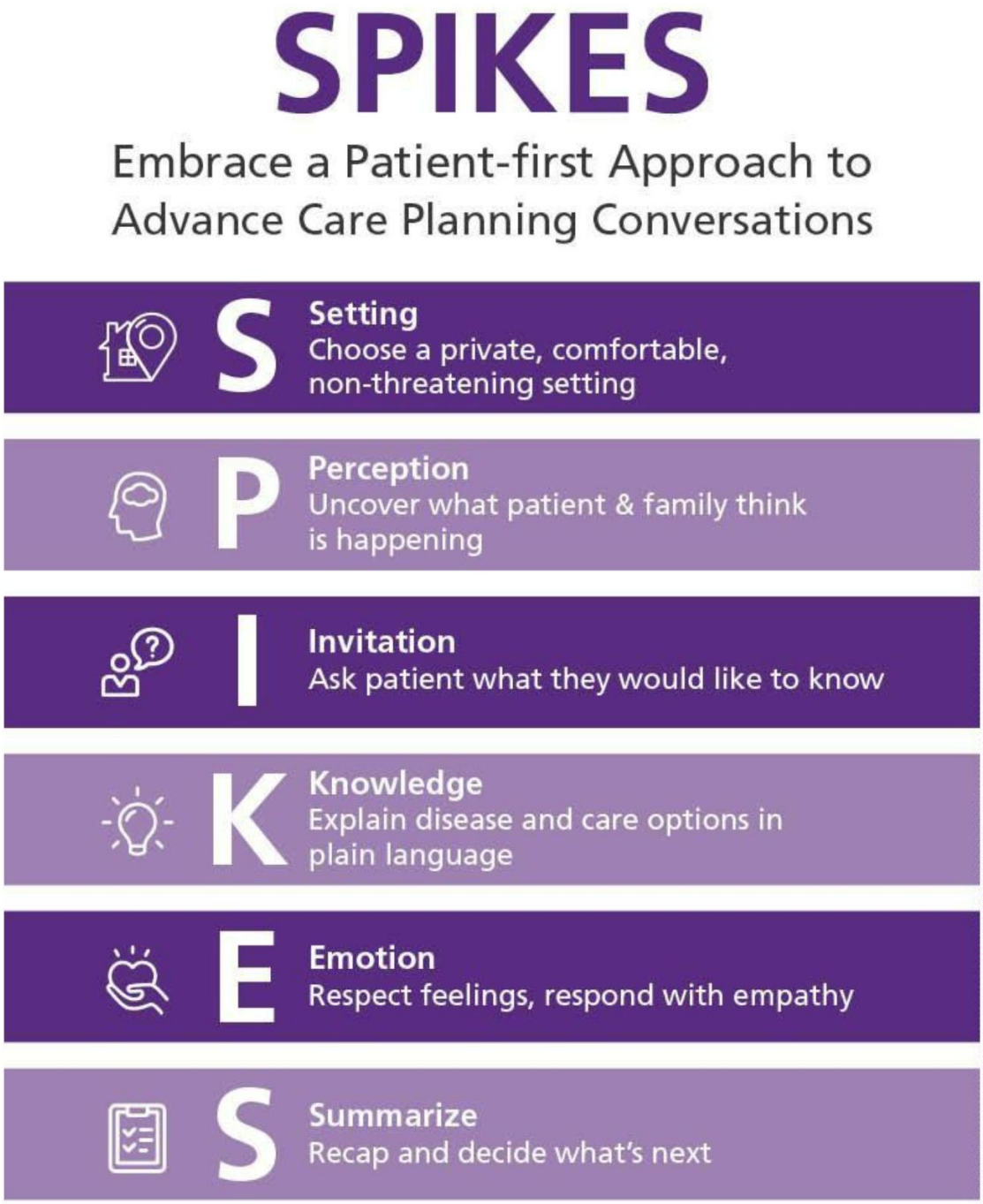
Operationalisation of behaviours/items:

Confused	Appears obviously confused and disoriented. May be unaware of the time, place or person.
Irritable	Easily annoyed or angered. Unable to tolerate the presence of others.
Boisterous	Behaviour is overtly "loud" or noisy. For example, slams doors, shouts out when talking, etc.
Verbally threatening	A verbal outburst which is more than just a raised voice; and where there is a definite intent to intimidate or threaten another person. For example, verbal attacks, abuse, name-calling, verbally neutral comments uttered in a snarling aggressive manner.
Physically threatening	Where there is a definite intent to physically threaten another person. For example, the taking of an aggressive stance; the grabbing of another persons clothing; the raising of an arm, leg, making of a fist or modeling of a head-butt directed at another.
Attacking objects	An attack directed at an object and not an individual. For example, the indiscriminate throwing of an object; banging or smashing windows; kicking, banging or head-butting an object, or the smashing of furniture.

	Monday / /			**Tuesday / /**			**Wednesday / /**			**Thursday / /**			**Friday / /**			**Saturday / /**			**Sunday / /**		
	Night	**Day**	**Eve**	**Night**	**Day**	**Eve**	**Night**	**Day**	**Eve**	**Night**	**Day**	**Eve**	**Night**	**Day**	**Eve**	**Night**	**Day**	**Eve**	**Night**	**Day**	**Eve**
Confused																					
Irritable																					
Boisterous																					
Verbal threats																					
Physical threats																					
Attacking objects																					
SUM																					
INTERVENTIONS																					

SPIKES protocol

A structured, six-step approach used to deliver difficult news in a compassionate and clear manner. The protocol provides a framework to help healthcare providers navigate sensitive conversations, ensuring that patients and their families receive information in a way that respects their emotional and psychological needs



ABDOMINAL DISTENSION/MASS WORKUP

01. Gastrointestinal Causes

Obstruction
- Small or large bowel obstruction
- Pyloric stenosis in infants

Mass Lesions
- Colonic or gastric tumors obstruction
- Appendiceal mass or abscess

Inflammation/ Infection
- Diverticulitis

Miscellaneous
- Fecal impaction
- Celiac disease
- Gastroparesis
- GORD

02. Hepatobiliary and Pancreatic Causes

Liver
- Liver abscess
- Hydatid cyst
- Hepatomegaly

Gallbladder
- Cholecystitis with distension
- Gallbladder carcinoma

Pancreas
- Pancreatic cysts or pseudocysts
- Pancreatic carcinoma

03. Genitourinary Causes

Kidneys
- Polycystic kidney disease
- Hydronephrosis
- Renal tumors

Bladder
- Distended urinary bladder (due to obstruction or neurogenic bladder).

Gynecological
- Ovarian cysts (e.g., dermoid, serous cystadenoma).
- Ovarian tumors (benign or malignant).
- Uterine fibroids.
- Pregnancy

04. Vascular Causes

Aneurysms
- Abdominal aortic aneurysm

05. Peritoneal and Mesenteric

Ascites
- Cirrhosis-related
- Malignancy-related/Peritoneal metastases
- Infectious (e.g., tuberculous or spontaneous bacterial peritonitis)
- Hypoalbuminemia (e.g., nephrotic syndrome, malnutrition)

06. Miscellaneous Causes

Lymphadenopathy
- Lymphoma or metastatic nodes

Obesity
- Increased subcutaneous and visceral fat

Hernias
- Inguinal, femoral, umbilical, or incisional hernias

Abdominal pain including Loin pain workup

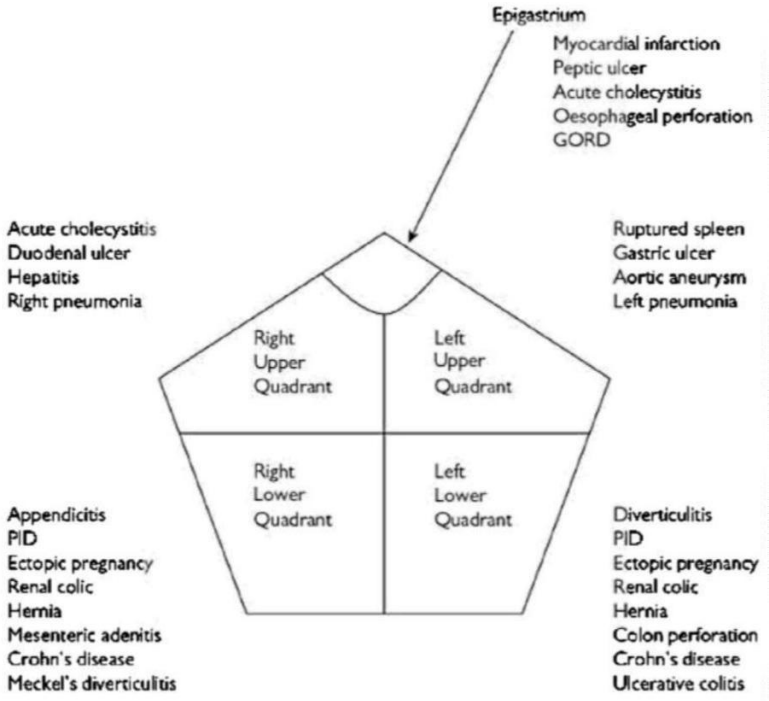


Figure 6.1 Causes of abdominal pain, based on location.

