Key Tables & Figures for Anesthesia Mini-OSCE

► Important

3- Shape of tube

- Regular, pre-formed or armored (Reinforced or non-kinkable)

- Regular (most used)
- Kinkable

- Oral tube
- "S" shaped (preformed)
- Used in nasal and maxillary surgeries

- Nasal tube
- "N" shaped (preformed)
- Used in oral and mandibular surgeries

- Non-kinkable
- Used in all surgeries
- Expensive
- Difficult to insert

It is armored (reinforced) with a wire, so you can bend it without kinking the tube.

Choice of LMA size

Volume of oxygen needed to fully inflate the cuff

Mask Size	Patient Size	Weight (kg)	Cuff Volume (mL)
1	Infant	<6.5	2–4
2	Child	6.5–20	Up to 10
2½	Child	20–30	Up to 15
3	Small adult	>30	Up to 20
4–5	Normal and large adult		Up to 30

Important

Endotracheal Tube *(Choice)*

Size of the tube

Number read at the lips

Age		Internal Diameter (in mm)	Depth of Insertion (in Cm)
Newnate or (full-term infant <1 month <3.5 kg weight)		2.5 - 3	9 - 10
Full term infant (non cuffed tube)		3.5	9 - 11
Child 1-12 years	Non-cuffed tube	4 + (Age/4)	12 + (Age/2) (12.5 - 18cm)
	cuffed tube	3.5 + (Age/4)	
Adult	Male	7.5 - 9	21 - 24
	Female	7 - 7.5	21 - 24

If you insert too deep it will enter the main bronchus (m/c the Rt)

>3.5kg <1 year

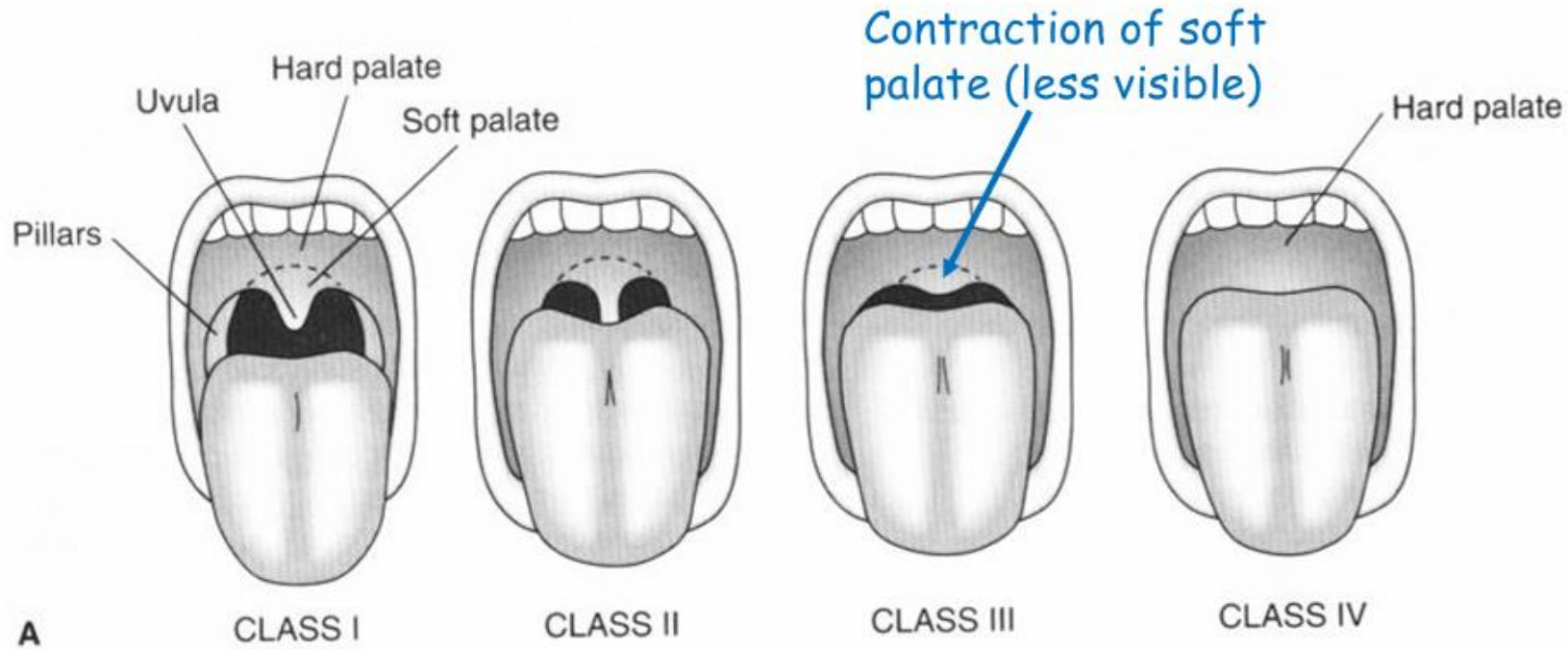
Endotracheal Intubation

- Airway assessment (must be done before intubation):

Feature	*Visualization of Larynx during laryngoscopy*	
	Likely Easy	*Likely Difficult*
History	free	Previous difficulty/snoring/ Neck pathology/radiation radiation causes stiffness of the tissues.
Facial Features:	symmetry	Asymmetry/Jaw recession
Pharyngeal view	Non-crowded	Crowded
Dental condition	Good	Protruding teeth/ mobile teeth
Head extension:	> 35 º	< 35 º
Neck length	Normal	Short
Mouth opening: > 2 fingers width	> 2 finger breadths (3 cm)	< 2 finger breadths
Thyro-mental distance: < 6 cm > 	> 6 cm	< 6 cm
Jaw protrusion ability.	able	Not able

Important

Mallampati classification (pharyngeal view)



Easy to intubate

Difficult to intubate

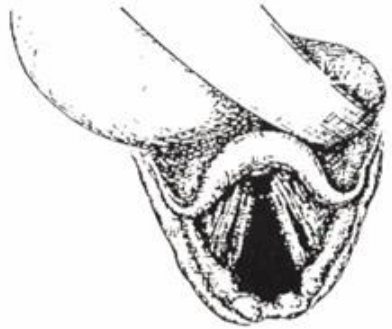
Class I: Soft palate, uvula, and pillars are visible.
Class II: Soft palate and uvula are visible, but the tonsillar pillars are not.
Class III: Soft palate and base of the uvula are visible.
Class IV: Soft palate is not visible at all (only hard palate is visible).

Important

Cormack – Lehane Classification

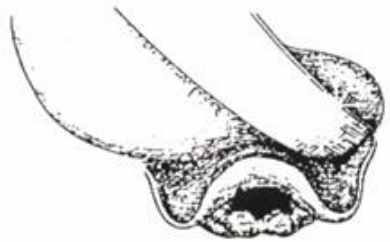
Laryngeal View Classification

Grade 1



View of all vocal cords
(full view of glottis)

Grade 2



Partial view of vocal cords
(lifts epiglottis only partially)

Grade 3

Only epiglottis seen

Grade 4

Cannot even see epiglottis, only tongue tissue (neither glottis nor epiglottis)
→ Visible with indirect laryngoscopy

Chart 1: The NEWS scoring system → Correlates vital signs with the risk of cardiac arrest

Dr. focused on scores 0 & 3

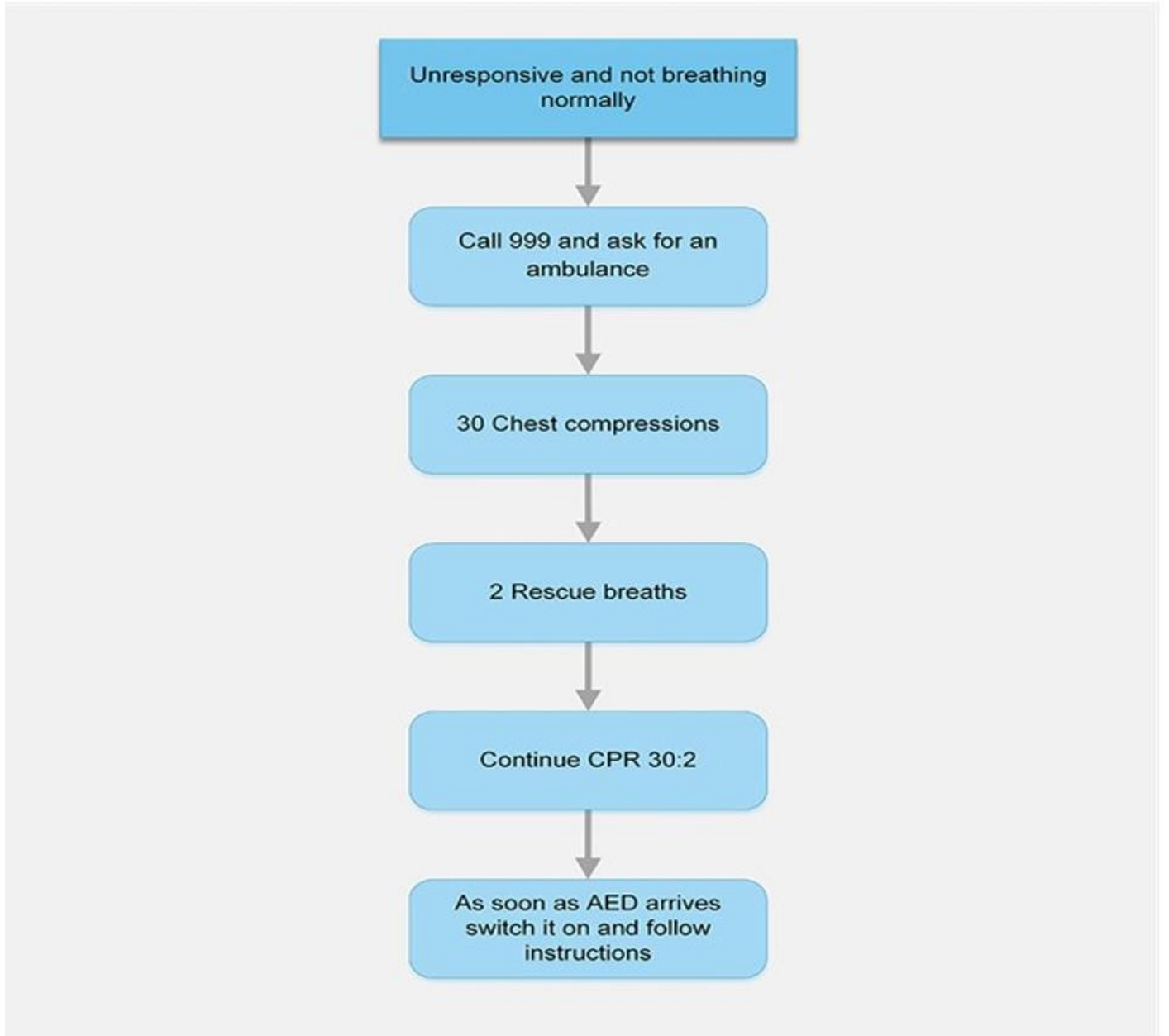
Physiological parameter	Score 3	2	1	0 (normal)	1	2	3
Respiration rate (per minute)	≤8		9–11	12–20		21–24	≥25
SpO_2 Scale 1 (%) for normal patients	≤91 PaO_2 = 60	92–93	94–95	≥96			
SpO_2 Scale 2 (%) for COPD patients	≤83	84–85	86–87	88–92 ≥93 on air	93–94 on oxygen	95–96 on oxygen	≥97 on oxygen
Air or oxygen? To increase SpO_2		Oxygen		Air			
Systolic blood pressure (mmHg)	≤90	91–100	101–110	111–219			≥220
Pulse (per minute)	≤40 bradycardia		41–50	51–90	91–110	111–130	≥131 tachycardia
Consciousness				Alert			CVPU
Temperature (°C)	≤35.0 hypothermia		35.1–36.0	36.1–38.0	38.1–39.0	≥39.1	

