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
	1. Bicarbonate administration
	2. Intubation and hyperventilation to manage symptoms – pH 7.50-7.55
	3. 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 wordsB: ClearC: Tachycardia and hypotensive- IV access ensured- Bloods sent, ABG/VBGD: GCS 14-15/15E: nil relevant |
| Initial TreatmentPatient 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% NaHCO3 = 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

# ECG TCA toxicity 3 resolution 2

# 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