Upper abdominal pain	Exclude acute abdomen 1st – See Ch 6.	Inferior MI/ACS	ECG
		GORD/Gastritis/Duodenitis/ Esophagitis	History Response to PPI
		Peptic ulcer/perforated peptic ulcer	CXR/UGIE
		Acute Cholecystitis	Murphy's sign and LFT/ USS
		Acute pancreatitis	S. Amylase, BISAP score
		Cholangitis	Charcot's triad and LFT/USS
		Hepatitis	LFT/USS
		Pneumonia	CXR
		Ruptured spleen	USS
		Aortic dissection	USS
		Abdominal Aortic aneurysm	USS
Lower abdominal pain	**Gastro-Intestinal**	Small bowel obstruction	USS/abdominal x-ray
		Large bowel obstruction	USS/abdominal x-ray
		Appendicitis	Alvarado Score/USS

Lower abdominal pain		IBD	LGIE
		Bowel ischemia, infarction	
	Genital	Female- ectopic	USS/UhCG
		Ovarian torsion	USS
		PID	USS/UFR
		Male- Testicular torsion	USS
		Orchitis	USS
		Urethritis	UFR
		Priapism	
		Scrotal trauma/ Fournier's gangrene	
	Urinary	Pyelonephritis	USS
		Cystitis	UFR
		Urethritis	UFR
		Hematuria	
		Renal colic	

Fever

Causes

- Infection (Viral - **Dengue.etc/**Bacterial-**Lepto etc../** Fungal/ Protozoal-**Malaria**
- Inflammatory
- Malignancy
- Allergic reaction
- Drug reaction
- Blood transfusion
- Graft-versus-host disease
- Thrombosis

Detailed history- Key elements

- Onset, duration & pattern of fever
- Associated symptoms
- Muddy Exposure
- Fever Contact
- Chronic symptoms
- Travel history
- Sexual history
- IV drug use
- Animal contact
- Medication history
- Vaccination history

Examination -Key elements

- Vitals (SpO2, RR, PR, BP, Temp)
- Lymphadenopathy
- Jaundice
- Skin – evidence of rash or cellulitis
- Musculoskeletal – evidence of arthroplasty, spinal, sternal tenderness
- Genitalia – ulcers, vesicles, discharges
- Mouth & oropharynx
- Eyes
- Abdomen – hepatomegaly, splenomegaly/ RAT
- CVS – new diastolic murmur, change in an existing murmur
- CNS-Neck Stiff ness

Investigations for FUO

- Blood tests – FBC, U&E, LFT, clotting, ESR, CRP
- Blood cultures
- Sputum microscopy & culture
- CXR
- ECG
- Urine dipstick, microscopy & culture
- Stool culture

Other investigations depend on the clinical picture

Management

- General
  - Antipyretics
  - Empirical antibiotics ~~if~~ an infective source is suspected, commenced after samples & cultures obtained
  - Increase fluid intake/Input - output chart
  - Remove excess clothing & bed linen
  - Bath or sponge with tepid water

- Specific management (determined by the underlying cause)

Indications for admission

1. Dengure fever with clinically/ ultrasonically confirmed leaking.
2. Fever with shock/sepsis.
3. Suspected Dengue fever with:

Essential criteria for admission

1. Patients platelet count less than 130 000/mm^3
2. If the Platelet Count is between 150 000 – 130 000/mm^3, the Medical Officer should make a decision depending on the clinical judgment.

   If the platelet count tested more than 4 hours ago is more than 130 000/ mm3 the patient should be observed in the fever room and a repeat count should be done. If the repeat count is lower, decide on admission.
3. Fever for 3 or more days, and already not performed a Full Blood Count, patient should be observed in the fever room until the Full Blood Count report is available.
4. Rapid drop in Platelet Count over a short period of time (in 2 consecutive FBC reports) platelet count coming close to 150 000/mm^3.
5. Patient is clinically unwell especially when fever is settling with deteriorating symptoms as follows (Warning Signs) to be applied on or after 3rd day of illness
   - Weakness
   - Lethargy / restlessness
   - Severe headache
   - Persistent severe vomiting
   - Severe abdominal pain
6. Patient insisting on admission – get a senior opinion if necessary
7. Special conditions
   - Pregnant mothers (Preferably admit on day 01)
   - Children less than one and half years old (Other patients who may need admission even without the above criteria:
   - Elderly patients
   - Obese patients
   - Patients with co-morbid conditions like diabetes, chronic renal failure, ischaemic heart disease, thalassaemia and other haemoglobinopathies and other major medical problems
   - Patients with adverse social circumstances- e.g. living alone, living far from health facility without reliable means of transport.

4. Leptospirosis

❖ Suspected case of leptospirosis with organ involvement and/or significant co morbidities.

HISTORY OF EXPOSURE FOR LEPTOSPIROSIS

- High risk occupations such as paddy farming, construction work, gem mining, sand mining, working in “keerakotu/kohilakotu”

- Recreational activities in paddy fields/muddy grounds, white water rafting
- Contact with potentially contaminated water such as cleaning drains/wells, bathing and washing in small water streams ,rivers and lakes, flood water
- Contact with animals or animal tissues such as cattle, buffalo - animal handlers, veterinarians, butchers, rodent control workers, abattoir workers.

Contact with water contaminated with urine from an animal known to be a reservoir species is the most important risk condition in transmission Known reservoir species include rats and other rodents, buffalo, cattle, dogs and pigs. The presence of breached skin increases the risk of infection

EVEIDENCE OF ORGAN INVOLVEMENT IN LEPTOSPIROSIS

EVIDENCE OF HEPATIC INVOLVEMENT

The presence of one or more of the following

- Jaundice
- Tender hepatomegaly
- Aspartate Transaminase (AST) or Alanine Transaminase (ALT) increased more than thrice the upper limit of normal
- Raised serum bilirubin, serum alkaline phosphatase or serum gamma-GT

EVIDENCE OF RENAL INVOLVEMENT

The presence of one or more of the following

- Suggestive symptoms, such as reduced urine output, haematuria
- Acute kidney injury (AKI) (Acute Kidney Injury Network (AKIN) stage 1 or above) Rise in serum creatinine ≥ 0.3 mg/dl (≥26.5 µmol/l) above baseline within 48 hours Serum
- creatinine > 1.5 times the baseline within 48 hours Urine output < 0.5ml/kg/hour for 6 hours
- Haematuria, granular casts, red cell casts in the urinary sediment

EVIDENCE OF PULMONARY INVOLVEMENT

The presence of one or more of the following

- Oxygen saturation 30/min (> 60/min in infants, >40/min in 1 – 12 years)
- Crackles and wheezes on auscultation of the lungs
- Lung parenchymal involvement on chest radiograph EVIDENCE OF CARDIAC INVOLVEMET The presence of one or more of the following
- Suggestive symptoms and signs, such as shortness of breath, chest pain, palpitations, crackles
- Hypotension
- Electrocardiogram (ECG) abnormalities such as arrhythmias, ST segment/ T wave changes , bundle branch block

- Wall motion abnormalities on echocardiography EVIDENCE OF HAEMATOLOGICAL INVOLVEMENT The presence of one or more of the following
- Bleeding manifestations
- Platelet count less than 130 x 109 /L
- Disseminated intravascular coagulopathy (DIC)

5. Clear focus of fever meeting sepsis criteria or needing admission for source control.
   Eg: pneumonia with CURB 65 score 2 or more
   Suspected meningitis

Discharge criteria

1.A suspected case of leptospirosis with NO organ involvement and/or significant co-morbidities COULD BE managed on an outpatient basis

Antibiotic therapy :Doxycycline 100mg 12 hourly for 7 days

Investigations
- Full Blood Count (FBC)
- Erythrocyte Sedimentation Rate (ESR)/C-Reactive Protein (CRP)
- Serum creatinine /urea, serum electrolytes
- AST/ALT
- Urine Full Report (UFR)

Monitoring
- Monitor urine output at home (provide a mechanism to measure urine output, such as a marked empty saline bottle)
- Review after 48 hours
- Present to Outdoor Patient Department (OPD) earlier if there is
  - appearance of jaundice
  -reduction in urine output <300ml in 12 hours
  -cough or breathing difficulty

- If no admission is needed at 48 hour review, re-assess in another 48 hours.

Decide on subsequent visits based on clinical features and the presence of fever

❖ Undifferentiated fever <3 days without suspicion of leptospirosis and haemodynamically. Review daily with Full Blood Count (FBC).

First FBC should be done at least on the third day of fever/illness and daily thereafter if the platelet count is >150,000/ mm3. FBC should be done twice daily if the platelet count is >100,000/ mm3.

- Ensure adequate oral fluid intake of around 2500 ml for 24 hours (if the body weight is less than 50kg give fluids as 50ml/kg for 24hours). This should consist of oral rehydration fluid, king coconut water, other fruit juices, kanji or soup rather than plain water. Exclude red and brown drinks which could cause confusion with

haematemesis or coffee ground vomitus.

- Adequate physical rest
- Tepid sponging for fever
- Paracetamol not exceeding 2 tablets six hourly (reduce dose for patients with lower body weights). Warn the patient that the fever may not fully settle with paracetamol and advice not to take excess.
- Anti-emetics and H2 receptor blockers if necessary
- Avoid all NSAIDS and steroids

Advise immediate return for review if any of the following occur:

-Clinical deterioration with settling of fever
-Inability to tolerate oral fluids
-Severe abdominal pain
-Cold and clammy extremities
-Lethargy or irritability/restlessness
-Bleeding tendency including inter-menstrual bleeding or menorrhagia
-Not passing urine for more than 6 hours

2.Dengue fever

Criteria for ambulatory care

Patients with a platelet count more than 130 000 / mm3 (tested within 2 hours) and clinically stable.

Advices during ambulatory care

1. Suitably document clinical signs and symptoms together with the Full Blood Count report.
2. When and how often should the Full Blood Count to be repeated?
    - Platelet Count 150 000 – 200 000 / mm3– repeat the count 2 to 3 times per day (If the Platelet drop in subsequent count is slow- repeat the count 2 times per day and if it is rapid, 3 times per day)
    - Platelet Count less than 150 000 / mm3 – repeat the count 3 times per day
3. What to eat and drink?
    - If appetite is good take a light and nutritious diet more frequently
    - The fluids should include not only water, but certain electrolyte solutions such as fruit juice, white rice kanji, Oral Rehydration Solution (ORS), king coconut juice. These solutions are better than taking only water.
    - Do not consume red or brown color foods or beverages to avoid confusion in blood stained vomiting
    - Unless medically advised, other dietary restrictions are not generally recommended

4. How to maintain the urine output?
    - Consume recommended amount of fluids to maintain the usual normal urine output. Amount needed for a child in one hour is approximately double the ideal body weight in milliliters with the maximum limit of 100 ml. The fluid amount for an average adult is 2 to 2.5 liters per day (unless there is vomiting/diarrhoea).
    - If the patient is feeling thirsty taking additional fluid up to 4 times/day is allowed but if needing more should seek medical advice again.
    - Patient should measure the urine output every 4 hourly. Ensure they pass at least about 1ml/ kg / hour urine(which equals approximate ideal body weight). If the urine output is less than this, patient should consume more fluids to maintain the above urine output.
    - N.B. – Diabetics with poor glycemic control may pass more urine even without adequate hydration. These patients need special attention.

5. How to control fever?
    - Fever should be controlled in children with Paracetamol (Dose 15- 20 / kg body weight) only. 15mg / kg dose – four times per day or 20 mg / kg dose – three times per day.
    - In adults Paracetamol should be given not exceeding 2 tablets 6 hourly (reduce dose for patients with lower body weight).
    - Paracetamol dose should not exceed 60 mg/ kg /day. • The gap between 2 doses of Paracetamol should be at least 4 - 6 hours
    - If fever is not adequately subsiding in between Paracetamol doses, using a fan and sponging with moderately warm water is recommended. Patient should be with minimal clothes under a bed net.
    - Make sure under no circumstances should NSAIDs be used to bring down the fever even for patients who are on these medications for chronic conditions.