High supplemental oxygen in COPD patients leads to hyperoxia

Chart 2: NEWS thresholds and triggers

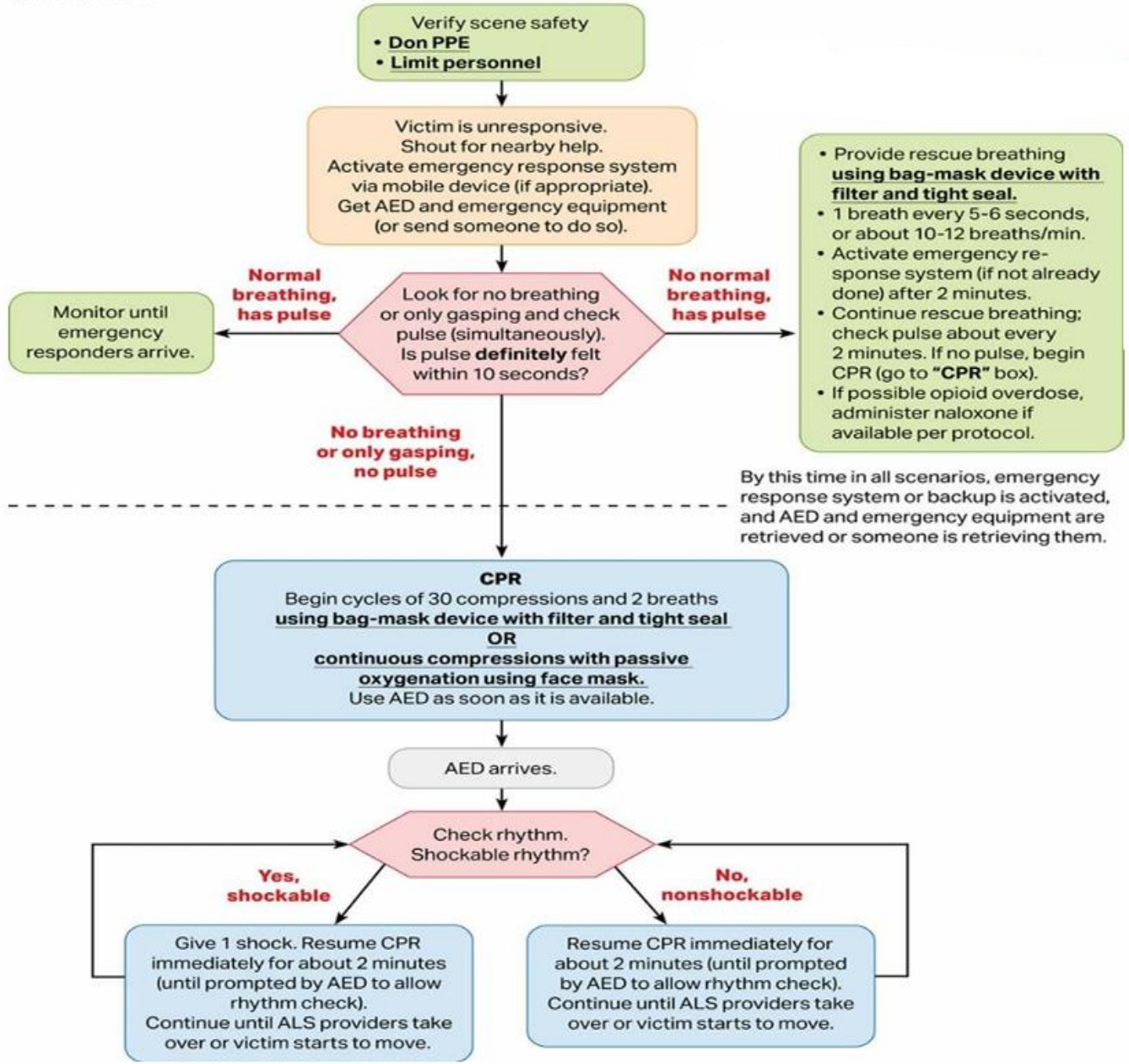
National Early Warning Score

NEW score	Clinical risk of cardiac arrest	Response
Aggregate score 0–4	Low	Ward-based response
Red score Score of 3 in any individual parameter	Low–medium	Urgent ward-based response*
Aggregate score 5–6	Medium	Key threshold for urgent response*
Aggregate score 7 or more	High	Urgent or emergency response**


Unresponsive and not breathing normally
Call 999 and ask for an ambulance
30 Chest compressions
2 Rescue breaths
Continue CPR 30:2
As soon as AED arrives switch it on and follow instructions

BLS Healthcare Provider Adult Cardiac Arrest Algorithm for Suspected or Confirmed COVID-19 Patients

Updated April 2020



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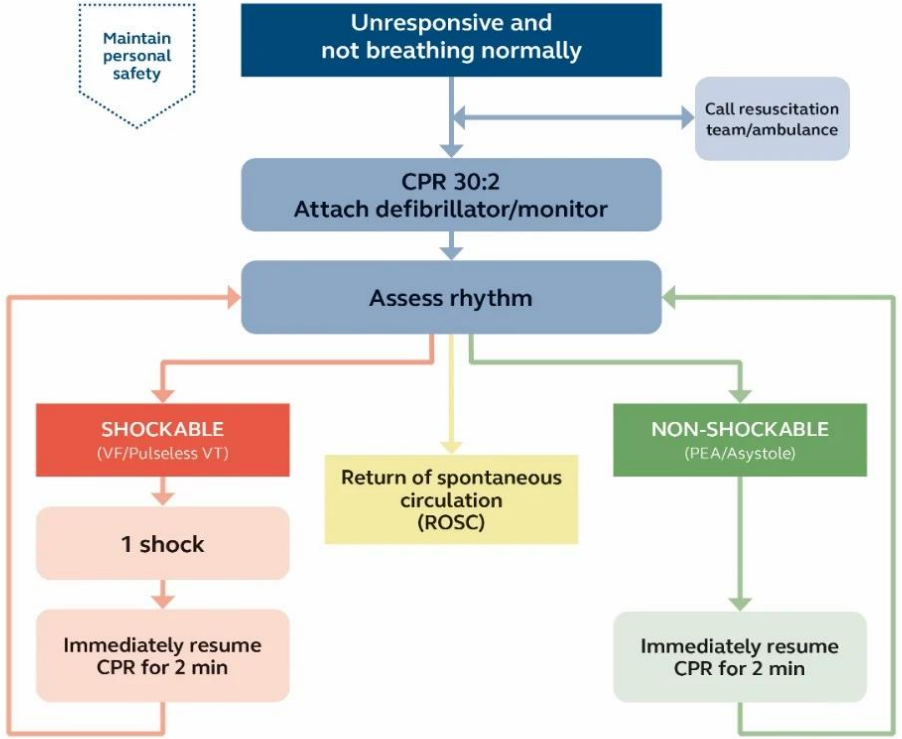
GUIDELINES 2021

Adult advanced life support



Give high-quality chest compressions, and:

- Give oxygen
- Use waveform capnography
- Continuous compressions if advanced airway
- Minimise interruptions to compressions
- Intravenous or intraosseous access
- Give adrenaline every 3–5 min
- Give amiodarone after 3 shocks
- Identify and treat reversible causes

Identify and treat reversible causes

- Hypoxia
- Hypovolaemia
- Hypo-/hyperkalaemia/ metabolic
- Hypo/hyperthermia
- Thrombosis – coronary or pulmonary
- Tension pneumothorax
- Tamponade – cardiac
- Toxins

Consider ultrasound imaging to identify reversible causes

Consider

- Coronary angiography/ percutaneous coronary intervention
- Mechanical chest compressions to facilitate transfer/treatment
- Extracorporeal CPR

After ROSC

- Use an ABCDE approach
- Aim for SpO_2 of 94–98% and normal $PaCO_2$
- 12-lead ECG
- Identify and treat cause
- Targeted temperature management

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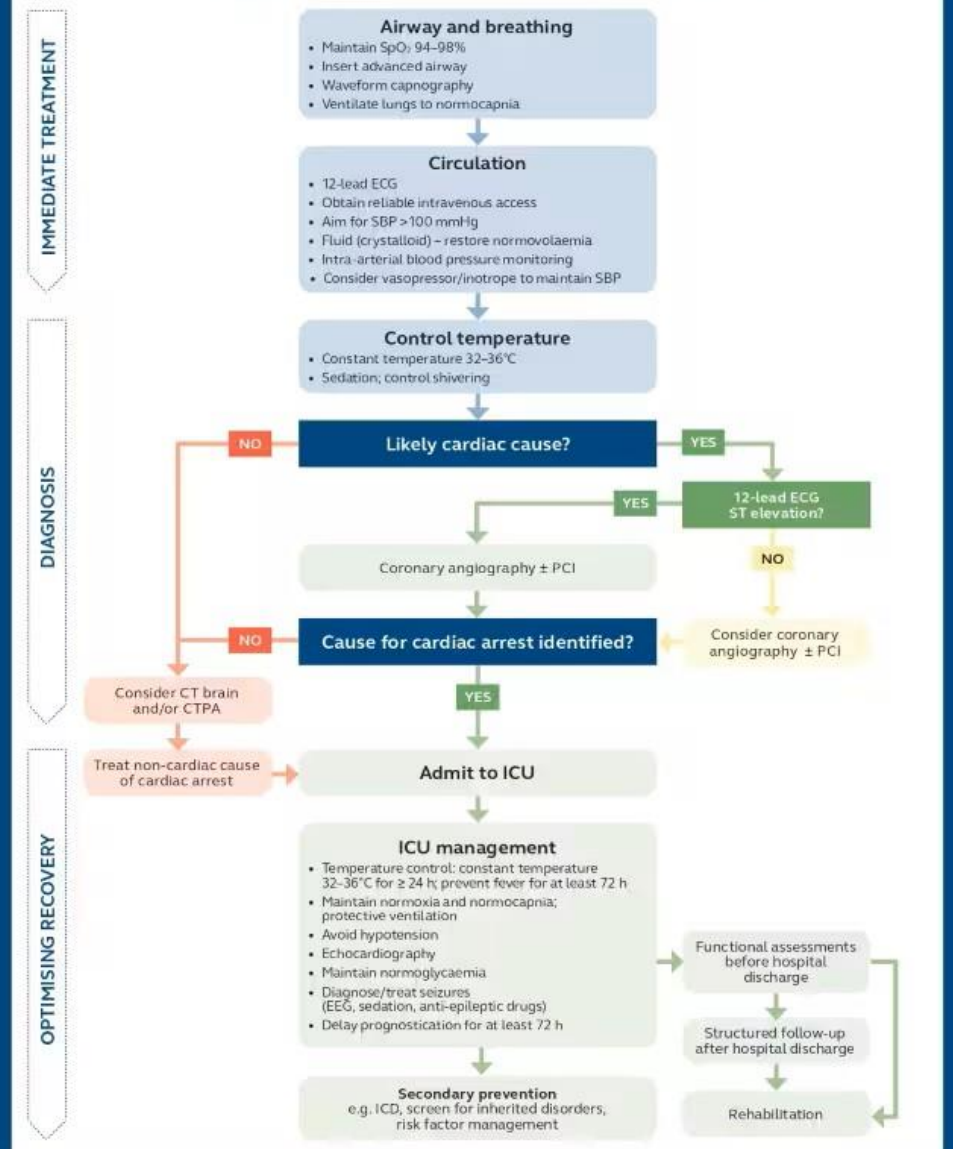
Adult post resuscitation care



