Simulation: Tox (TCA)

Title:

Learning Objectives: (enter - identify/demonstrate etc) - technical/non-technical

1. Application of Toxicological approach (RRSIDEAD) to a resuscitation scenario
2. Making an adequate Risk Assessment in a Toxicological resuscitation in the setting of TCA (Dothiepin) overdose
3. Management of the patient with seizures/coma and cardiac toxicity in the TCA overdose patient
    a. Bicarbonate administration
    b. Intubation and hyperventilation to manage symptoms – pH 7.50-7.55
    c. Management of seizures with benzodiazepines
4. Display effective Non-Technical Skills in management of Toxicological Resuscitation

Take Home Points:

1. The importance of Risk Assessment in management of TCA overdose (>10mg/kg potentially life threatening)
2. The importance of Sodium Bicarbonate administration and hyperventilation for prevention of cardiac toxicity in TCA overdose

Sim Brief - Introduction, Familiarisation, Ground Rules, Basic Assumption

Case Stem (for participants) – Read out to participant at the start.

Brief case history. Typically ambulance handover style (MIST - Mechanism/Medical Complaint, Injuries/Illness, Signs & Symptoms, Treatment so far)

Pt. is 22yo Shenealle-Grey PeachFlower.
Called Ambulance after taking overdose of her medication following an argument with her boyfriend. 60kg pt.

Time of ingestion: 1hr prior
Dothiepin 75mg x 15 (15 left in pack) = 1125mg
Diazepam 5mg x 10 (40 left in pack) = 50mg
ETOH – mixed. BAL 0.03

PMHx:
Borderline PD
Past Suicide attempts

Medications:
Dothiepin 75mg OD
Temazepam 10mg nocte prn
Diazepam 5mg PRN for anxiety

Background Info (For instructors eyes only)

- 22yo lady.
- Ideal progression of Sim
    - Pt. wheeled in conscious but drowsy, slightly hypotensive but can give some history.
    - Ideally history taken, establish amount of tablets taken and make a risk assessment. Include PMHx and recognise life threatening dose is predisposing of Dothiepin (TCA)
    - Identify need for RSI, Intubation and Hyperventilation
    - Appropriate investigation – VBG, ECG, Paracetamol etc
    - Appropriate seizure management
    - Appropriate cardiotoxicity management
        - Repeat doses of Bicarb. 2mmol/kg 1-2minutely until resolution
    - There should be appropriate call for help (Tox. On-call + Senior ED physician help +/- ICU)
    - Appropriate disposition planning

Settings for SIM Man/Woman

Significant moulage not required
Settings as per already on ALSi iPad – tachycardia, normotension,

Equipment required

- Cardiac monitor/Defib
- ECG printouts – Prolonged QT, TdP, Bradycardia
- VBG/ABG printouts – low/normal pH – 2 VBGs
- Imaging printouts – CXR – normal. CXR with adequate intubation if required
- O2 +/- masks/NP
- IVC equipment
- Relevant specific medications - bicarbonate

- Relevant products - colloids/crystalloids/blood

Participants required

- ED Registrars – Team Lead, Airway, Circ/Defib
- Nursing Staff – at least airway + drugs, ideally defib. and scribe

Scenario Outline

Brief outline in table form of step-by-step progression of SIM
Include possible alternatives and end-points

Scenario Outline (Outline of what should occur at each stage)	Participant Response (Expected or ideal response)	Outcome (what do participants do, what happens to SIM mannequin)
Stem given to team	Role allocation. Plan of approach.	
Patient arrives with Ambulance	Patient transferred over. Handover given to team. Begin to obtain a history	Mannequin makes some groaning noises and confused mumblings. Obs should begin to be taken.
Assessment of patient	ABCDE approach ED Reg. reviews charts - Notices vital signs - Low BP - Tachycardia - RR 16 - GCS 14/15	A: Mumbles, confused words B: Clear C: Tachycardia and hypotensive - IV access ensured - Bloods sent, ABG/VBG D: GCS 14-15/15 E: nil relevant