6. Care at home
    - Physical rest is highly recommended. Patients should be preferably at home, resting.
    - Make sure patients are not left alone at home. There has to be somebody to look after them.

7. Symptoms like repeated vomiting, diarrhoea can lead to dehydration. Such patients should seek immediate treatment without waiting for the next Full Blood Count

8. Patients should avoid other medications especially Steroids during the fever episode. Patients who are on special medications like Warfarin, Aspirin and Clopidogrel should seek medical advice whether to continue these drugs as they are not recommended during Dengue fever.

ACUTE POISONING

Mnemonic- **Resus R S I D E A D**

RESUSCITATION

D R S A B C D → **Cardiac Arrest –** follow BLS/ALS.

Not cardiac arrest → **Critically ill –** Follow ABCDE approach.

A - Assess the adequacy of airway and provide protection with an ET tube if necessary.

B - Monitor breathing and ventilate if necessary.
Ventilatory failure → hypoxia and hypercarbia

C - Manage hypotension according to the cause.
eg. Hypovolemia, arrhythmia, cardiac depression.
Correct hypoxia, hypercarbia, acidosis, electrolyte abnormalities.

D - Prolonged convulsions should be treated with benzodiazepines

E - Check for other injuries. eg. Head injuries.
Ensure - normoglycaemia and normotension.

Non-critically ill

RISK ASSESSMENT

History from patient and collateral history. History of poisoning +

- If known poisoning, consider antidote.
- If unknown poisoning applies toxidrome.

IF THE CAUSE IS POISONING → **ANTIDOTE**

TOXIDROMES

Toxidrome	Causative agents	Clinical features	Management
Sympathomimetic	Cocaine Amphetamines Gamma hydroxybutyrate Decongestants Caffeine Theophylline	Sweating Hyperthermia Anxiety Hypertension Chest pain Agitation Hyperreflexia Seizures Rhabdomyolysis Intracerebral bleeds	Supportive. Intravenous fluids. Benzodiazepines for agitation or seizures. Intravenous glyceryl trinitrate (GTN) or phentolamine for hypertension that does not respond to Benzodiazepines. Aspirin, benzodiazepines, and GTN for chest pain.

SUPPORTIVE CARE

Mechanical ventilation
Circulatory support
Antidote and poison-specific measures.

INVESTIGATIONS

VBG
Urine hCG
ECG
LFT,
RFT
FBC

DECONTAMINATION

Skin decontamination
Active charcoal – 1g/kg orally within 1hr of poisoning
Gastric lavage – for life-threatening overdose within 2 hours Whole bowel irrigation with kleen prep

ELIMINATION

Depends on the type of the poison. Urinary alkalization with $NaHCO_3$ infusion
Hemodialysis – methanol, lithium, phenobarbital
Hemoperfusion – barbiturates, theophylline, choral hydrate

ANTIDOTE

Drug Antidotes

Drug	Antidote
Acetaminophen	Acetylcysteine
Anticholinergics	Physostigmine
Benzodiazepines	Flumazenil
Ca Channel Blockers	Calcium Chloride
Cyanide	Hydroxocobalamin Amyl Nitrite, Sodium Nitrite, Sodium Thiosulfate
Digoxin	Digoxin Immune Fab
Heparin	Protamine Sulfate
Iron	Deferoxamine
Insulin	Glucagon
Lead	Dimercaptosuccinic Acid/EDTA
Opioids	Naloxone
Warfarin	Vitamin K

			Cooling (if resistant to hyperthermia consider dantrolene).
Anticholinergic	Tricyclic antidepressants Antihistamines Antipsychotics Selective serotonin reuptake inhibitors Anti-parkinsonian Atropa belladonna (deadly nightshade)	Mad as a hatter (confusion, delirium). Hot as a hare (hyperthermia). Blind as a bat (mydriasis). Red as a beet (flushing). Dry as a bone (dry mouth and skin). Urinary retention. Sinus tachycardia. Functional ileus (reduced bowel sounds, Constipation). Hypertension.	Supportive. Intravenous fluids. Benzodiazepines for agitation or Seizures. Cooling.
Cholinergic	Organophosphates Physostigmine Carbamate insecticides	Parasympathetic symptoms: **D**iarrhoea **U**rination **M**iosis and muscle weakness **B**ronchorrhoea **B**radycardia **E**mesis **L**acrimation **S**weating, salivation Nicotinic symptoms: weakness, fasiculations, and paralysis CNS symptoms: drowsiness, seizures	Decontamination Supportive Atropine (titrate until secretions dry up) Pralidoxime
Opioid	Morphine Heroin	Miosis Respiratory depression Reduced level of consciousness Coma Hypotension	Supportive. Naloxone (dose 400 mcg IV/IM, which may be repeated up to a dose of 10 mg.