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Adult tachycardia

Assess with ABCDE approach

- Give oxygen if SpO_2 < 94%
- Obtain IV access
- Monitor ECG, BP, SpO_2, record 12-lead ECG
- Identify and treat reversible causes e.g. electrolyte abnormalities, hypovolaemia causing sinus tachycardia

Life threatening features?

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

YES

Synchronised DC shock up to 3 attempts

- Sedation or anaesthesia if conscious

If unsuccessful:

- Amiodarone 300 mg IV over 10–20 min
- Repeat synchronised DC shock

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

If previous certain diagnosis of SVT with bundle branch block/ aberrant conduction:

- Treat 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

If ineffective:

- Verapamil or beta-blocker

IRREGULAR

Probable atrial fibrillation:

- Control rate with beta-blocker
- Consider digoxin or amiodarone if evidence of heart failure
- Anticoagulate if duration > 48 h

If ineffective:

- Synchronised DC shock up to 3 attempts
- Sedation or anaesthesia if conscious

Resuscitation Council UK

GUIDELINES 2021

Adult bradycardia

Assess with ABCDE approach

Give oxygen if appropriate and obtain IV access

Monitor ECG, BP, SpO_2, record 12-lead ECG

Identify and treat reversible causes e.g. electrolyte abnormalities

Evidence of life threatening signs?

- Shock
- Syncope
- Myocardial ischaemia
- Heart failure

YES

Atropine 500 mcg IV

Satisfactory response?

YES

NO

Interim measures:

- Atropine 500 mcg IV repeat to maximum of 3 mg
- Isoprenaline 5 mcg min^{-1} IV
- Adrenaline 2–10 mcg min^{-1} IV
- Alternative drugs*

or

Transcutaneous pacing

Seek expert help

Arrange transvenous pacing

NO

Risk of asystole?

- Recent asystole
- Mobitz II AV block
- Complete heart block with broad QRS
- Ventricular pause > 3 s

YES

NO

Observe

*** Alternatives include:**

- Aminophylline
- Dopamine
- Glucagon (if beta-blocker or calcium channel blocker overdose)
- Glycopyrrolate can be used instead of atropine

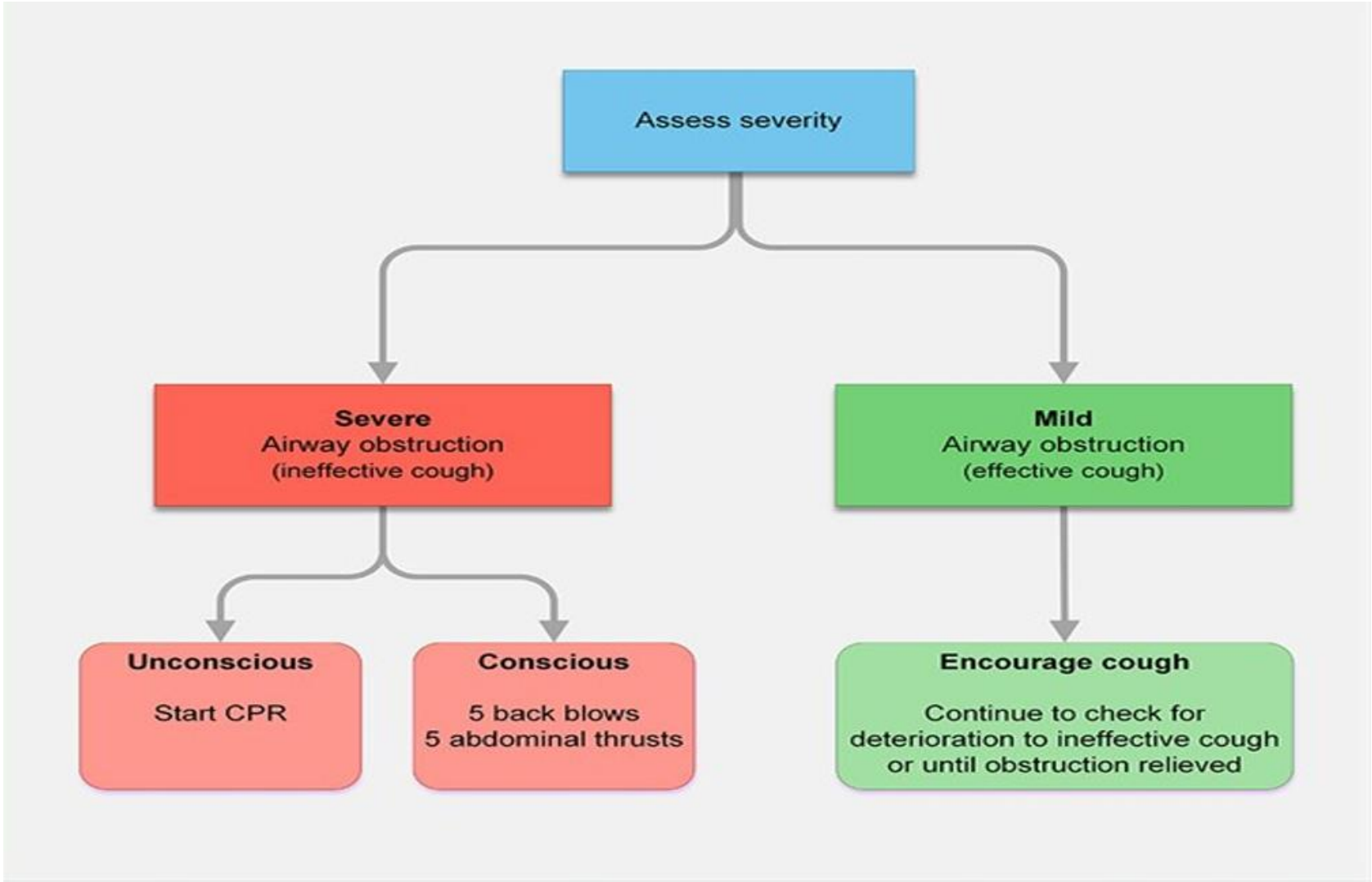
Cardioversion	Defibrillation
Elective planned procedure	Emergency life saving procedure
Synchronized shock	Un-synchronized shock
Low energy shock	High energy shock
There can be some delay	No delay, immediate
Anti-coagulation needed	No anti-coagulation needed
Less damage to myocardium	More damage to myocardium
Used in most of the arrhythmias except VT /VF	Used in VT / VF

Two types of defibrillators:

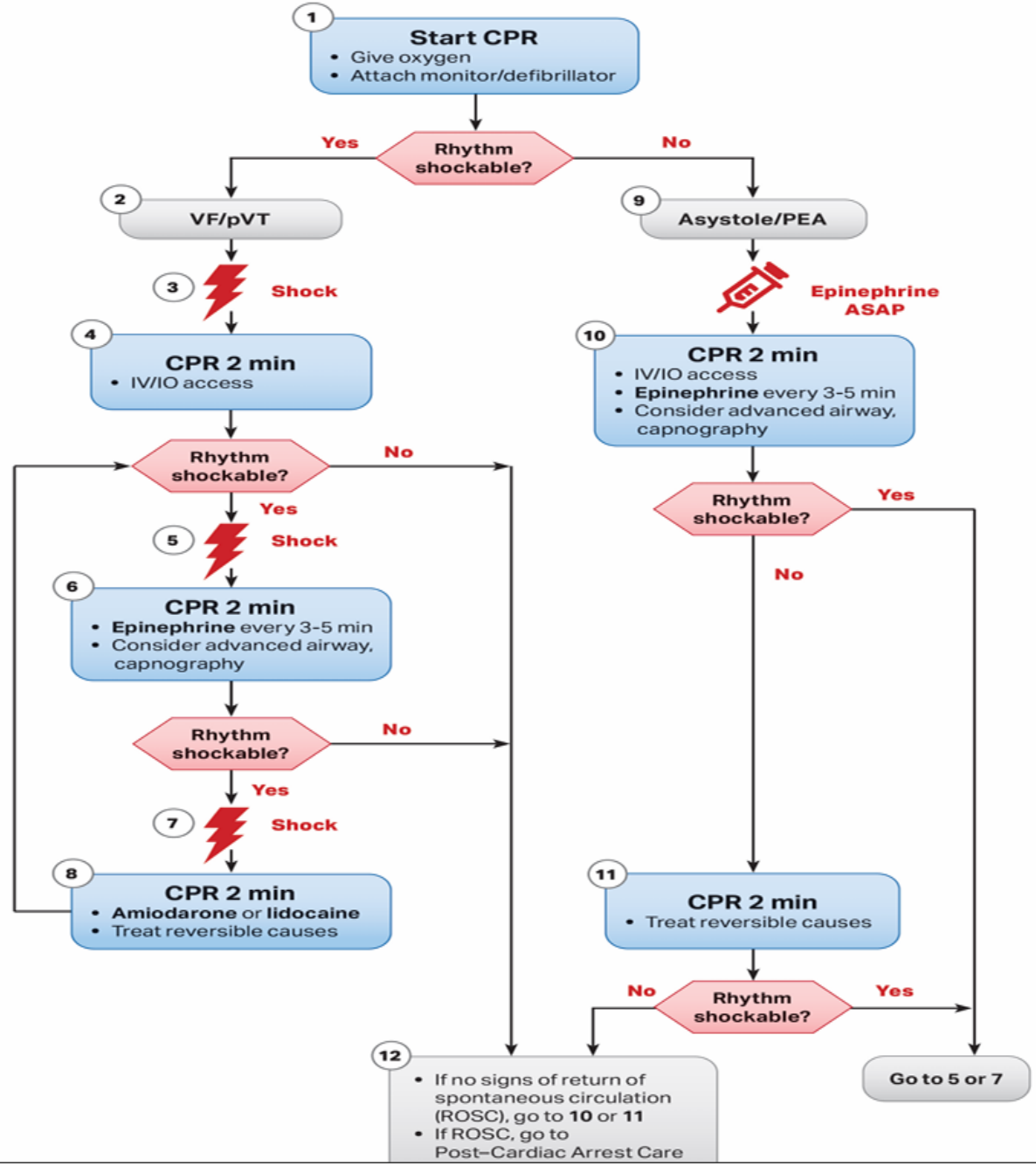
Overall better

Monophasic Defibrillation	Biphasic Defibrillation
current travels only in one direction	deliver current in two directions
It requires more electrical energy	It requires less electrical energy
It causes more trauma	It causes less trauma
It has more chances of burn	It has fewer chances of burn
It causes more myocardial damage	It causes less myocardial damage
First shock success rate is 60%	First shock success rate is 90%

