

NALHN Booklet 1

Answers

SAQ 1 (18 marks)

A 67 year old male patient was brought into the ED by his family after he collapsed at home. His past medical history includes dialysis dependent chronic renal failure (secondary to diabetic nephropathy), hypertension, ischaemic heart disease and congestive cardiac failure.

His initial vital signs in ED are as follows:

GCS 15

BP 80/50

P 80

RR 30

SpO₂ 90% on air

(a) List 4 specific point of care / bedside tests which are indicated in this patient and state your justifications (8 marks)

Blood glucose level - hypoglycaemia

Serum K⁺ - hyperkalaemia

ECG – dysrhythmias secondary to hyperkalaemia

Bedside U/S – pericardial tamponade, pulmonary oedema

CXR – pulmonary oedema

Blood gas – acid-base status → expect metabolic and respiratory acidosis

Lactate – hypoperfusion, sepsis

Hb – critical anaemia

(b) An ECG is performed. List 3 diagnostic abnormalities in his ECG and state your unifying diagnosis (4 marks)

Peaked T waves

Abnormally wide QRS

Superior axis

Sinoventricular rhythm / sine-wave morphology

Diagnosis : critical hyperkalaemia

(c) In view of the ECG findings, state 3 priorities of treatment to address this specific abnormality and the critical interventions you would institute to achieve these goals (6 marks)

Stabilise myocardium : calcium chloride or calcium gluconate

Move K⁺ from extracellular to intracellular space : salbutamol, insulin / dextrose, bicarbonate

Remove K⁺ : haemodialysis

Pass marks a 7/8 b 3/4 c 4/6 total 14/18

SAQ 2 (18 marks)

A 70 year-old female with a known seizure disorder has self-presented to your rural ED at 2am after brief <1min seizure (she lives several hours out of town with her husband).

Her past history also includes middle cerebral artery stroke with no residual focal deficits, hypertension and hypercholesterolaemia.

Her seizure disorder is managed on levetiracetam and she has not had a seizure for 2 years. She had missed 7 days of her anticonvulsants while she was travelling interstate.

Her observations are:

PR 90
BP 130/70
SaO2 97% RA
RR 18
Temp 37.3

She has isolated right shoulder pain without evidence of injury in other locations.

Her X-ray is included in the **props booklet**.

a. Describe the findings on the X-Ray. **(2 marks)**

- Anterior shoulder dislocation
- Greater tuberosity fracture

Must state direction of dislocation/Hills Sachs NOT an acceptable answer – zero score if direction stated or incorrect direction of dislocation

b. List your three (3) treatment priorities for this patient with brief details of each **(6 marks)**

Management Priority (3 marks)	Details (3 marks)
Analgesia to facilitate assessment and relieve symptoms	Appropriate therapy with oral (per pain ladder) Nitrous IV opiates etc MULTIPLE OPTIONS
Reduction of shoulder dislocation	Any appropriate method - can attempt non sedated method e.g. cunninghams Appropriate sedatio and analgesia for given method NOTE: min displaced greater tuberosity doesn't preclude ED reduction – some methods e.g. Kochers rely on an intact greater tuberosity and are less suitable

Provision of anticonvulsant loading/reinstitution of anticonvulsant therapy	Keppra 20mg/kg loading Or other alternative medication appropriate Reinstitute previous dosing regimen
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c. List three (3) important components of discharge planning for this patient with brief details of each. **(6 marks)**

Discharge plan (3 marks)	Details (3 marks)
Discharge advice	Wearing a sling for min 3 weeks/till seen in fracture clinic Active exercises of wrist and elbow +/- physio Avoid abduction Ensure that takes anticonvulsants/analgesic regime
Appropriate follow up (may be clumped in with discharge advice – will gain both marks if so)	Fracture clinic follow up in 1-2 weeks (this may be telehealth given rural location) Neurology clinic/GP follow up for seizure management
Counselling RE seizures and driving/other safety measures/report to MVR	Advise patient not to drive and notify MVR - patient may be driving again as has been seizure free on meds for several years No swimming in sea/climbing ladders/other dangerous pursuits

Prior to commencing any treatment the patient asks whether there are any likely complications from the injury.

d. List four (4) potential complications from this injury. **(4 marks)**

- Impingement of greater tuberosity fragment under the acromion – reduced ROM
- Frozen shoulder
- Axillary nerve damage – affects deltoid and teres minor so reduced abd and ext rotn (other nerved radial/median/musulocut/ulnar/BP all are rare) – only allow max of one mark of nerve injuries.
- Rotator Cuff Injury
- Ongoing Instability/Re-dislocation
- Other soft tissue injuries e.g. glenoid tear
- Axillary artery injury - rare

Pass marks a 2/2 b 4/6 c 4/6 d 3/4 total 13/18

SAQ 3 ANSWERS

a.