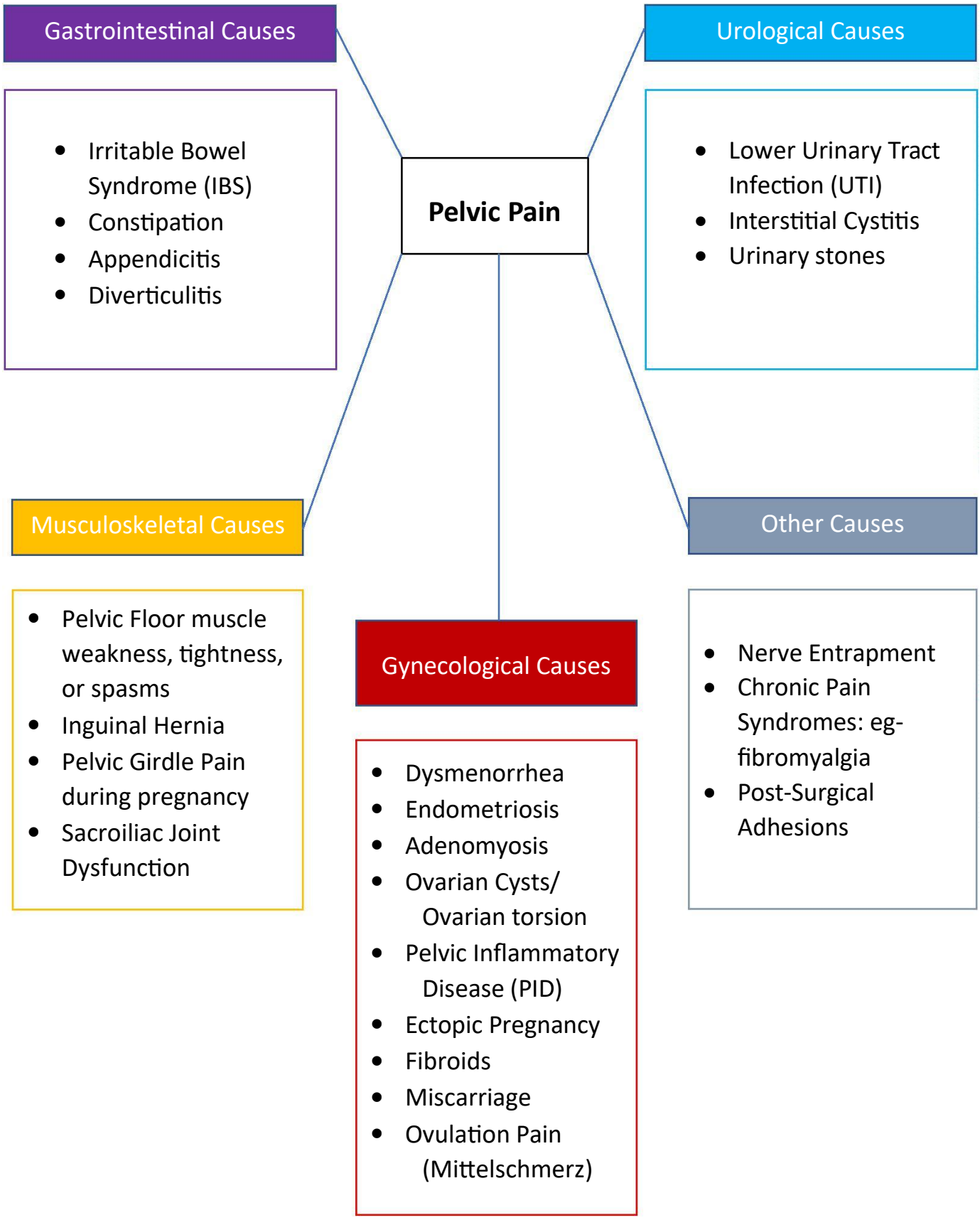
DISPOSITION

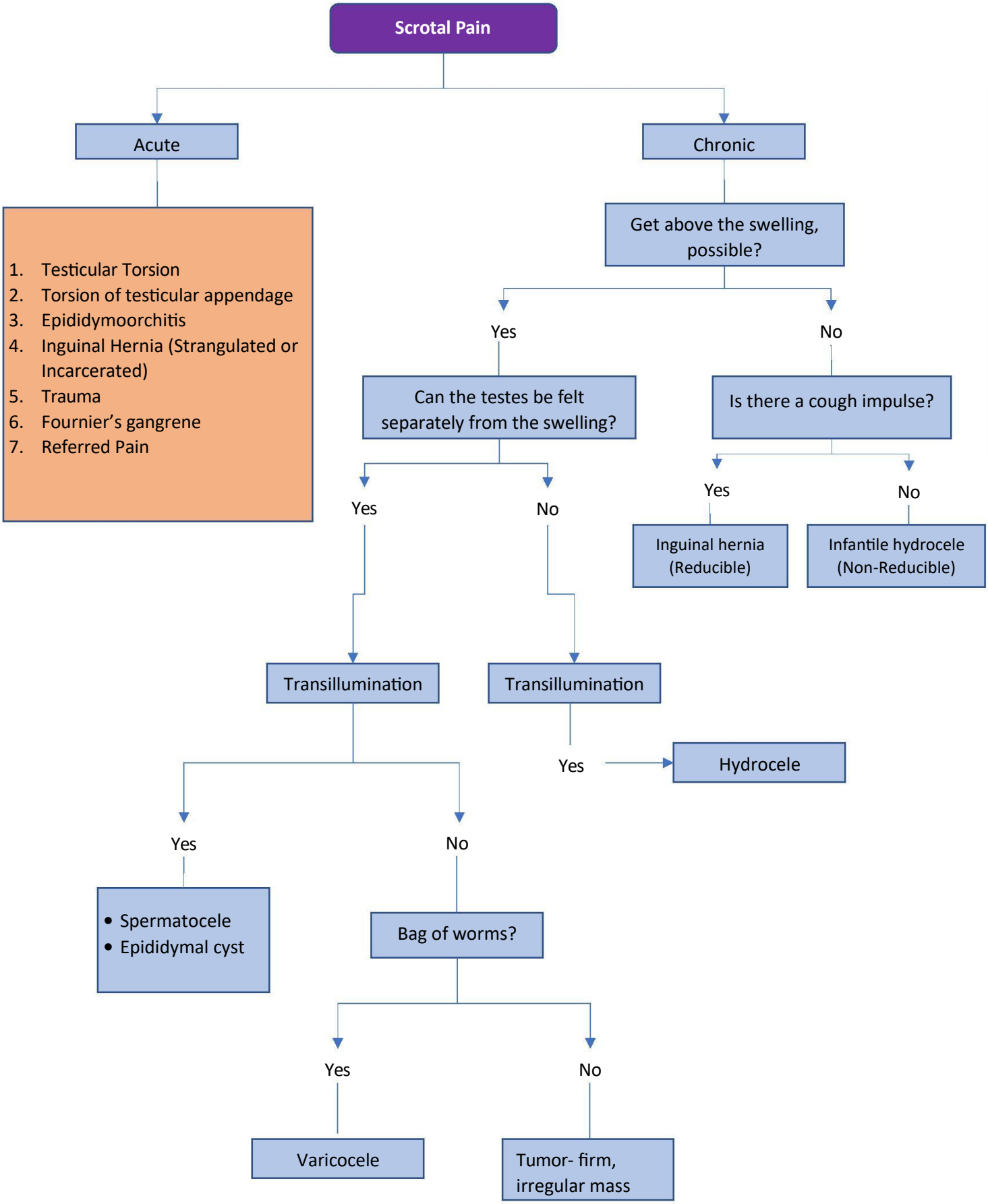
The Patient must be admitted to an environment capable of providing an adequate level of monitoring and supportive care.

ICU admission is needed for,

- Unstable patient
- Potentially lethal overdose
- Cardio toxic overdose

Psychiatric counseling


Pelvic Pain
Gastrointestinal Causes
Irritable Bowel Syndrome (IBS)
Constipation
Appendicitis
Diverticulitis
Urological Causes
Lower Urinary Tract Infection (UTI)
Interstitial Cystitis
Urinary stones
Musculoskeletal Causes
Pelvic Floor muscle weakness, tightness, or spasms
Inguinal Hernia
Pelvic Girdle Pain during pregnancy
Sacroiliac Joint Dysfunction
Gynecological Causes
Dysmenorrhea
Endometriosis
Adenomyosis
Ovarian Cysts/ Ovarian torsion
Pelvic Inflammatory Disease (PID)
Ectopic Pregnancy
Fibroids
Miscarriage
Ovulation Pain (Mittelschmerz)
Other Causes
Nerve Entrapment
Chronic Pain Syndromes: eg- fibromyalgia
Post-Surgical Adhesions


Scrotal Pain
Acute
Chronic
1. Testicular Torsion
2. Torsion of testicular appendage
3. Epididymoorchitis
4. Inguinal Hernia (Strangulated or Incarcerated)
5. Trauma
6. Fournier's gangrene
7. Referred Pain
Get above the swelling, possible?
Yes
No
Can the testes be felt separately from the swelling?
Is there a cough impulse?
Yes
No
Yes
No
Inguinal hernia (Reducible)
Infantile hydrocele (Non-Reducible)
Transillumination
Transillumination
Yes
Hydrocele
Yes
No
• Spermatocele
• Epididymal cyst
Bag of worms?
Yes
No
Varicocele
Tumor- firm, irregular mass

Testicular Torsion

Cause	History	Examination
Twisting of the spermatic cord, leading to compromised blood flow to the testicle.	• Sudden, severe, unilateral testicular pain. • Pain may radiate to the lower abdomen. • Nausea and vomiting often accompany the pain. • No history of trauma, but sometimes occurs after physical activity or spontaneously.	○ Affected testicle is high-riding and horizontally oriented. ○ Absent cremasteric reflex (stroking the inner thigh does not cause the testicle to rise). ○ Severe tenderness on palpation. ○ Negative Prehn's sign (lifting the scrotum does not relieve pain). ○ This is a **surgical emergency** requiring immediate intervention.

Epididymitis/Epididymoorchitis

Cause	History	Examination
Inflammation of the epididymis and or testes often due to bacterial infection (STIs in young men, urinary pathogens in older men).	• Gradual onset of pain, usually unilateral. • Pain may radiate to the lower abdomen or flank. • Dysuria (painful urination), frequency, or urgency may be present if there's a urinary tract infection. • In younger men, usually associated with sexually transmitted infections	○ Swelling and tenderness of the epididymis, which may spread to the testicle. ○ Positive Prehn's sign (lifting the scrotum provides pain relief). ○ Intact cremasteric reflex. ○ Scrotum may appear erythematous and warm.

Orchitis

Cause	History	Examination
Inflammation of the testicle, often due to viral infections like mumps, or less commonly, bacterial infections.	• Gradual onset of testicular pain and swelling. • Often follows a viral illness (e.g., mumps) in post-pubertal males. • Fever and systemic symptoms like malaise may accompany. • Associated with parotitis (inflammation of the parotid glands) in cases of mumps.	○ Tender, swollen testicle, possibly bilaterally in cases of mumps. ○ The overlying skin may be red and warm. ○ No relief with lifting the scrotum (negative Prehn's sign).

Inguinal Hernia (Strangulated or Incarcerated)

Cause	History	Examination
Protrusion of abdominal contents into the scrotum through the inguinal canal. Strangulation occurs when the blood supply is compromised.	• Gradual or sudden-onset pain, which may radiate to the groin or lower abdomen. • Pain worsens with straining, lifting, or coughing. • Swelling in the groin or scrotum that may change in size, especially when standing. • Nausea, vomiting, and signs of bowel obstruction if strangulated.	○ A palpable mass in the inguinal region or scrotum. ○ Hernia may be reducible (can be pushed back) or irreducible (trapped). ○ Signs of bowel obstruction and tenderness indicate strangulation, which is a surgical emergency.

Varicocele

Cause	History	Examination
Dilation of the veins within the spermatic cord (similar to varicose veins).	• Dull, aching pain or discomfort, typically on the left side. • Pain may worsen with standing or physical activity and improve when lying down. • May be asymptomatic and discovered incidentally.	○ “Bag of worms” feel on palpation, especially when standing. ○ Scrotal swelling and possible atrophy of the affected testicle. ○ No acute tenderness.

Hydrocele

Cause	History	Examination
Collection of fluid within the tunica vaginalis surrounding the testicle.	• Painless or mild discomfort due to scrotal swelling. • Swelling may increase gradually over time.	○ Smooth, non-tender, fluid-filled mass. ○ Positive transillumination test (shining a light through the scrotum causes the fluid-filled sac to glow). ○ No tenderness or signs of infection.

Spermatocele

Cause	History	Examination
Cystic accumulation of sperm in the epididymis.	• Painless or mild discomfort. • Often found incidentally during self-examination.	○ A smooth, cystic mass separate from the testicle. ○ Transillumination is positive (light passes through). ○ No tenderness or signs of inflammation.

Testicular Tumor

Cause	History	Examination
Malignant growth within the testicle	• Painless, unilateral swelling or nodule. • Occasionally presents with dull discomfort or heaviness. • History of undescended testis or family history of testicular cancer may be present	○ A firm, non-tender mass in the testicle. ○ Does not transilluminate. ○ Scrotal ultrasound is usually required for confirmation

Referred Pain

Cause	History	Examination
Pain from other areas, like the kidneys (kidney stones), or from nerve entrapment	• Pain that may originate in the flank or abdomen and radiates to the scrotum. • Associated with symptoms like back pain, urinary symptoms, or no local scrotal symptoms.	○ Normal scrotal examination. ○ Focus on examining the abdomen, flanks, and back.

ENT Issues

Ear pain

Otitis Externa	Otitis Media
Infection of the external auditory canal	Infection of the middle ear
History- pain, pruritic, discharge Hearing may reduce	Earache and deafness in older children Fever, lethargy, irritability, poor feeding in young children
Examination- inflamed, oedematous auditory canal	Tympanic membrane- red, inflamed, bulging with loss of light reflex May be perforated and purulent discharge in the external auditory canal
Management- Keep ears dry Simple analgesia Topical ear drops – corticosteroids + antibiotics Aminoglycosides contraindicated if perforated tympanic membrane Aural toilet ENT referral	Symptomatic relief with analgesia and antipyretics Antibiotics according to local guidelines ENT referral

Ear discharge – exclude OE, OM, foreign body, trauma and other ear infections, ENT referral

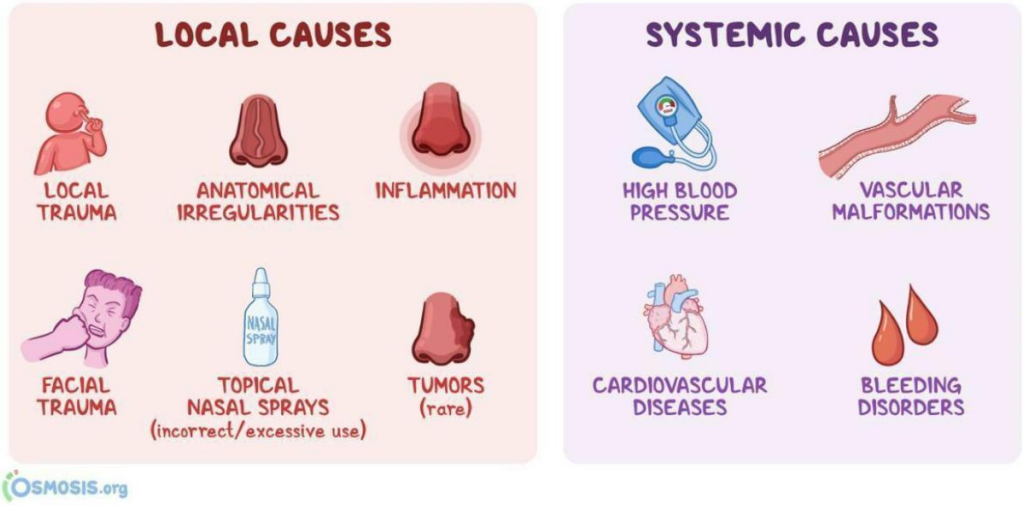
Foreign body

Ear	Nasal	Throat
Removal of foreign body at ED If unsuccessful – ENT referral	Removal by nose blowing, suction, forceps If patient uncooperative or foreign body cannot be reached- ENT referral	Direct visualization and removal by forceps If not visualized- latera; neck Xray and ENT referral