Higher success rate



Adult choking algorithm



CPR Quality

- Push hard (at least 2 inches [5 cm]) and fast (100-120/min) and allow complete chest recoil.
- Minimize interruptions in compressions.
- Avoid excessive ventilation.
- Change compressor every 2 minutes, or sooner if fatigued.
- If no advanced airway, 30:2 compression-ventilation ratio.
- Quantitative waveform capnography
  - If P_{ETCO_2} is low or decreasing, reassess CPR quality.

Shock Energy for Defibrillation

- **Biphasic**: Manufacturer recommendation (eg, initial dose of 120-200 J); if unknown, use maximum available. Second and subsequent doses should be equivalent, and higher doses may be considered.
- **Monophasic**: 360 J

Drug Therapy

- **Epinephrine IV/IO dose:** 1 mg every 3-5 minutes
- **Amiodarone IV/IO dose:** First dose: 300 mg bolus. Second dose: 150 mg.
  or
  Lidocaine IV/IO dose: First dose: 1-1.5 mg/kg. Second dose: 0.5-0.75 mg/kg.

Advanced Airway

- Endotracheal intubation or supraglottic advanced airway
- Waveform capnography or capnometry to confirm and monitor ET tube placement
- Once advanced airway in place, give 1 breath every 6 seconds (10 breaths/min) with continuous chest compressions

Return of Spontaneous Circulation (ROSC)

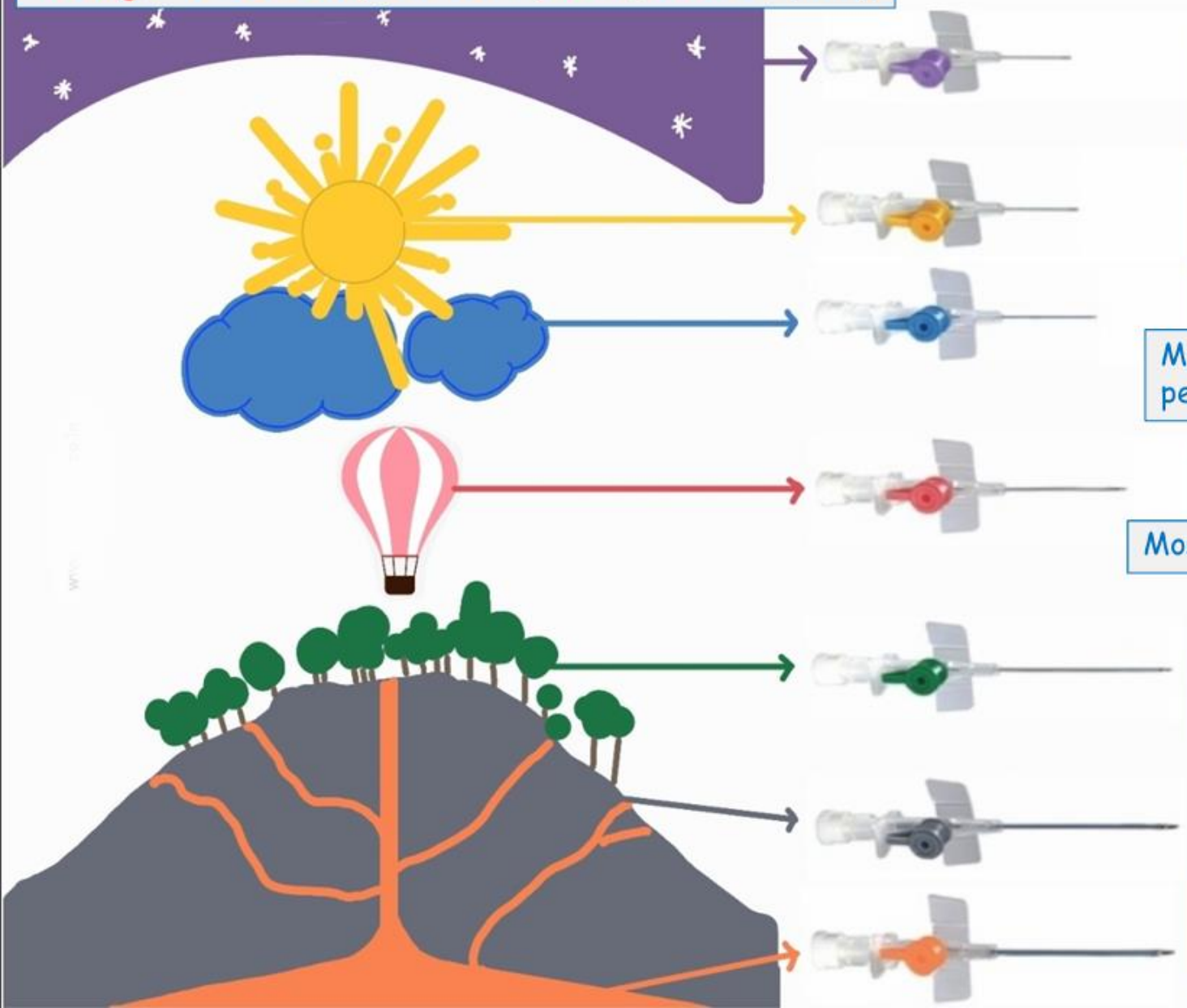
- Pulse and blood pressure
- Abrupt sustained increase in P_{ETCO_2} (typically ≥40 mm Hg)
- Spontaneous arterial pressure waves with intra-arterial monitoring

Reversible Causes

- **H**ypovolemia
- **H**ypoxia
- **H**ydrogen ion (acidosis)
- **H**ypo-/hyperkalemia
- **H**ypothermia
- **T**ension pneumothorax
- **T**amponade, cardiac
- **T**oxins
- **T**hrombosis, pulmonary
- **T**hrombosis, coronary

Important IV Cannula Gauge Sizes & Color Code -VISUAL MNEMONIC

↑Gauge → ↓size of cannula (↓diameter & flow)



COLOR	GAUGE	Flow Rate	Recommended Use
VIOLET	26	13mL/min	Elderly & Neonates
YELLOW	24	20mL/min	Very Fragile veins, Elderly & Pediatric patient
BLUE	22	36mL/min 31 mL/min	Chemotherapy Infusions, elderly and pediatrics.
PINK	20	60mL/min 54 mL/min	" Multipurpose IV " For medications & Hydration.
GREEN	18	90ml/min 85 mL/min	Blood Transfusion. Large volume Infusion
GREY	16	180mL/min	Trauma, Surgery, Large volume Infusion.
ORANGE	14	240mL/min	Massive trauma

Most common for pediatric patients

Most commonly used

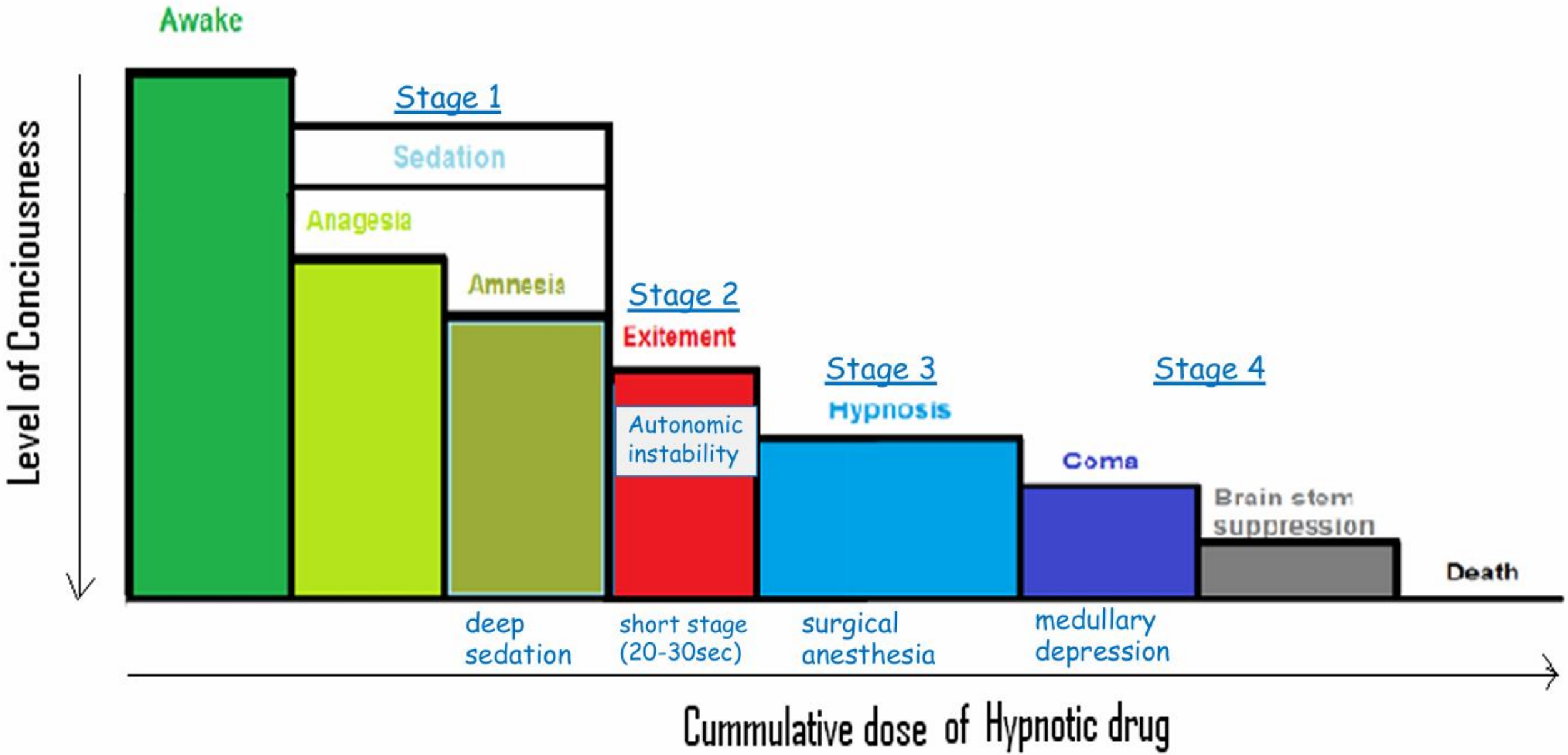
Maintenance of fluids

Prevention of aspiration ASA Fasting Guidelines

Clear fluid	**2 hours**	Water , Fruit juice withou pulp
Milk		
(breast milk) **Human**	**4 hours**	
Infant formula	**6 hours**	
Light Foods	**6 hours**	Fruits , juice with pulp Vegetables
Heavy foods	**8 hours**	Fatty meals , meat