Initial Treatment Patient Deterioration	Notice: - ECG displays widened QRS - pH low-normal Begin to take steps to remedy this	- Ideally begin relevant corrections for abnormal values immediately and display recognition of TCA OD risk. - Take step towards RSI - If inadequate progress, patient will have a seizure
Resus	- Pt. has seizure - Display appropriate seizure management - Will cease with benzodiazepines - Sats will drop until some airway maneouvres	- Team should progress to intubation
Ongoing Resus	- Pt. is intubated - Unless appropriate bicarbonate administration pt. will develop widening QRS - Pt. goes into VT unresponsive to defibrillation - Pt. will respond only if adequate bicarb. Given to pH target, and hyperventilated	- End Sim

Debriefing Objectives:

- Cover Toxicology of TCA OD
    - SNRI, GABA-antagonist, antimuscarinic, antihistamine, peripheral alpha receptor blockers
    - 10mg/kg and greater is potentially lethal
    - Peak 1-2 hours
    - Large Vd – plasma and tissue protein bound
- Discuss concept of bicarbonate administration
    - Improved fast sodium channel function mitigates na-ch blocker effect
    - Maximal at 7.50-7.55
    - 50ml 8.4% $NaHCO_3$ = 50mmol
    - 2mmol/kg (120mmol) every 1-2 minutes
    - Infusion = 150mmol in 850ml N/Saline at 250ml/hr
- ECG in TCA
    - NaCh blockade. QRS >100 = seizures. >160 = arrhythmias.
    - R wave >3mm aVR. Widened QRS.
- Relevant Non-Technical Skills.

Blood Gas 1

Sample (ABG/VBG)	Value	Reference Range
pH	7.30	7.35 - 7.45
pCO2	48	35 - 45 mmHg
pO2	50	75 - 100 mmHg (arterial)
HCO3-	21	22 - 26 mmol/L
Base Excess	0	-2 to +2 mmol/L
Hb	120	135 - 180 g/L
Na+	140	135 - 145 mEq/L
K+	3.5	3.5 - 5.0 mEq/L
iCa2+	0.90	0.90 - 1.15 mmol/L
Cl-	100	96 - 106 mmol/L
Anion Gap	24	22 - 26
Lactate	1.5	0.5 - 1.0 mmol/L
Bilirubin		
Creatinine	120	50 - 120 mmol/L