Epistaxis

95% occur in Little's area/Kiesselbach's plexus anteriorly

Posterior bleeds are uncommon- usually occur in elderly



Management

ABC assessment – clear airway

If hemodynamic compromise fluid resuscitation
First Aid- Sit and lean forward
Pinch tip of nose for 10 min and apply ice
Observe for 15min
If settles can discharge

↓

If not settling-

Wear appropriate PPE
Good light source and nasal speculum
Remove clots in anterior part
Apply cotton soaked with adrenalin or
lignocaine If vessel visible cautery with
silver nitrate
If settles can discharge with nasal antiseptic cream

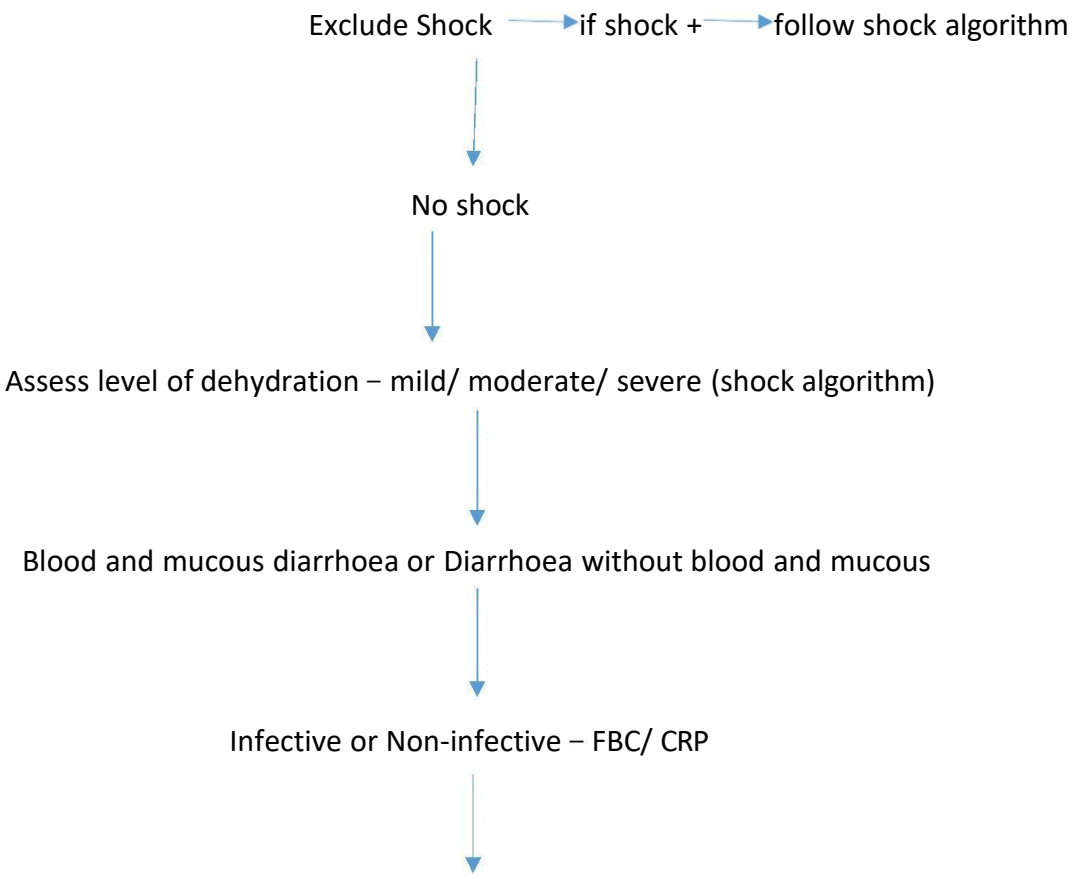
↓

If not settling-

Contact ENT urgently

Posterior packing with Foley catheter(14G)/nasal tampon with a posterior balloon Admit under ENT

Diarrhoea workup



Limb pain and swelling (atraumatic) workup

Limb pain

Acute limb ischemia

Chronic limb ischemia

Due to atheroma

1. Asymptomatic
2. Intermittent claudication
3. Rest pain
4. Gangrene

Limb swelling

Unilateral

Vascular causes

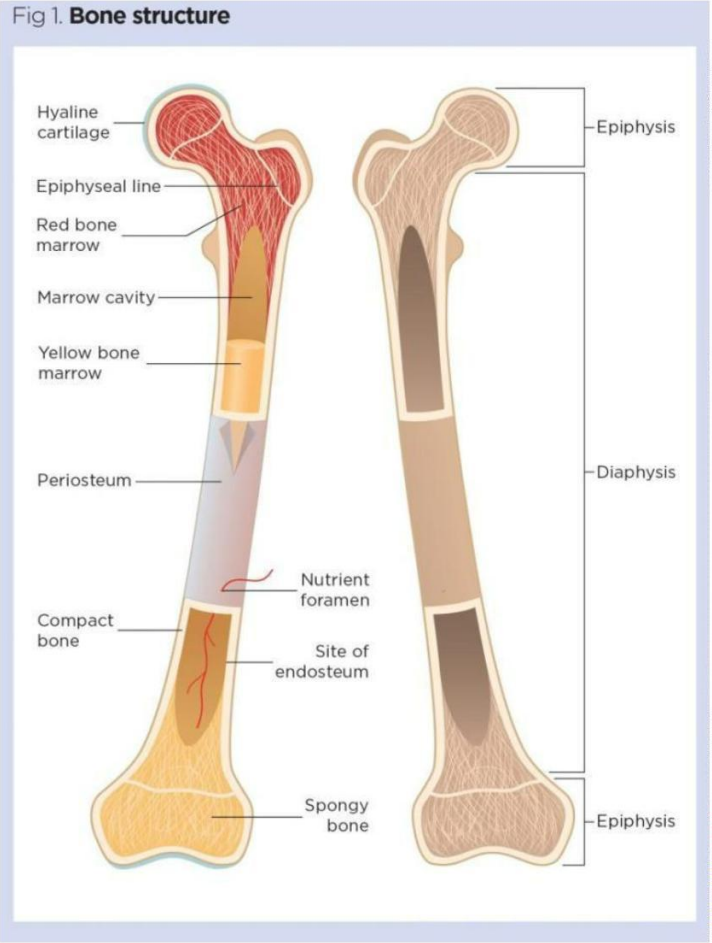
Infective- cellulitis

Malignancy

Bi-Lateral

Systemic causes (heart failure, liver failure, Renal failure, hypoproteinemia, IVC obstruction)

Traumatic Upper Limb and Lower Limb Injuries



Checklist for evaluating plain films for fracture

- Check identity and date
- Minimum of two images AP and lateral, at right angles to each other
- Soft tissues
- Cortical outline
- Medullary cavities
- Joint space width and congruity
- Correlate abnormal findings with the site of symptoms

Open fractures

Open (or compound) fractures occur when there is a breach of the skin overlying the fracture. They may result from sharp bone edges piercing the skin from the inside out, or from trauma to the overlying skin and subcutaneous structures. Those that are open from 'outside in' are at greater risk of infection and tend to have greater damage to other structures, such as muscles, nerves, and blood vessels.

Open Fracture Management

- Management should follow ATLS principles.
- Dramatic limb-threatening injuries must not distract you from 'ABCDE' management.
- Haemorrhage control should be dealt with in 'C' by the use of **direct pressure, elevation, and splinting**. If this is unsuccessful, **wound packing and/or indirect pressure at arterial pressure points** (e.g. brachial artery) may be necessary.
- If these steps do not control haemorrhage, and the *bleeding is life-threatening*, a **tourniquet may be required.**
- Fluid resuscitation should be guided by the patient's haemodynamic status.
- Intravenous morphine should be provided for analgesia.
- A photograph should be taken of the wound to avoid repeated undressing and examination before surgery.
- Any obvious contamination (e.g. large lumps of debris) should be removed.
- The wound should be irrigated with saline and then covered with a sterile moist dressing.
- Distal pulses should be marked and their presence recorded in the notes. A Doppler ultrasound probe should be used if pulses are impalpable.
- Sensation should be assessed and documented. Neurovascular status should be reassessed frequently.
- The limb should be immobilized in plaster or an appropriate splint.
- Broad-spectrum intravenous antibiotics should be given.
- Tetanus status should be established and a booster/immunoglobulin given if indicated

Compartment syndrome

Clinical features of compartment syndrome

The six 'P' s of compartment syndrome

- Pain out of proportion to the injury and on passive stretch
- Paresthesia (late sign)
- Pallor
- Paralysis (late sign)
- Pulseless (late sign)
- Poikilothermic

Investigations for compartment syndrome

- X-ray—if the mechanism of injury suggests a possible fracture.
- Urine—should be tested for myoglobin. Laboratory results can take several days, however, myoglobin on a urinary dipstick tests positive for blood.
- CK and renal function—due to the high risk of rhabdomyolysis and renal failure.
- Coagulation screen—if disseminated intravascular coagulation is suspected.
- Intra-compartmental pressure measurement—may be helpful if the diagnosis is uncertain. If the difference between the intra-compartment and the diastolic pressure is <30 mmHg, then a fasciotomy is required.

Emergency department management of compartment syndrome

- High index of suspicion.
- Remove any restrictive dressings, casts, or splints.
- Intravenous morphine for analgesia.
- Avoid any nerve blocks which may mask symptoms.
- Urgent orthopaedic referral.

Upper Limb Injuries

Shoulder dislocations

Shoulder dislocations are a common injury presenting to the emergency department (ED). Anterior dislocations are the most common type; however, shoulders can also dislocate posteriorly or inferiorly.

- Anterior dislocation—forced external rotation/abduction of the shoulder.
- Posterior dislocation—blow to the anterior aspect of the shoulder; fall onto an internally rotated arm; strong muscular contractions during a seizure or electric shock.

Fractures of the distal radius

Colles' fracture

A Colles' fracture involves the distal radius with dorsal angulation. The X-ray appearances include:

- Posterior and radial displacement of the distal fragment.
- Dorsal angulation of the distal fragment (normally the articular surface of the distal radius has a 5°
- volar tilt on the lateral view).
- Radial angulation of the distal fragment (normally the articular surface of the distal radius has a 22° tilt in the ulnar direction on the AP view).
- Impaction, resulting in shortening of the radius relative to the ulna.