We encourage patients to have water 2 hours before surgery because it ↓sensation of hunger postop

Synthetic milk needs more time to be emptied from the stomach


Awake
Stage 1
Sedation
Anagesia
Amnesia
Stage 2
Exitement
Autonomic instability
Stage 3
Hypnosis
Stage 4
Coma
Brain stem suppression
Death
Level of Conciousness
deep sedation
short stage (20-30sec)
surgical anesthesia
medullary depression
Cummulative dose of Hypnotic drug

Composition of Body Fluid Compartments

Ion	Plasma (mmol/L)	ICF (mmol/L)
Na+	143 (mainly extracellular)	9
K+	5	135 (mainly intracellular)

OUTPUT	
Urine	1500 ml
Gastrointestinal(faeces)	200 ml
Skin(sweat)	400 ml
Respiratory	400 ml
Total	2500
INTAKE	
Drinking (includes juice, coffee, etc.)	1500 ml
Eating	750 ml
Metabolism	250 ml
Total	2500

ELECTROLYTE	DAILY LOSS / REQUIREME NT	75 Kg PERSON PER DAY
Sodium	1-1.5 mmol/kg	75 - 112.5 mmol
Potassium	1-1.5 mmol/kg	75 – 112.5 mmol
Magnesium	0.1-0.2 mmol/kg	7.5 – 15 mmol
Calcium	0.1-0.2 mmol/kg	7.5 – 15 mmol
Chloride	0.07-0.22 mmol/kg	5.25 – 16.5 mmol
Phosphate	20-40 mmol/kg	1500 – 3000 mmol

Estimated Blood Volume (EBV)

Take into consideration the patient's weight

- Men 75 ml / kg — A 70kg man has 5L blood so he can tolerate 1L loss
- Women 65 ml / kg
- Infants 80 ml / kg
- Neonates 85 ml / kg
- Premature Neonates 96 ml / kg — A 2kg premature infant → start blood transfusion at 20ml (10%) blood loss

Ringer's Lactate (Hartman's)

Memorize the contents of Ringer's lactate:

- Na+ = 131 mmol/L (normal range 135-145mmol/L)
- Cl- = 111 mmol/L
- Lactate = 29 mmol/L
- K+ = 5 mmol/L (in the upper border 3.5-5.3mmol/L)
- Ca++ = 2 mmol/L
- PH = 6.5 acidic
- Osmolality = 279 mosm/L

  (osmolality of plasma is 275-300 so its osmolality is within range)
- Potential problem = potassium may accumulate due to its relatively high K+ content

Notice it is isotonic & isosmotic

Normal saline (0.9% saline solution)

- 9 g of NaCl/L water
- 154 mmol/L sodium (slightly high)
- 154 mmol/L chloride (high)
- Osmolality = 308 mosm/L (hyperosmolality)
- PH = 5.0 (acidic)
- Potential problem = hyperchloraemic metabolic acidosis, more likely with renal insufficiency

ASA risk score

Category	Health status	Examples
ASA 1	A normal healthy patient	Nonsmoker, BMI <30, non pregnant
ASA II	A patient with mild systemic disease	No functional limitations and a well-controlled m disease (e.g., treated hypertension, obesity with under 35, frequent social drinker, or cigarette sm pregnancy
ASA III	A patient with a severe systemic disease that is not life-threatening uncontrolled	Some functional limitation due to disease (e.g., poorly treated hypertension or diabetes, morbid obesity, chronic renal failure, a bronchospastic disease with intermittent exacerbation, stable angina, implanted pacemaker)
ASA IV	A patient with a severe systemic disease that is a constant threat to life uncontrolled + had a recent complication of the disease	(e.g., unstable angina, poorly controlled COPD, symptomatic CHF, recent (less than three months ago) myocardial infarction or stroke)
ASA V	A moribund patient who is not expected to survive without the operation	(e.g., ruptured abdominal aortic aneurysm, mass trauma, and extensive intracranial hemorrhage w mass effect)
ASA IV	A brain-dead patient whose organs are being removed with the intention of transplanting them into another patient.	

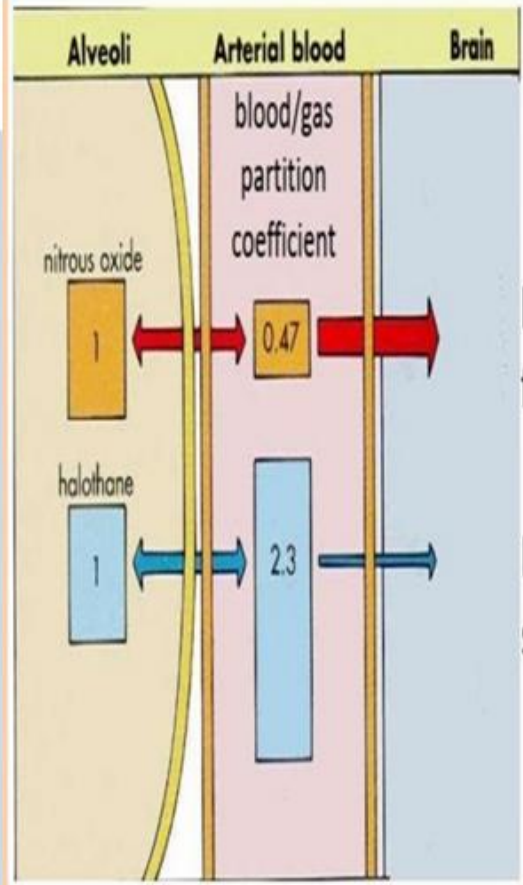
Receptor	Clinical Effect	Agonists
μ	Supraspinal analgesia (μ_1) Respiratory depression (μ_2) Physical dependence Muscle rigidity	Morphine Met-enkephalin[2] β-Endorphin[2] Fentanyl
κ	Sedation Spinal analgesia	Morphine Nalbuphine Butorphanol Dynorphin[2] Oxycodone
δ	Analgesia Behavioral Epileptogenic	Leu-enkephalin[2] β-Endorphin[2]
σ	Dysphoria Hallucinations Respiratory stimulation	Pentazocine Nalorphine Ketamine

Blood:Gas partition coefficient (λb/g)

- Blood compared to alveoli.
- Related to blood solubility and onset/offset.

High solubility in blood	Low solubility in blood
High blood/gas partition coefficient	Low blood/gas partition coefficient
- Slow induction and recovery	- Rapid induction and recovery
- Slow adjustment of depth of anaesthesia	- Rapid adjustment of depth of anaesthesia
(Blood acts as a reservoir (store) for the drug so it doesn't enter or leave the brain readily until the blood reservoir is filled)	(Because the blood reservoir is small the anaesthetic is available to pass into/out of the brain quicker)

Agent	Blood:gas coefficient at 37°C
Desflurane (fast onset/offset)	0.45
Sevoflurane	0.65
Isoflurane	1.4
Halothane (slowest onset/offset)	2.3
N_2O (fast onset/offset)	0.47



MORE POTENT?

LOW solubility in blood= fast induction and recovery

HIGH solubility in blood= slower induction and recovery

Agent	MAC (%)
Desflurane (least potent vapor)	6.6
Sevoflurane	2.0
Isoflurane	1.1
Halothane (most potent)	0.75
N_2O (least potent)	104

Non-Depolarizers

- ED95: We need to block at least 95% of the receptors to completely paralyze the patient
- If there is still some movement give a top-up dose → (1/16-1/10 of the initial dose)

Drug	Structure	Metabolism	Primary Excretion	Onset	Duration	Hist. Release	Vagal Blockade
Atracurium	Benzylisoquinolone	+++	x	++	++	+	0
Cisatracurium (used nowadays)	Benzylisoquinolone	+++	x	++	++	0	0
Mivacurium	Benzylisoquinolone	Cholinesterase enzymes	x	++	+	+	0
Doxacurium	Benzylisoquinolone	Insignificant	Renal	+++	+++	0	0
Pancuronium	Steroidal	+	Renal	+++	+++	0	++
Pipercuronium	Steroidal	+	Renal	+++	+++	0	0
Vecuronium	Steroidal	+	Biliary	++	++	0	0
Rocuronium (only steroidal used)	Steroidal	insignificant	Biliary	+	++	0	+

Muscarinic side effects of Cholinesterase inhibitors:

Parasympathetic activation

Organ System	Muscarinic Side Effects
Cardiovascular	Decreased heart rate, bradyarrhythmias
Pulmonary	Bronchospasm, bronchial secretions
Cerebral	Diffuse excitation[1]
Gastrointestinal	Intestinal spasm, increased salivation
Genitourinary	Increased bladder tone

Spinal Needle:

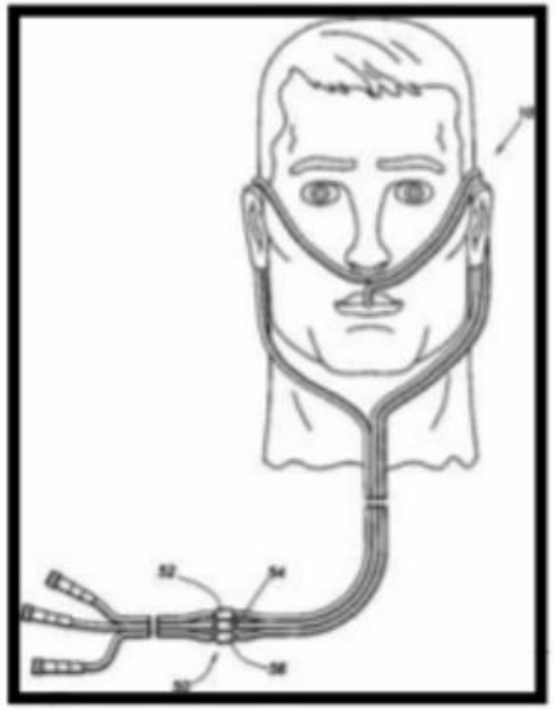
GAUGE	HUB COLOUR
18G	Pink
19G	Cream
20G	Yellow
21G	Green
22G	Black
23G	Blue
24G	Medium Purple
25G	Orange
26G	Brown
27G	Medium Gray