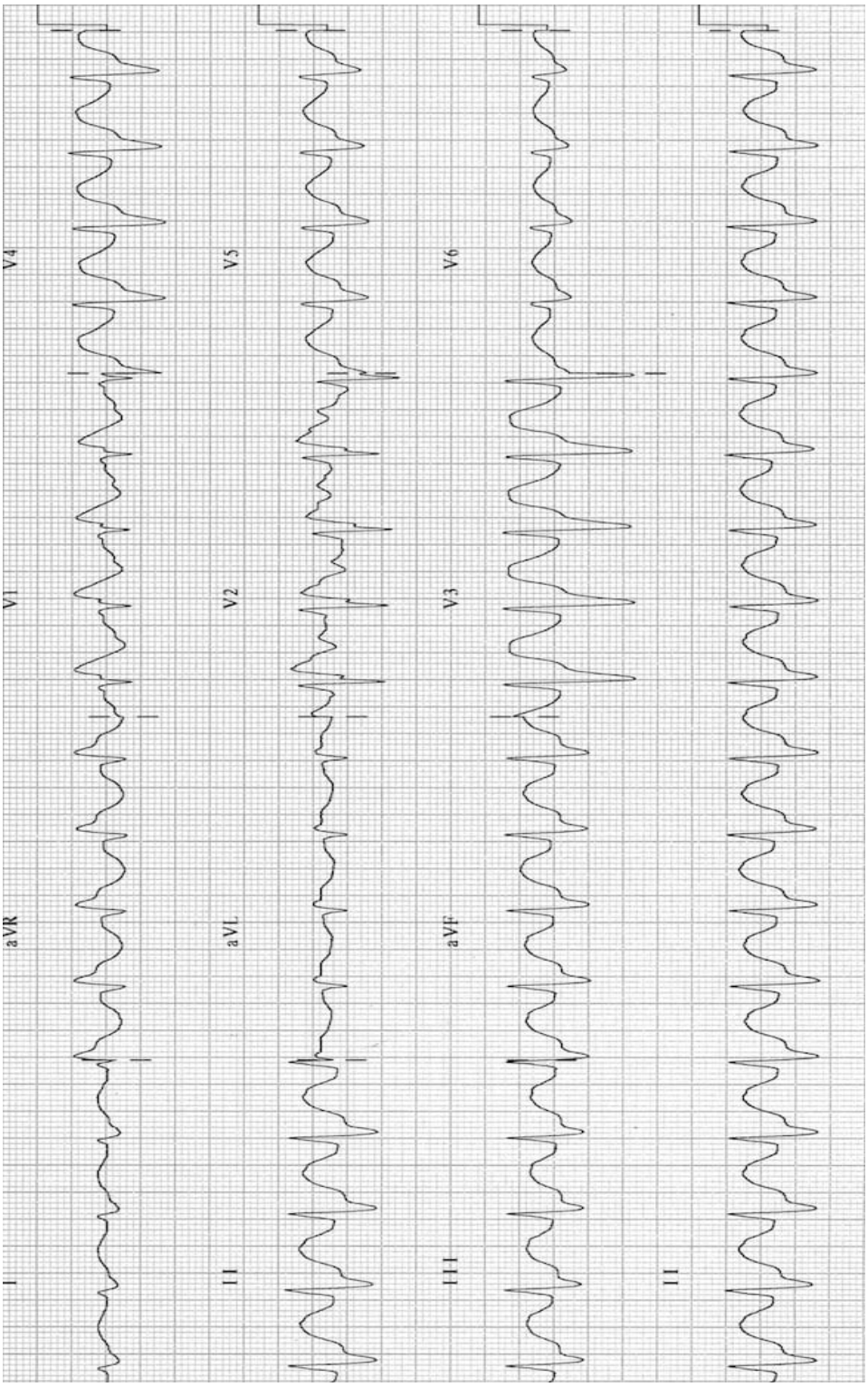
Blood Gas 2 (hyperventilation and bicarb)

Sample (ABG/VBG)	Value	Reference Range
pH	7.45	7.35 - 7.45
pCO2	30	35 - 45 mmHg
pO2	50	75 - 100 mmHg (arterial)
HCO3-	28	22 - 26 mmol/L
Base Excess	0	-2 to +2 mmol/L
Hb	120	135 - 180 g/L
Na+	140	135 - 145 mEq/L
K+	3.6	3.5 - 5.0 mEq/L
iCa2+	0.90	0.90 - 1.15 mmol/L
Cl-	100	96 - 106 mmol/L
Anion Gap	24	22 - 26
Lactate	1.8	0.5 - 1.0 mmol/L
Bilirubin		
Creatinine	120	50 - 120 mmol/L