Such injuries are usually reduced in the ED under a haematoma block or Bier's block.

Smith's fracture

A Smith's fracture is a fracture of the distal radius with volar displacement and angulation. This is an unstable injury which usually requires operative fixation.

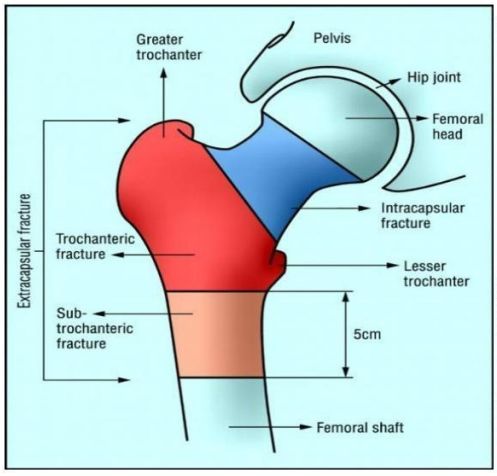
Lower limb injuries

Hip fractures

Neck of femur fractures are a common injury in the elderly, often resulting from low-energy falls in patients with pre-existing osteoporosis. Fractures in younger patients are usually the result of high-energy injuries.

The blood supply to the femoral head is derived principally from an arterial ring at the base of the neck. Fractures of the neck of the femur may lead to avascular necrosis of the femoral head, especially if they are intracapsular.

Level of fracture:



- Intracapsular
    - Subcapital
    - Transcervical
- Extracapsular
    - Basicervical/intertrochanteric
    - Pertrochanteric

Patients attending the ED with a suspected hip fracture should have the following management instigated:

- Adequate pain relief.
- Consideration of nerve block (such as fascia iliaca) if pain is poorly controlled with paracetamol and opioid analgesia
- Early radiology. If there is doubt regarding the diagnosis, MRI is the investigation of choice, although CT is a more readily available alternative.
- Fluid and electrolyte abnormalities measured and corrected.
- Anaemia identified and corrected.
- Any co-existing medical conditions optimized (e.g. uncontrolled diabetes, uncontrolled heart failure, acute chest infection, exacerbation of chronic chest condition, correctable arrhythmias, or ischaemia).
- Pressure sore prevention. Use of soft surfaces to protect the heels and sacrum. Those judged to be at very high risk should be nursed on an alternating-pressure air mattress.
- Fast tracking: Patients should be transferred to the ward within two hours of their arrival in the ED.

Ottawa knee and ankle rules

The Ottawa knee and ankle rules are well-recognized clinical decision rules used in the ED to determine which injuries require an X-ray. They have been extensively validated and shown to apply to children as well.

Ottawa knee rules

A knee X-ray series is only required for patients with knee injuries and any of the following findings:

- Age 55 years or older
- Isolated patella tenderness
- Tenderness of the head of fibula
- Inability to weight bear both immediately and in the ED (4 steps)

Ottawa ankle rules

An ankle X-ray series is only required if there is pain in the malleolar zone and any of the following findings:

- Bone tenderness over the posterior margin of the distal 6 cm of the lateral malleolus
- Bone tenderness over the posterior margin of the distal 6 cm of the medial malleolus
- Inability to weight bear both immediately and in the ED (4 steps)

A foot X-ray series is only required if there is pain in the mid-foot zone and any of the following findings:

- Bone tenderness at the base of the fifth metatarsal
- Bone tenderness over the navicular
- Inability to weight bear both immediately and in the ED

ECG Interpretation

1. **Name**
2. **Proper Lead Orientation** (AVR - down)
3. **Rhythm Strip**
    - Bradycardia (HR < 60)
    - Tachycardia (HR > 100)
    - Ectopics
        - Atrial
        - Ventricular
            - Bigeminy (2:1)
            - Trigeminy (3:1)
            - Quadrigeminy (4:1)
            - Infrequent

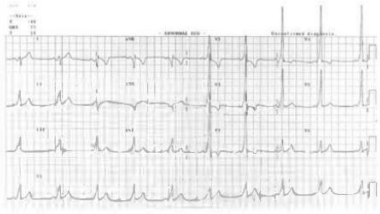
4. **Ischaemia/Infarction**

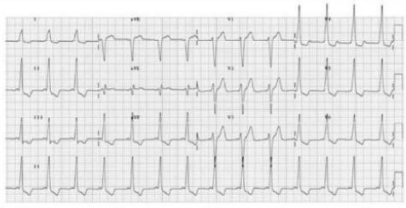
- ST depression / T inversion ?**Reciprocal changes** (PAILI)
    - Repeat ECG in 30 mins

- ST elevation ± reciprocal changes
    - **Dynamic →** ST elevation equivalent
    - **Non-dynamic →** ? ST elevation mimics

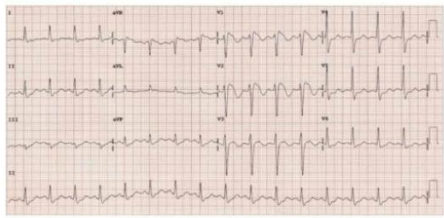
5. Arrhythmogenic conditions

- **WPW** (short PR interval with delta wave)

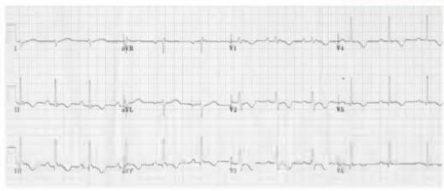


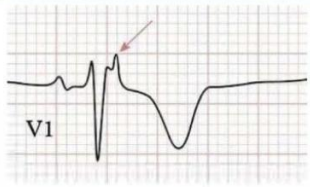


- **Brugada** (V1-V3 convex ST ups)

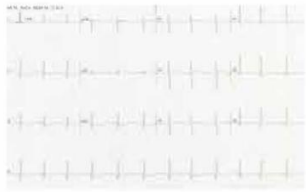


- **ARVD** (Epsilon wave)





- **QT prolongation**

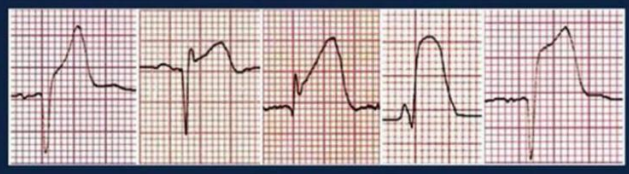


6. Other

- **Bundle branch blocks**
  - **LBBB**
  - **RBBB**
  - **Bi-fascicular**
  - **Tri-fascicular**
- **HOCM**
- **Electrolyte abnormalities**

STEMI mimics; A proposed acronym

Simon Mark Daley (2018)



R aised intracranial pressure - such as in SAH or haemorrhagic stroke

A bberrant conduction (Left Bundle Branch Block)

I nflammation (Pericarditis)

S pontaneous coronary artery dissection (SCAD)

E lectrolytes (Hyperkalaemia)

D evice (Ventricular paced rhythm)

S odium channelopathy (Brugada Syndrome)

T horacic aortic dissection

S pasm of the coronary arteries (Prinzmetal's angina)

E mbolism (Pulmonary)

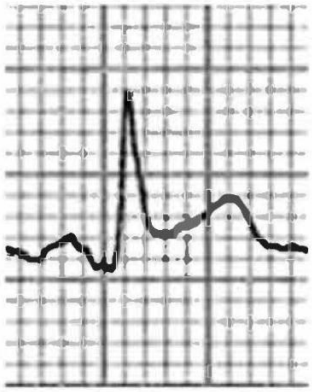
G rief (Takotsubo cardiomyopathy)

M yocardial infarction recently (leading to ventricular aneurysm)

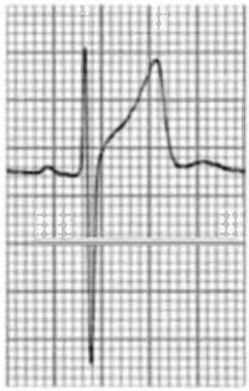
E nlarged ventricle (Left ventricular hypertrophy)

N ormal for them (Benign early repolarisation)

T emperature (Hypothermia)



Pericarditis



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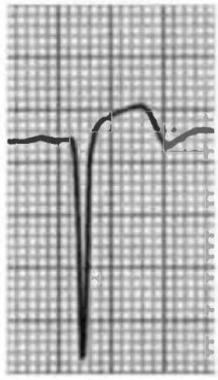
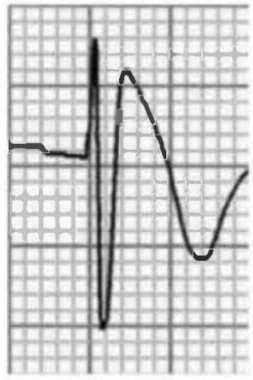


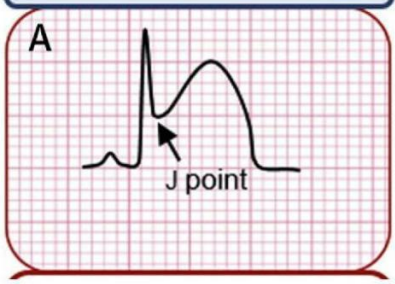
LV Aneurysm



Brugada

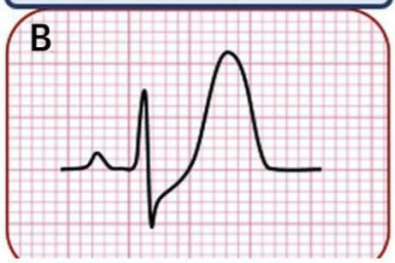
STEMI Equivalents

Conventional STEMI



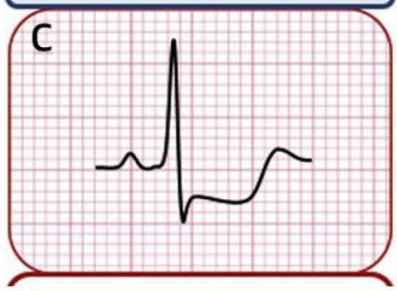
Elevation of ST segment at (or 40-60 ms after) the J point

De Winter syndrome



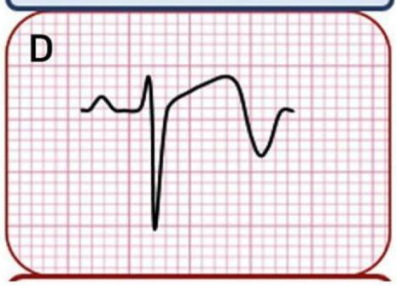
J-point depression and upsloping ST depression in V1-V6 that continues into tall, positive symmetrical T-waves, often with 1-2 mm ST elevation in aVR