Complications of spinal anesthesia:

Complications	**Estimated frequency**	**Comments**
Direct nerve damage	1:10,000 – 1:30,000	No effective treatment
Spinal Haematoma	1:150,000 – 1:220,000	Requires urgent evacuation
Spinal infection	1:100,000 – 1:150,000	Aggressive Abs +/- evacuation
Drug error	Unknown	Avoidable, may be fatal
Systemic toxicity	Unknown	May be fatal without treatment
Respiratory depression	Unknown	Especially using opiods
Hypotension	Common	Early treatment needed
Confusional states	Common in elderly	Especially using opiods
Pruritis / nausea / urinary retention	Up to 16% incidence	Treat effectively
Technical failure	5-25%	Accept failure Consider alternative

Nasal cannula

- Simple plastic tubing + prongs with an over the ear adjustments.
- Sizing available for adults children and infants.
- Fio2 increases app. 1-2% with every increase in o2 flow per litre.
- Flow > 5lt/min is less tolerated due to flow jet in nasal cavity



1 - 24%
2 - 28%
3 - 32%
4 - 36%
5 - 40%
6 - 44%

Variable performance

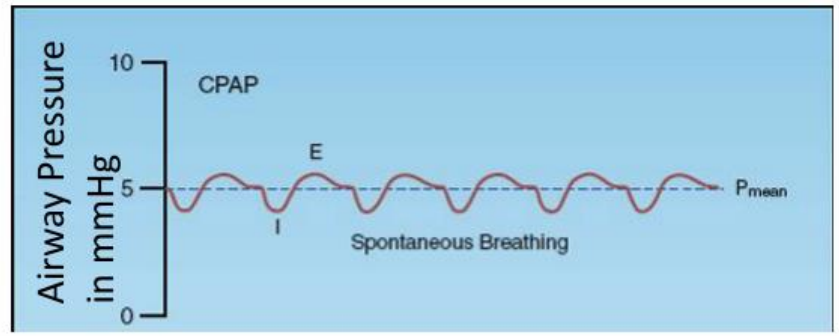
Table 6.2 Factors that affect the delivered FiO_2 in the variable performance masks

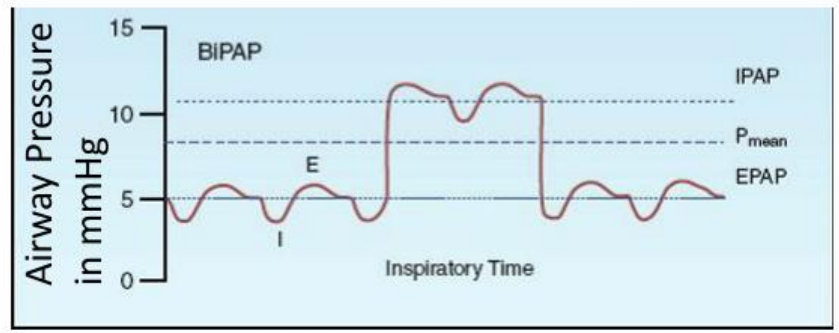
High FiO_2 delivered	Low FiO_2 delivered
Low peak inspiratory flow rate	High peak inspiratory flow rate
Slow respiratory rate	Fast respiratory rate
High fresh oxygen flow rate	Low fresh oxygen flow rate
Tightly fitting face mask	Less tightly fitting face mask

Venturi valve

Color	FiO2	O2 Flow
Blue	24%	2 L/min
White	28%	4 L/min
Orange	31%	6 L/min
Yellow	35%	8 L/min
Red	40%	10 L/min
Green	60%	15 L/min

Fixed Performance
Non invasive mechanical ventilation





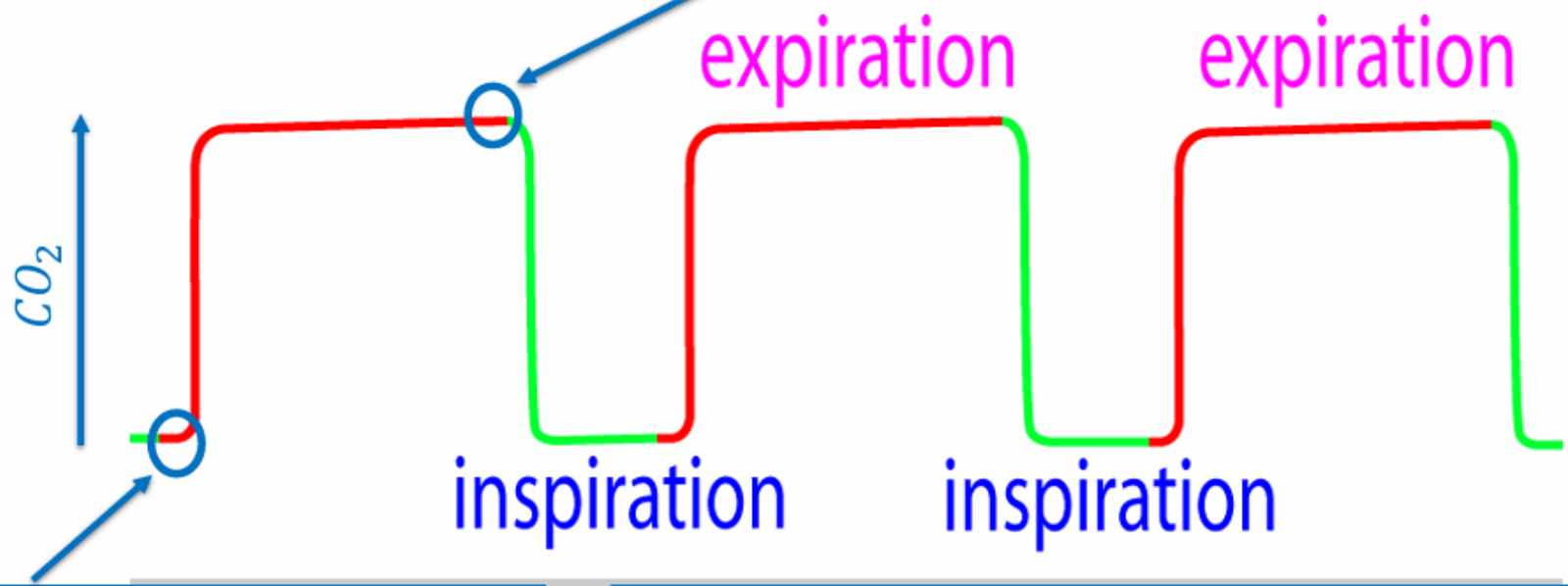
Classes of Hypovolemic Shock:

	Class I	Class II	Class III	Class IV
Blood Loss	< 750	750-1500	1500-2000	> 2000
% Blood Vol.	< 15%	15 – 30%	30 – 40%	> 40%
Pulse	< 100	**> 100**	> 120	> 140
Blood Pressure	Normal	Normal	**Decreased**	**Decreased**
Pulse Pressure	Normal	**Decreased**	**Decreased**	**Decreased**
Resp. Rate	14 – 20	**20 – 30**	**30 – 40**	**> 40**
UOP	> 30	**20 – 30**	**5 – 15**	**negligible**
Mental Status	sl. Anxious	mildly anx	**confused**	**lethargic**
Fluid	crystalloid	crystalloid	**blood**	**blood**

Respiratory system monitors

Capnography

The end tidal CO_2 is the closest value to the arterial CO_2, this is because it is from the gas in the bottom of the alveoli which is only separated from the arterial blood by an alveolar membrane (total equilibrium with the arterial blood is not possible because the membrane is semipermeable).

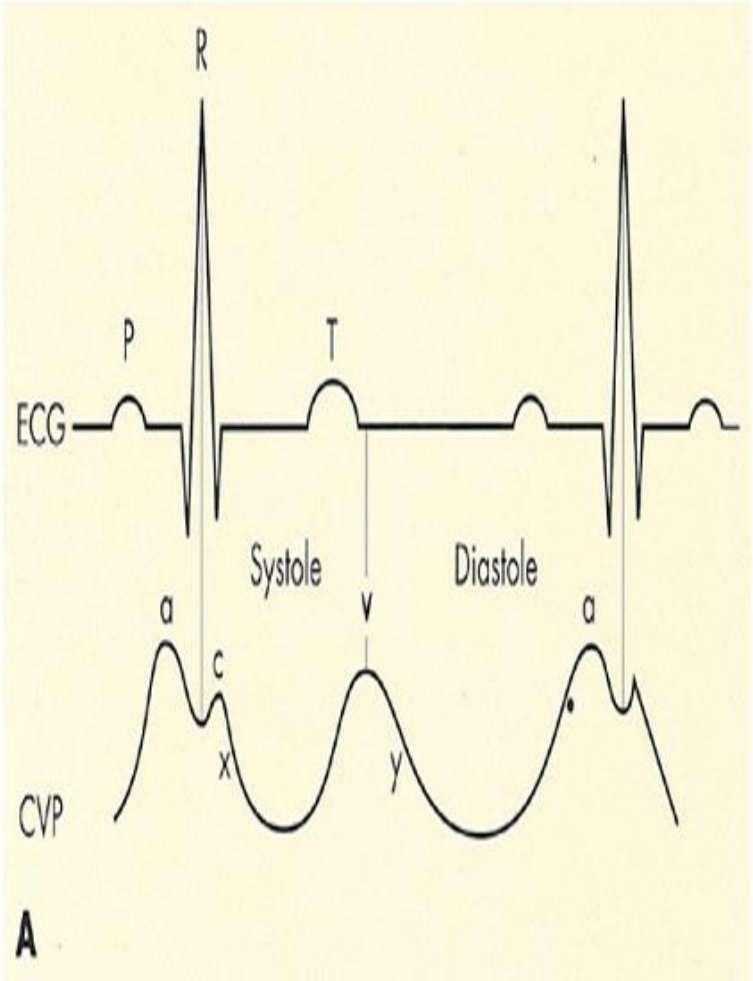


At the beginning of expiration, the gas is released from the dead space (no gas exchange occurs in the dead space so it has no CO_2) so the expiration wave starts at the zero line.

Once the gas starts to come out from the alveoli (where gas exchange occurs), the device starts to detect CO_2 and the wave goes up until it reaches a plateau, the plateau represents the real alveolar gas of the alveoli.