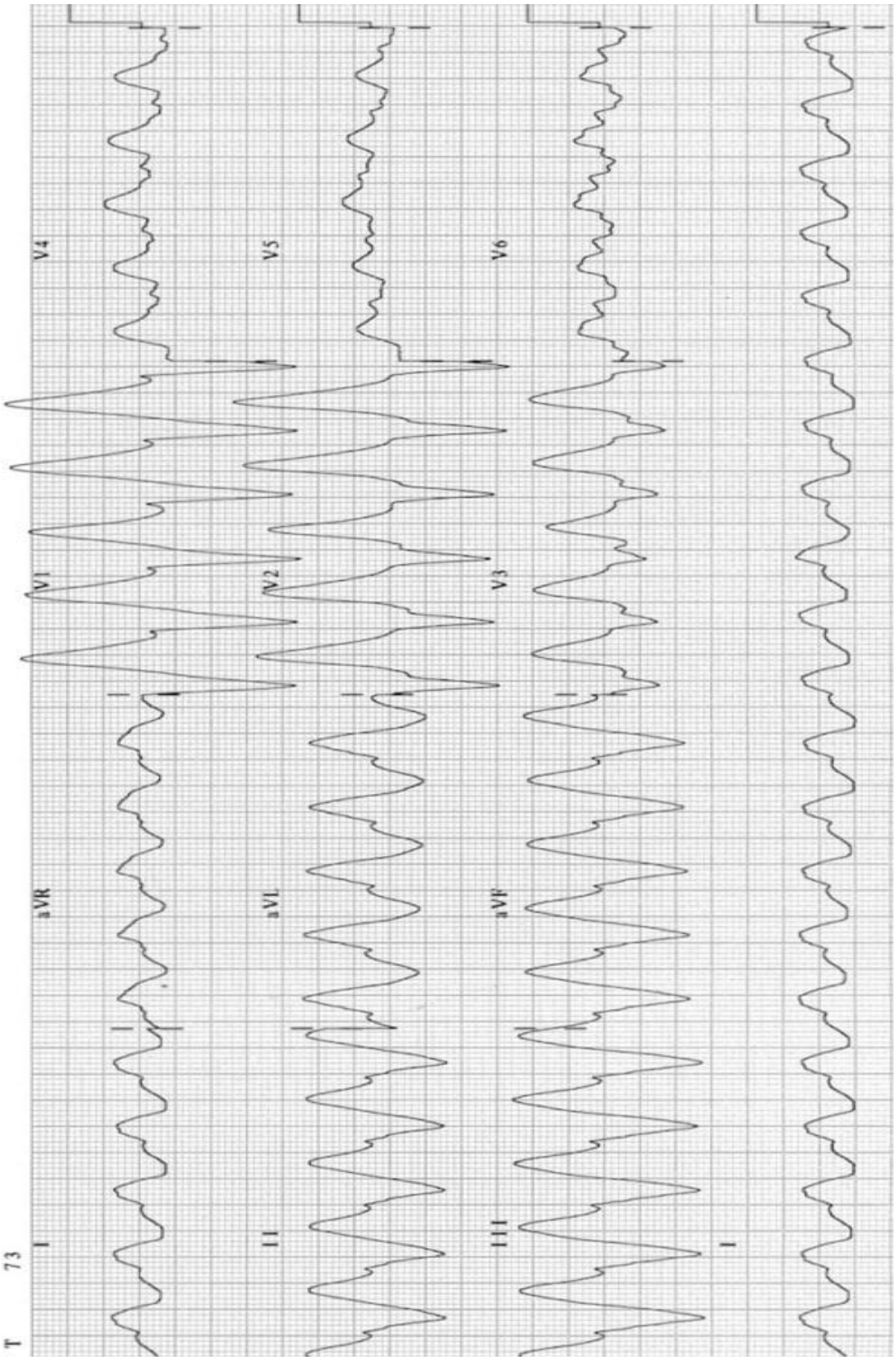
Blood Gas 3

Sample (ABG/VBG)	Value	Reference Range
pH	7.55	7.35 - 7.45
pCO2	29	35 - 45 mmHg
pO2	50	75 - 100 mmHg (arterial)
HCO3-	24	22 - 26 mmol/L
Base Excess	0	-2 to +2 mmol/L
Hb	120	135 - 180 g/L
Na+	143	135 - 145 mEq/L
K+	4.0	3.5 - 5.0 mEq/L
iCa2+	1.10	0.90 - 1.15 mmol/L
Cl-	100	96 - 106 mmol/L
Anion Gap	24	22 - 26
Lactate	1.5	0.5 - 1.0 mmol/L
Bilirubin		
Creatinine	120	50 - 120 mmol/L