Posterior STEMI



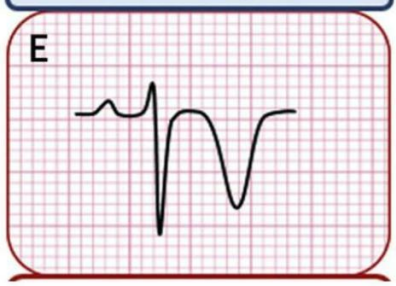
ST depression ≥0.05 mV (horizontal or downsloping and concave) in V1-V3 (or V4) especially if there is a tall R in V1/V2 with R/S ratio >1 in V2

Wellens sign A



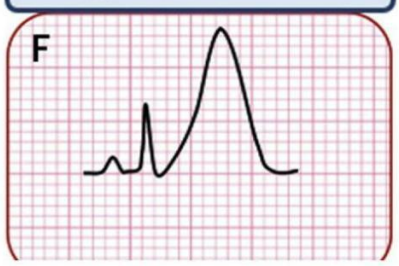
Biphasic anterior T waves, not always accompanied by chest pain

Wellens sign B



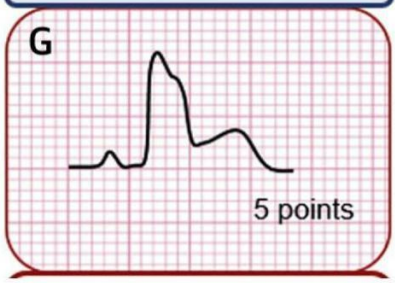
Deeply inverted anterior T waves, not always accompanied by chest pain

Hyperacute T wave



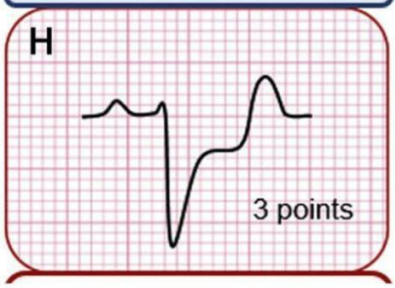
Tall, often asymmetrical, broad-based anterior T-waves often associated with reciprocal ST depression

Sgarbossa criterion 1



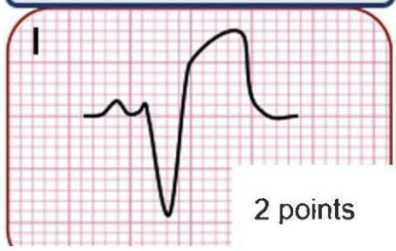
ST elevation ≥0.1 mV concordant to the QRS in any of the leads I, aVL, V4 to V6.

Sgarbossa criterion 2



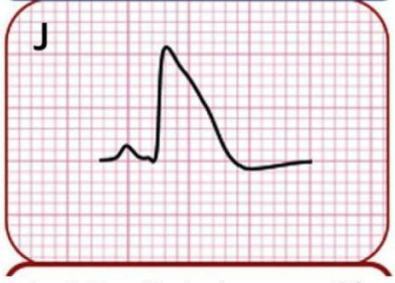
ST depression ≥0.1 mV concordant to the QRS in any of the leads V1 to V3.

Sgarbossa criterion 3^{modified}



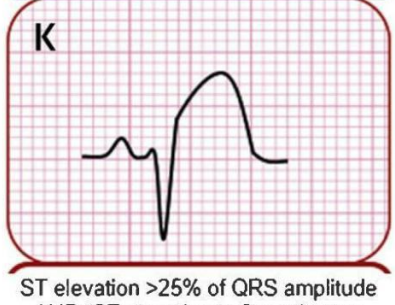
ST elevation with amplitude >25% of the depth of the preceding S-wave with discordant QRS complex (leads V1 to V3)

"Shark fin"



J-point transitioning in a convex ST-segment (T wave indistinguishable from ST-segment due to extreme ST deviation)

Acute ischemia in LVH

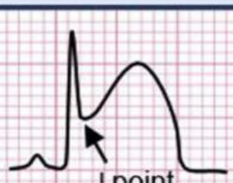


ST elevation >25% of QRS amplitude AND (ST elevation in 3 contiguous leads, or T-wave inversions in the anterior leads)

STEMI Equivalents

Conventional STEMI

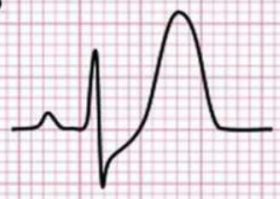
A



Elevation of ST segment at (or 40-60 ms after) the J point

De Winter syndrome

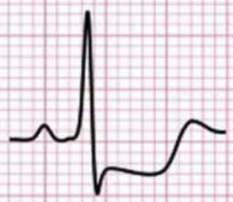
B



J-point depression and upsloping ST depression in V1-V6 that continues into tall, positive symmetrical T-waves, often with 1-2 mm ST elevation in aVR

Posterior STEMI

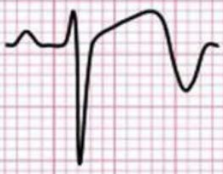
C



ST depression ≥0.05 mV (horizontal or downsloping and concave) in V1-V3 (or V4) especially if there is a tall R in V1/V2 with R/S ratio >1 in V2

Wellens sign A

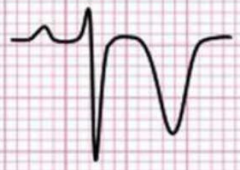
D



Biphasic anterior T waves, not always accompanied by chest pain

Wellens sign B

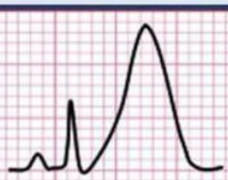
E



Deeply inverted anterior T waves, not always accompanied by chest pain

Hyperacute T wave

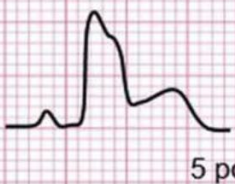
F



Tall, often asymmetrical, broad-based anterior T-waves often associated with reciprocal ST depression

Sgarbossa criterion 1

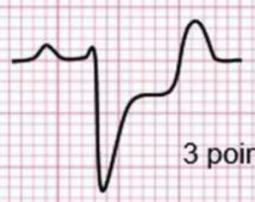
G



ST elevation ≥0.1 mV concordant to the QRS in any of the leads I, aVL, V4 to V6.

Sgarbossa criterion 2

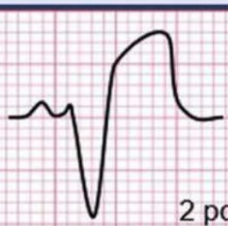
H



ST depression ≥0.1 mV concordant to the QRS in any of the leads V1 to V3.

Sgarbossa criterion 3[modified]

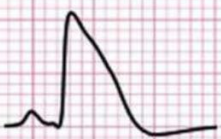
I



ST elevation with amplitude >25% of the depth of the preceding S-wave with discordant QRS complex (leads V1 to V3)

"Shark fin"

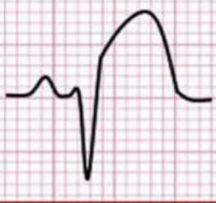
J



J-point transitioning in a convex ST-segment (T wave indistinguishable from ST-segment due to extreme ST deviation)

Acute ischemia in LVH

K



ST elevation >25% of QRS amplitude AND (ST elevation in 3 contiguous leads, or T-wave inversions in the anterior leads)

- **ADULT MAJOR PRESENTATIONS**

				1	2	3	4	5
1. Anaphylaxis								
2. Hypoxia								
3. Shock	Hypovolemic	Bleeding	Trauma / Non-Trauma					
		Dehydration- NVD/ DKA /HHS /Poor Oral Intake						
		Burns						
		Dengue / critical phase						
	Cardiogenic	Acute heart failure (Acute MI)	LVF without RVF					
			RVF ± LVF					
		Acute on chronic heart failure						
		Unstable arrythmias						
	Obstructive	Tension Pneumothorax						
		Cardiac tamponade						
		Pulmonary embolism						
	Distributive	Anaphylaxis with shock						
		Sepsis with shock						
		Neurogenic						
4. Sepsis								
5. Unconscious								
6. Major trauma								

- **ADULT ACUTE PRESENTATIONS**

Airway and Breathing related problems

	1	2	3	4	5	6	7	8	9	10
Breathlessness										
Cough										
Cyanosis										
Ventilatory support										

Circulation-Related Problems

	1	2	3	4	5	6	7	8	9	10
Blackout/collapse TLOC / Syncope										
pre-syncope / Dizziness										
Falls - Medical										
Oliguric										
Palpitations										
Chest pain										
Hypertensive Emergency										
Hypertensive Urgency										

Disability Neurological and Pain-Related Problems

Acute back pain										
Aggressive/disturbed behavior										
Confusion/acute delirium										
Dizziness and vertigo										
Fits and seizures										
Headache										
Head injury										
Neck pain										
Pain management										
Mental health										
Weakness and paralysis										

Exposure related problems

	1	2	3	4	5	6	7	8	9	10
Abdominal pain, including loin pain										
Abdominal swelling, mass, constipation										
Diarrhea										
Fall-accidental										
Fever										
Hematemesis and melaena										
Jaundice										
Limb pain and swelling (atraumatic)										
Painful ears										
Pelvic pain										
Poisoning – Snake bite										
Poisoning - Chemical										
Poisoning - Plant										
Poisoning - Drugs										
Poisoning - Other										

- **PAEDIATRIC MAJOR PRESENTATIONS**

	1	2	3	4	5
Cardiorespiratory arrest					
Anaphylaxis					
Apnea, stridor, and airway obstruction					
Shock					
Sepsis					
The unconscious child					
Major trauma					

1. PAEDIATRIC ACUTE PRESENTATIONS

Airway and Breathing related problems

	1	2	3	4	5	6	7	8	9	10
Apparent life-threatening events (ATLE)										
Breathing difficulties										

Circulation-Related Problems

	1	2	3	4	5	6	7	8	9	10
Floppy child										
Dehydration secondary to diarrhea and vomiting										

Disability Neurological and Pain-Related Problems

	1	2	3	4	5	6	7	8	9	10
Headache										
Pain in children										

Exposure related problems

	1	2	3	4	5	6	7	8	9	10
Abdominal pain										
Accidental poisoning, poisoning, and self-harm										
Blood disorders										
Concerning presentations										
Ears, nose, and throat (ENT)										
Fever in all age groups										
Gastrointestinal bleeding										
Ophthalmology										
Painful limbs in children—atraumatic										
Painful limbs in children—traumatic										
Rashes in children										
Sore throat										