Invasive monitoring

Central Venous Line

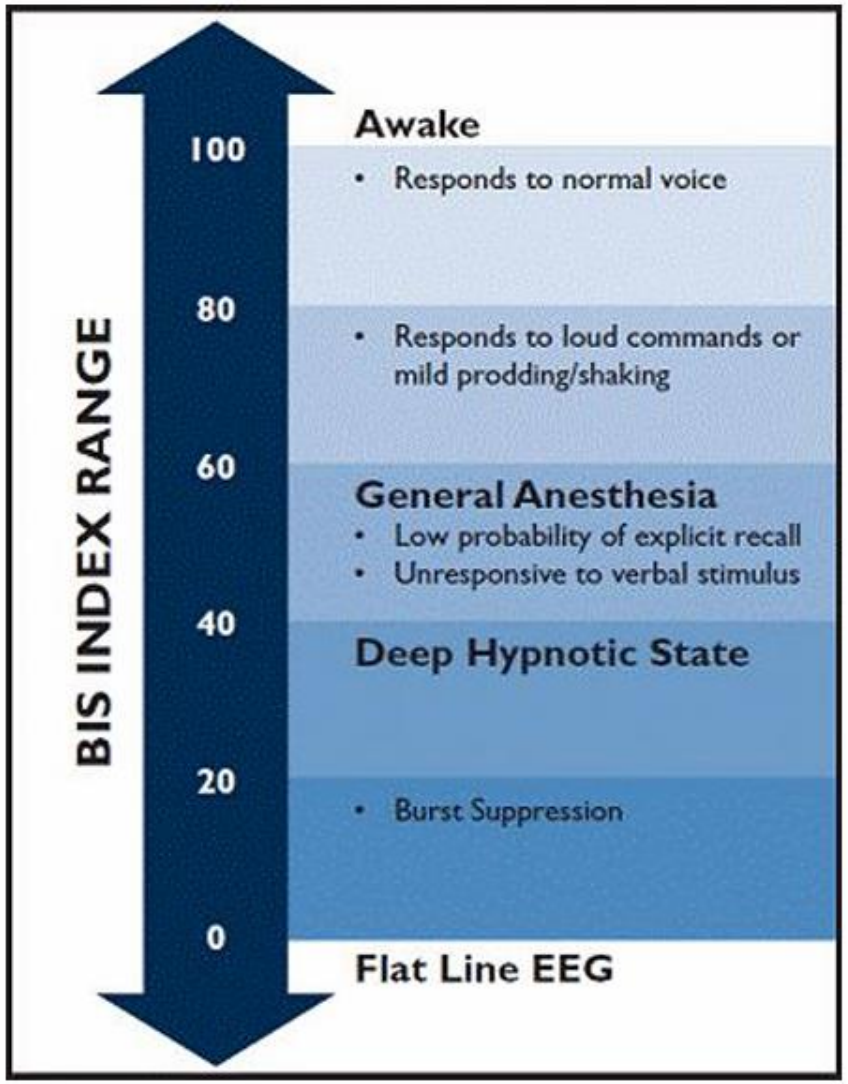


Component	Phase of Cycle	Event
a wave (+ve)	End diastole	Atrial cont (↑CVP)
c wave (+ve)	Early systole	Isovol vent cont (↑CVP)
x descent (-ve)	Mid systole	Atrial relaxation (↓CVP)
v wave (+ve)	Late systole	Filling of atrium (↑CVP)
y descent (-ve)	Early diastole	Vent filling (↓CVP)

Any abnormality in any wave on the CVP reflects where the abnormality is in the cardiac cycle.

BIS Device:


BIS
VISTA
52


BIS INDEX RANGE
100
80
60
40
20
0
Awake
• Responds to normal voice
• Responds to loud commands or mild prodding/shaking
General Anesthesia
• Low probability of explicit recall
• Unresponsive to verbal stimulus
Deep Hypnotic State
• Burst Suppression
Flat Line EEG

Goals for Resuscitation of The Trauma Patient

PARAMETER	GOAL
Blood pressure	Systolic 80 mmHg, mean 50-60mmHg
Heart rate	< 120 bpm
Oxygenation	SaO2 > 95%
Urine output	0.5ml/kg/h
Mental status	Following commands
Lactate level	<1.6mmol/l
Base deficit	> -5
Haemoglobin	>8.0g/dl

The rule of nine:- adults vs pediatrics

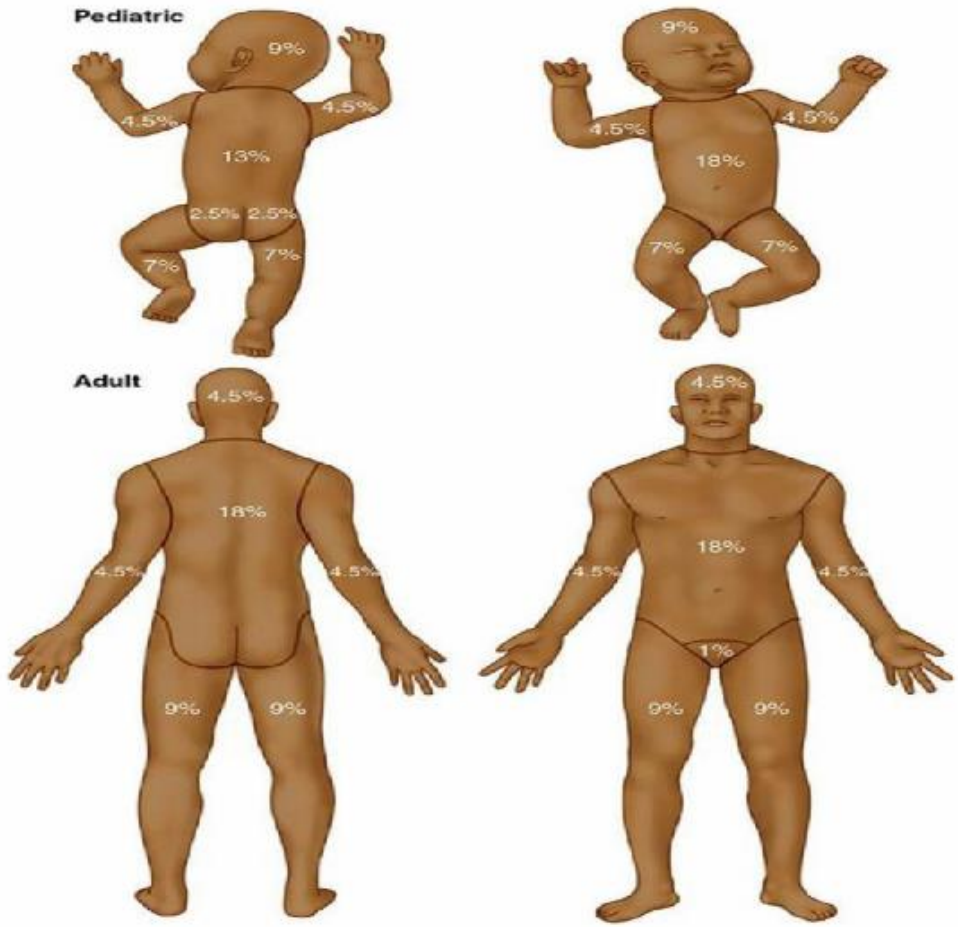


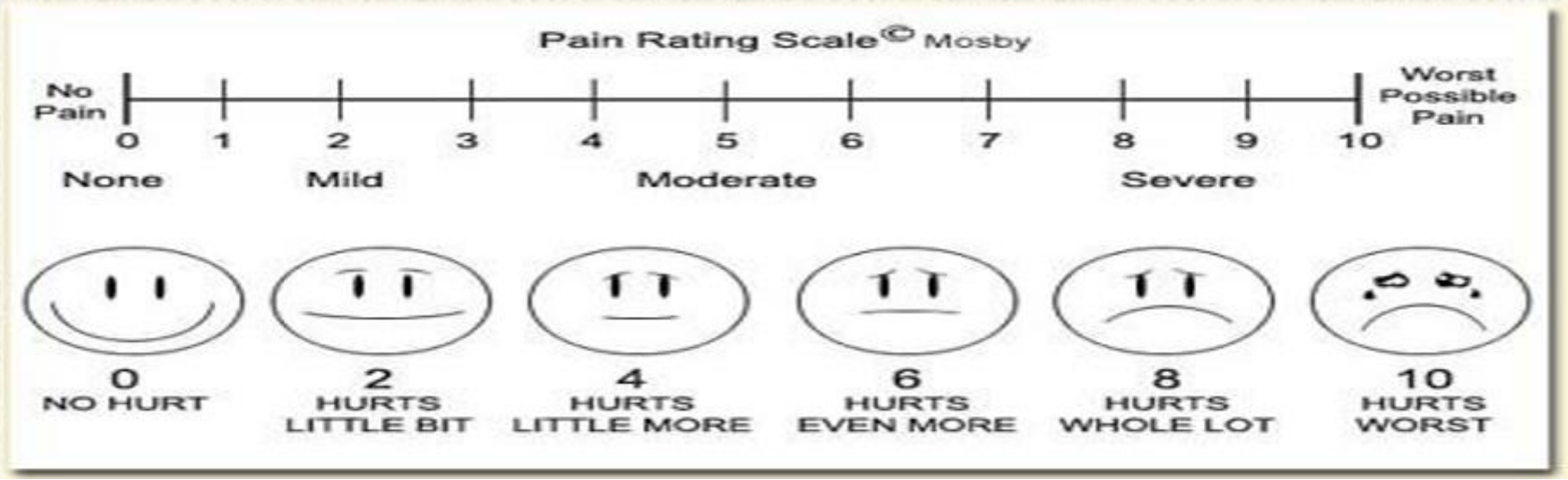
FIGURE 39–6 The Rule of Nines, utilized to estimate burned surface area as a percentage of total body surface area (TBSA). (Reproduced with permission from American College of Surgeons. *ATLS: Advanced Trauma Life Support for Doctors (Student Course Manual)*. 9th ed. Chicago, IL: ACS; 2012.)