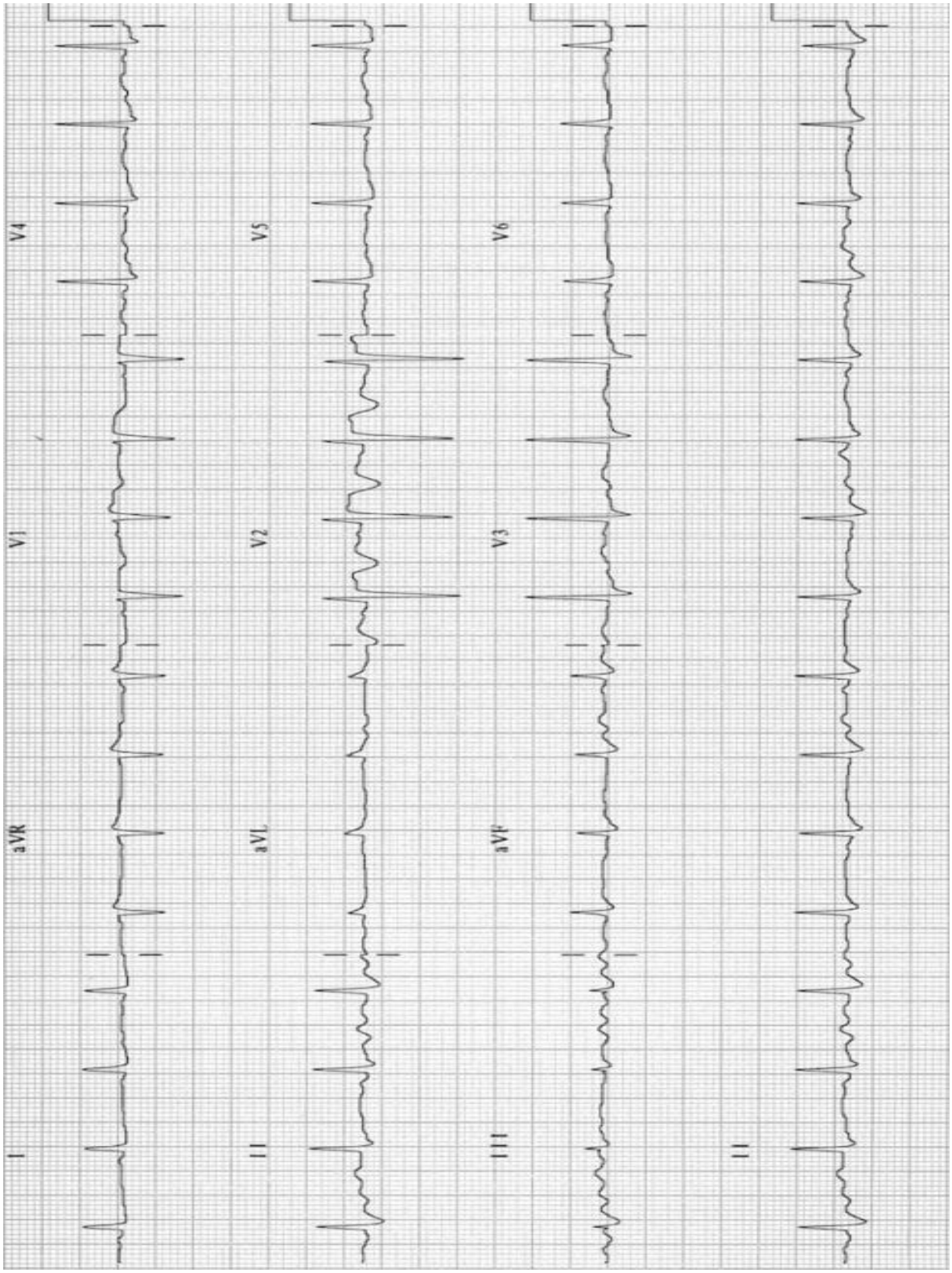
ECG 1



ECG 2



ECG 3



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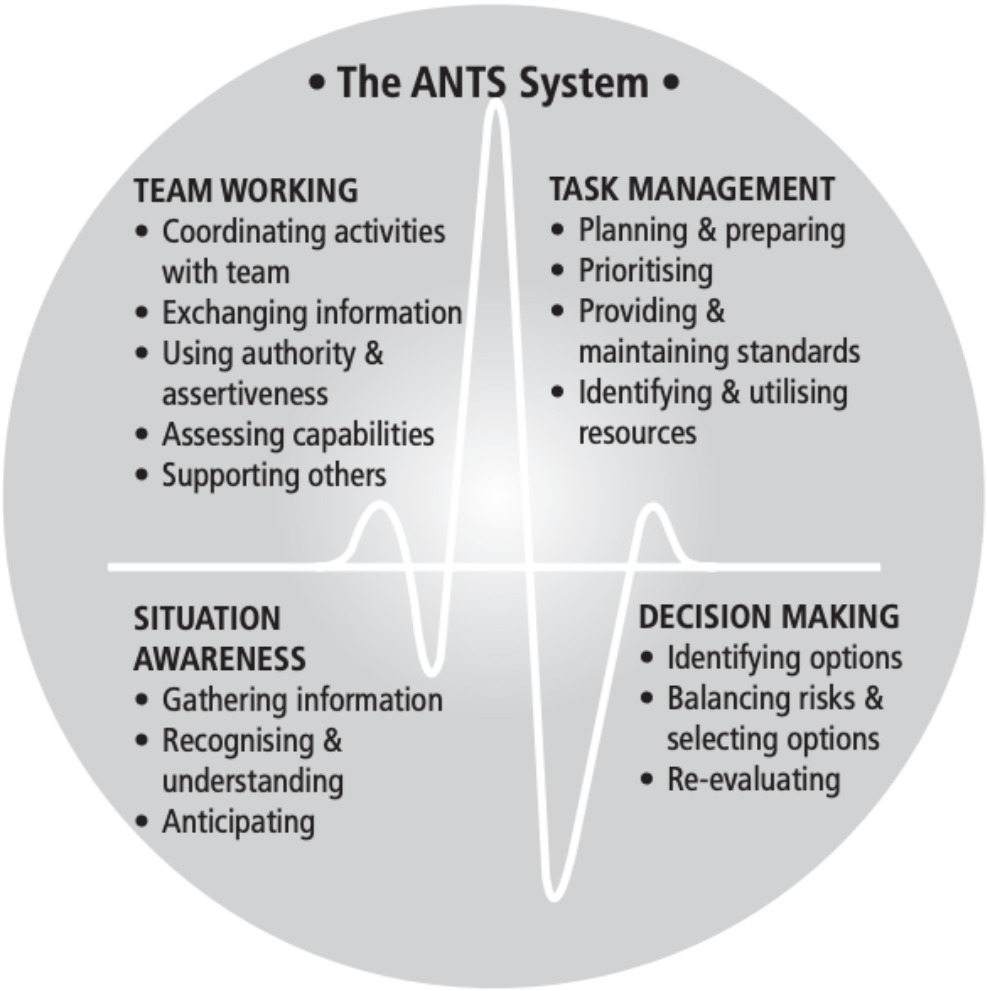
Non-Technical Skills

It is suggested to implement a consistent, frequent and repeated teaching of non-technical skills during SIM in order to entrain these skills.
The anaesthesia is a suggested framework that can be applied for the observation of SIM.
See below for a brief screenshot of the framework, and a link to the ANTS handbook for further information.
Feel free to choose your own approach here.



ANTS Framework
https://www.abdn.ac.uk/iprc/documents/ANTS%20Handbook%202012.pdf