Neonatal presentations										

Date…… **Presentation ……**

Patient Details -

- **Triage category** - CAT 1/2/3/4
- **Initial Stabilization –** **(Major trauma - Chapter 4)**
- **A** -

  patency

  Interventions/Adjuncts

B -

Respiratory Rate-

Tracheal position-

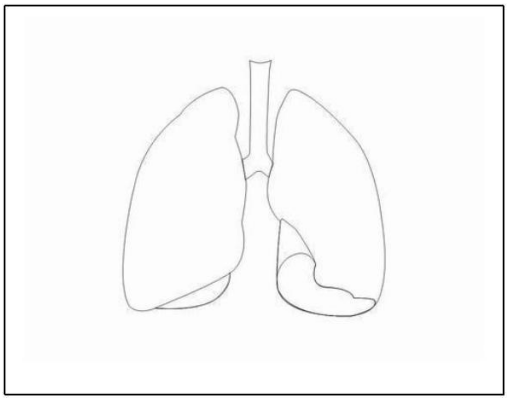
Lung Findings -

Inspection

Palpitation

Percussion

Auscultation



SPO2 -

interventions/Adjuncts-

C -

Peripheries -

CRFT -

Pulse Rate- Rhythm- volume- delays-

Blood pressure-

Interventions/ Adjuncts-

D -

AVPU /GCS -

Orientation - Time - Place- Person-

Pupil size and reactivity

R	L

Focal neurological signs-

Capillary blood sugar-

Interventions/ Adjuncts-

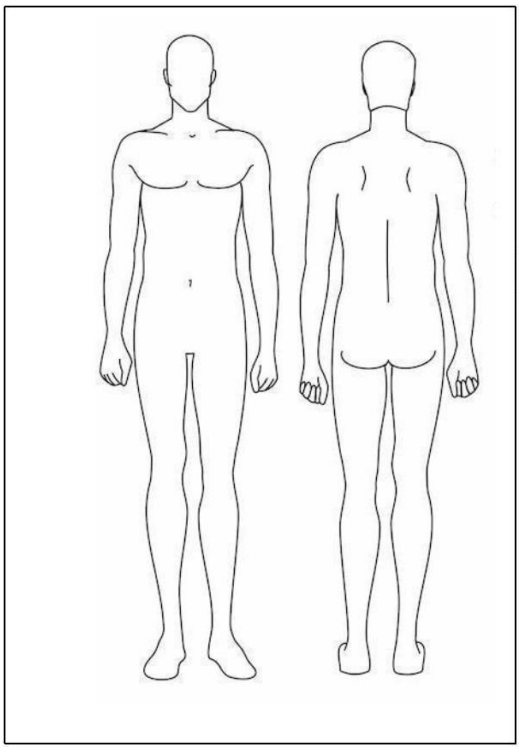
E -

Temperature -

Rashes / Edema -

Other Findings -

Interventions -



Additional /adjuncts -

- **History & Examination**

- **Problems Identified**

- **Definitive /Further Management**

Imaging/Investigation/ECG Findings

Breaking Bad news/Patient Education

Follow up

Clinical Skills / Procedural Skills	*Date*			
Airway Assessment				
Basic Airway Maneuvers				
• Advanced Endotracheal Intubation Adult, Pediatric and neonatal • LMA Insertion • Needle and Surgical Cricothyroidotomy • Tracheotomy				
Procedural sedation				
Rapid sequence induction and delayed sequence induction				
General anesthesia				
Regional anesthesia and nerve block				
Range of pain management techniques				
Intraoperative and immediate post-operative management				
Cervical spine Stabilization				
Bag and mask ventilation: Adult, Pediatrics and neonatal				
Noninvasive ventilation				
High flow nasal oxygenation				
Invasive ventilation: initiation, maintenance, and weaning				
High flow nasal oxygen				
Intravenous cannulation				
Interosseous line insertion				
Noninvasive Monitoring				

Central venous cannulation and CVP monitoring: USS guided				
Intra-arterial cannulation and invasive blood pressure monitoring				
Damage control resuscitation massive blood transfusion protocol				
Using Rapid Transfusion Pump				
Interpretation of Thromboelastogram				
Neuroprotective Ventilation measure				
ICP bolt insertion and monitoring ICP				
Burr hole and craniotomy				
Point of care ultrasonography • E-FAST • RUSH • Cardiac echo • Vascular scan USS guided procedures				
Chest drain insertion				
Needle thoracotomy				
Pericardiocentesis				
Closed manipulation and splinting of fractures				
Joint relocation - shoulder, elbow, and ankle				
Cast application				

Clinical Skills I Procedural skills				
Wound care and dressing				
Suturing techniques				
Pelvic stabilization				
Draining an Abscess				
Lumbar Puncture				
Pleura1 aspiration				
Paracentesis				

Joint aspiration				
Peritoneal dialysis catheter insertion				
Urinary catheterization and Suprapubic Catheter Insertion				
Nasogastric tube insertion				
Obtaining samples for microbiological investigations				
Cardiopulmonary resuscitation-ALS				
DC Cardioversion and defibrillation				
Electrocardiogram				
External Pacing				
Temporary Intravenous pacing				
Anterior Nasal packing				
Posterior nasal packing				
Fibro-optic nasolaryngoscopy				
Ophthalmoscopy				
Slit lamp examination				
Foreign body removal - eye				
Perform intermediate and minor. surgical procedures				
Assisting surgical procedures				
normal labor				
Perform and interpret CTG				
Caesarian _section- Emergency and routine				
Removal of retained placenta				
Neonatal Resuscitation				
Speculum and bimanual vaginal examination				
Blood grouping and cross matching				
Interand intra\hospital critically ill patient transfer				
Team leadership and acting as a team member				

Supervising and helping juniors				
Breaking bad news and consenting for procedures				
Effectively com1nunicates with patients & relatives				
Communicates and works well with other disciplines				
Follows instructions of senior colleague				
Clinical handing over				
Teaching medical studentsand other staff				

Acute Presentations Workup			
	Topic	**Work Up**	**Chapter**
A - Air Way **B - Breathing**	1. Allergy 2. Angioedema 3. Choking	Exclude anaphylaxis 1st then manage as allergy	2
	2. Breathlessness	SOB workup & Asthma workup.	10, 14.1
	3. Cough & Hemoptysis		10
	4. Sore throat	Fever pain score	7
	5. Ventilatory Support	Ventilator support workup	3,10
	6. Cyanosis	Cyanosis work up	10
C - Circulation	7. Palpitation	Tachycardiaworkup	9, 2.5, 2.6, 14.8
	8. Hypertensive emergency	Hypertensive Emergency workup	9.10
	9. Hyperkalemia	Hyperkalemia work up	12.4
	10. Chest pain	Chest pain workup	9
	11. Blackout/Collapse/Syncope (TLOC)	TLOC workup	9.7,11
	12. Dizziness/Pre syncope	TLOC workup-Syncope workup	7,9,11
	13. Hematemesis and Malena		13
	14. Oliguria/ Hematuria	AKI workup	6, 12
	15. Vaginal Bleeding		8
	16. PR Bleeding	Lower GI Bleeding work up	13.3
	17. Hypertensive Urgency	Hypertensive Emergency workup	9.10
D- Disability	16. Acute back pain	Back pain workup	5.16
	17. Aggressive /Disturbed behavior		18, 21
	18. Confusion and acute Delirium	Acute confusion workup	11, 14, 18, 14.2, 14.3, 14.5
	19. Dizziness/vertigo	Vertigo workup	7.8
	20. Falls	Fall workup	11
	21. Fits/ Seizures		11
	22. Headache	Exclude red flags	11
	23. Head injury		4
	24. Neck pain & Neck trauma	Neck pain workup	4, 7.20
	25. Pain Management	Pain workup	3.6
	26. Weakness and paralysis	Weakness and paralysis workup	4,11

	27. Mental Health		18
E- Exposure	28. Abdominal swelling, mass, constipation		6
	29. Abdominal pain and loin pain	Abdominal pain workup	6
	30. Fever	Fever workup Dengue discharge workup	15, 9.11, 20
	31. Poisoning- snake bite	Poisoning workup SLMA Snake bite Guideline	17,18
	32. Poisoning - Chemical	Poisoning workup Management of Poisoning Book	
	33. Poisoning- Plant	Poisoning workup Management of Poisoning Book	
	34. Poisoning- Drugs	Poisoning workup Management of Poisoning Book	
	35. Poisoning- Other	Poisoning workup Management of Poisoning Book	
	36. Pelvic Pain		8
	37. Vomiting/ Nausea		13.4, 8.8
	38. Jaundice		13
	39. ENT issues		7
	40. Rash		16
	41. Red Eye + Eye issues		7
	42. Diarrhea	Diarrhea workup	13
	43. Limb pain and swelling (atraumatic)	Limb pain and swelling (atraumatic) workup	5
	44. Traumatic limb and Joint injuries	Upper limb and lower limb injuries workup	4,5 For procedural sedation Ch 3.5
	45. Wound assessment		5
	46. Dog Bite	Dog Bite guideline	5

Pediatric Major

Pediatric Major	47. Anaphylaxis		19
	48. Apnoea, stridor, and airway obstruction		19
	49. Cardiorespiratory arrest		19
	50. Major trauma		19

	51. The shocked child		19
	52. The unconscious child		19
Acute paediatric presentations	53. Abdominal pain		6, 19
	54. Accidental poisoning, poisoning, and self-harm		17, 18
	55. Apparent life-threatening events (ATLE)		19
	56. Blood disorders		19, 20
	57. Breathing difficulties		19
	58. Concerning presentations		19
	59. Dehydration secondary to diarrhoea and vomiting		19
	60. Ears, nose, and throat (ENT)		7
	61. Fever in all age groups		15, 19
	62. Floppy child		19
	63. Gastrointestinal bleeding		19
	64. Headache		11, 19
	65. Neonatal presentations		19
	66. Ophthalmology		7
	67. Pain in children		3
	68. Painful limbs in children—atraumatic		19
	69. Painful limbs in children—traumatic		5, 19
	70. Rashes in children		16
	71. Sore throat		7

Reference

1. **Revision Notes for the FRCEM Intermediate SAQ Paper- Ashis Banerjee/ Clara Oliver**
2. **Management of Poisoning by Professor Ravindra Fernando**