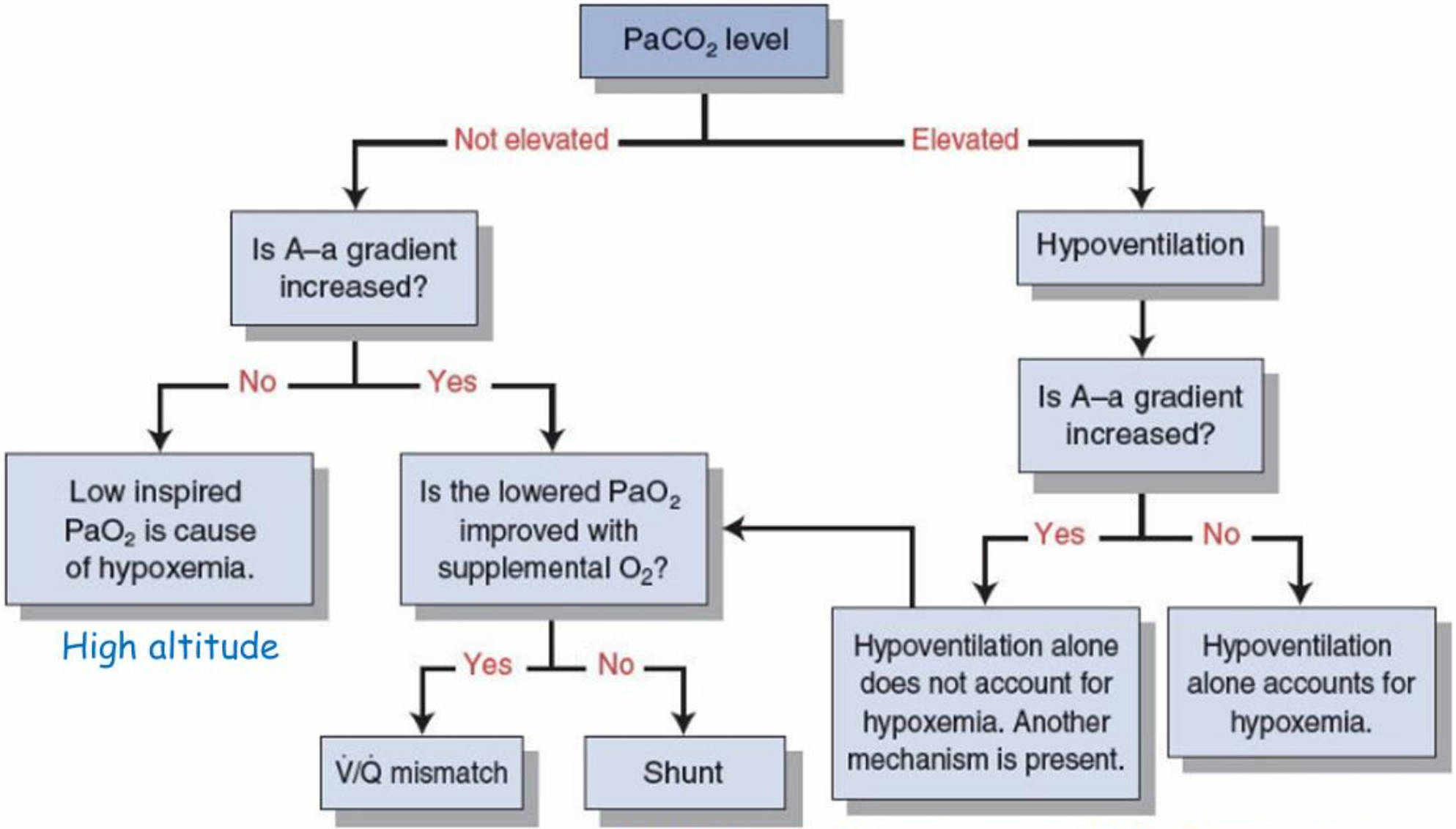
*Age-related changes in vital signs:

Age	Heart rate	SBP	Resp. rate
Newborn	110-170	> 60	30-50
1 year	100-160	> 80	< 40
5 years	80-130	> 90	< 30
> 10 years	< 90	> 90	< 20

Age	Size—Internal Diameter (mm)
Newborns	3.0–3.5
Newborn–12 months	3.5–4.0
12–18 months	4.0
2 years	4.5
>2 years	ETT size = (16 + age)/4

Pain assesment:





shunt is the only case that does not improve with 100% O2 supplimetation

FIGURE 2.12 **Evaluation of a patient with hypoxemia.**

THE WEANING PATH

Ready, weaning!

If:

- Reversal of cause for respiratory failure
- GCS ≥ 8
- Spontaneous breathing
- PaO_2/FiO_2 > 200
- Hemodinamic stability

Ready, breathing!

If:

- Reversal of cause for respiratory failure
- GCS ≥ 8
- Spontaneous breathing
- PaO_2/FiO_2 > 200
- Hemodinamic stability

- Able to cough
- O_2 saturation > 90% on FiO_2 ≤ 0.4
- RR < 35 bpm
- PEEP ≤ 8 cmH_2O
- RSBI < 105

Ready, extubation!

If:

- Reversal of cause for respiratory failure
- GCS ≥ 8
- Spontaneous breathing
- PaO_2/FiO_2 > 200
- Hemodinamic stability

- Able to cough
- O_2 saturation > 90% on FiO_2 ≤ 0.4
- RR < 35 bpm
- PEEP ≤ 8 cmH_2O
- RSBI < 105

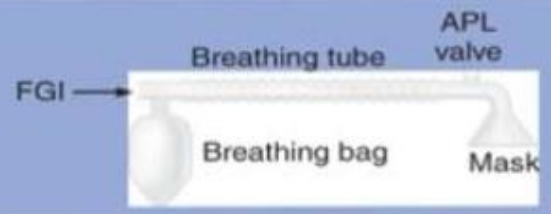
- Successful 30 minutes SBT

Rapid shallow breathing index (RSBI) =
TV/RR

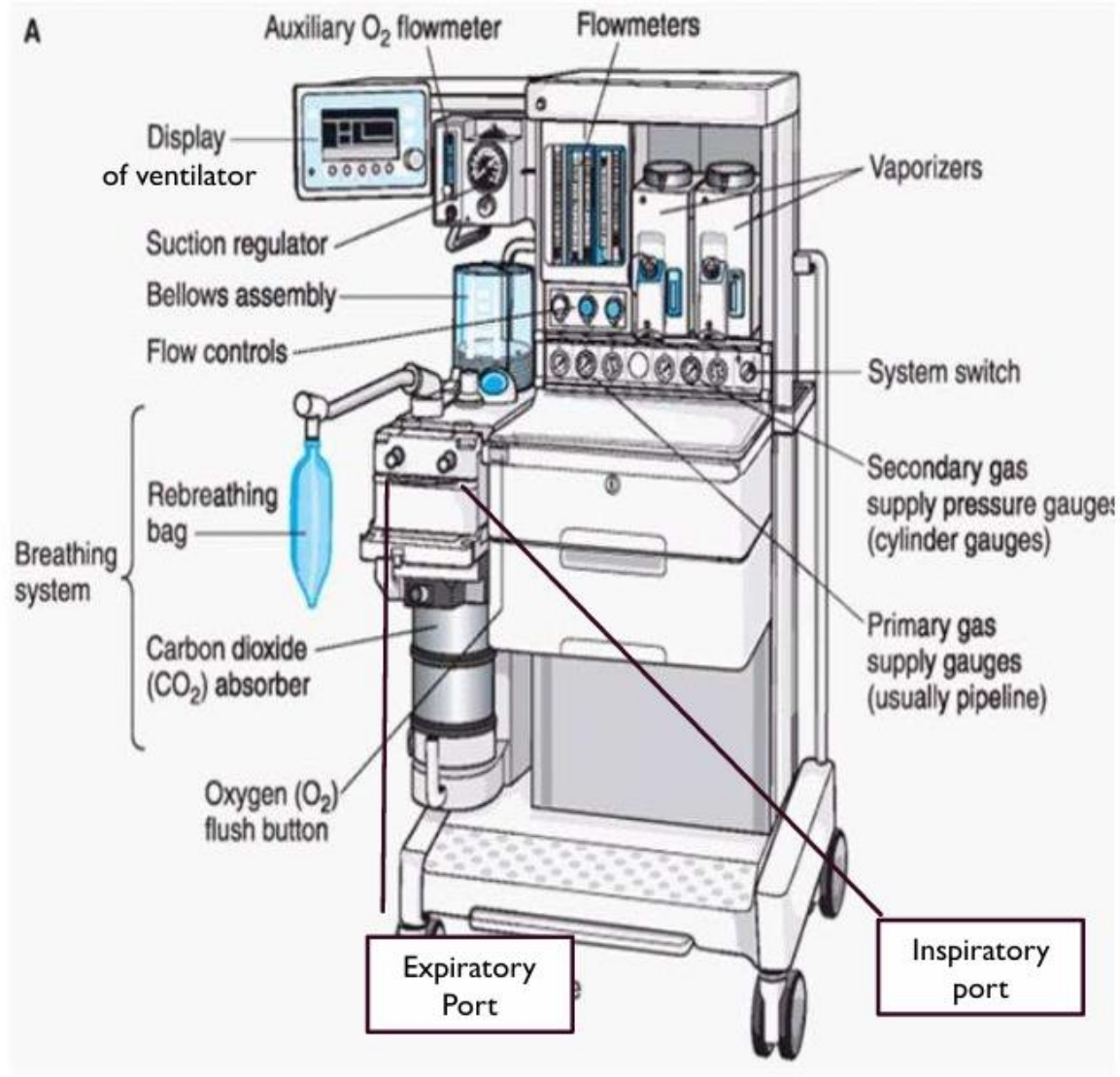
GAS CYLINDERS –COLOR CODING SYSTEMS – US VS UK

Gas cylinder	Color (US)	Color ISO (UK)
Oxygen	Green	White
Air	Yellow	Black & White
Nitrous oxide	Blue	Blue
Entonox® (50/50% O2/N2O)	Not available	Blue & White
Heliox (21/79% Helium/O2)	Brown & White	Brown & White

MAPILSON CIRCUITS

Mapleson Class	Other Names	Configuration[1]	Required Fresh Gas Flows: Spontaneous	Required Fresh Gas Flows: Controlled	Comments
A	Magill attachment		Equal to minute ventilation (≈80 mL/kg/min)	Very high and difficult to predict	Poor choice during controlled ventilaton. Enclosed Magill system is a modification that improves efficiency. Coaxial Mapleson A (Lack breathing system) provides waste gas scavenging.
B			2 × minute ventilation	2–2½ × minute ventilation	
C	Waters' to-and-fro		2 × minute ventilation	2–2½ × minute ventilation	
D	Bain circuit		2–3 × minute ventilation	1–2 × minute ventilation	Bain coaxial modification: fresh gas tube inside breathing tube.
E	Ayre's T-piece		2–3 × minute ventilation	3 × minute ventilation (I:E-1:2)	Exhalation tubing should provide a larger volume than tidal volume to prevent rebreathing. Scavenging is difficult.
F	Jackson-Rees' modification		2–3 × minute ventilation	2 × minute ventilation	A Mapleson E with a breathing bag connected to the end of the breathing tube to allow controlled ventilation and scavenging.


Med Gas Flowmeters
Ventilator Control Panel
Vaporizer
Bellows/ Bellows Housing
Med Gas Pressure Gauges
Bag Arm
Integrated Suction
Absorber System
Inspiratory Expiratory ports
O² Flush Button
CO2 Absorbent Canister
Auxiliary O² Flow Control


A
Auxiliary O_2 flowmeter
Flowmeters
Display of ventilator
Vaporizers
Suction regulator
Bellows assembly
Flow controls
System switch
Secondary gas supply pressure gauges (cylinder gauges)
Breathing system
Rebreathing bag
Primary gas supply gauges (usually pipeline)
Carbon dioxide (CO_2) absorber
Oxygen (O_2) flush button
Expiratory Port
Inspiratory port