Clinical Syndrome	Causative Snake
Coagulopathy – VICC (Venom induced consumption coagulopathy)	Brown, Tiger, Taipan
Coagulopathy - Anticoagulant	Mulga/Black
Neurotoxicity	Death Adder, Taipan, Tiger, (Brown-rare/mild)
Myotoxicity	Mulga, Tiger, Black (Taipan)
Systemic Symptoms (nausea, vomiting, headache, abdominal pain, diarrhoea, diaphoresis)	Tiger, Black, Death Adder, Taipan, Brown
Thrombotic microangiopathy	Brown, Tiger, Taipan
Cardiovascular Effects	Brown

NB – only 5 marks allocated (half mark for each box) as candidates could just state the 5 effects of either Brown or Tiger snake using these as their example of causative snake for every syndrome.

Reference:

Table 30.1.1 Clinical syndromes associated with the major venomous Australian snakes and the recommended antivenom, Cameron's Textbook of Ault Emergency Medicine 4th Ed.

b.

- Indication for antivenom unchanged
- Dosage of antivenom unchanged
- The volume of toxin to be neutralised is unchanged (as per dosage of antivenom for children) and best care of mother is the best care of the baby

c.

- Staff able and willing to manage snakebite management including definitive treatment of severe envenoming and treatment of potential complications
- Lab facilities able to do Ix 24/7
- Antivenom stocks adequate for definitive treatment in the right timeframe

Pass marks a 6/8 b 2/2 c 2/3 total 10/13

SAQ 4 (12 marks)

A 13 year old girl presents to the emergency department with confusion and abdominal pain. She has a background of type 1 diabetes requiring insulin treatment. She has had 3 days of vomiting and 2 days of diarrhoea prior to this presentation. It is unknown if she has been taking her insulin during this current illness. She is afebrile, has a heart rate of 124, and a blood pressure of 120/70 with a central capillary refill time of 4 seconds.

Her initial venous blood gas results on room air are:

pH	6.93	Na	124 mmol/L
pCO ₂	9 mmHg	K	6.2 mmol/L
pO ₂	44.9 mmHg	Cl	79 mmol/L
HCO ₃	2 mmol/L	Glc	43.5 mmol/L
BE	-25.5 mmol/L	Hb	162 g/L

- a. Quote four (4) appropriate formulae that assist the analysis the above blood results.
You are not required to insert the appropriate values or calculate results. **(4 marks)**

Formula 1: Anion Gap = $\text{Na}^+ - (\text{Cl}^- + \text{HCO}_3^-)$. Will also accept $(\text{Na}^+ + \text{K}^+) - (\text{Cl}^- + \text{HCO}_3^-)$

Formula 2: Corrected $\text{Na}^+ = [\text{Na}^+] + [\text{Glucose}]/3$

Formula 3: Metabolic acidosis expected change in $\text{pCO}_2 = (1.5 \times \text{HCO}_3^-) + 8$

Formula 4: Serum K decreases by 0.3mEq/L for every 0.1U increase in pH above normal.

Formula 5: Delta ratio, $\text{Delta Gap} = \text{Anion Gap} - \text{Baseline Gap}$ (i.e. 12)

$\text{Delta ratio} = (\text{Delta Gap (Increase in Anion Gap)} / \text{Delta HCO}_3 \text{ (Decrease in bicarbonate)})$

In DKA, ratio should be close to 1, due to loss of ketone acids in urine.

- b. State four (4) important principles regarding your fluid and electrolyte treatment of this patient while in ED, and give a justifying statement (which may include doses) for why it is an important principle. **(8 marks)**
- c. Rehydrate over 48 hours.
- a. Reason: patient 10% dehydrated and thus needs to be rehydrated slowly to ensure no rapid fluid/electrolyte shifts within body compartments. Fluid

rehydration should include maintenance plus rehydration deficit replacement. Small bolus is OK.

- d. Start insulin infusion early (without bolus).
 - a. Reason: need to start shifting glucose back into cells early in order to correct the acidosis (recommended rate $0.1\text{u/kg/hr} = 4\text{u/hr}$)
- e. Monitor glucose fall closely.
 - a. Reason (any of the following will be accepted): Often rapid falls in glucose are due to rapid fluid rehydration and thus the fluid rehydration rate may need to be slowed.
 - b. Theoretical rapid glucose fall may result in cerebral oedema.
- f. Monitor potassium closely.
 - a. Reason: fall in potassium will occur due to fluid rehydration plus addition of insulin. Need to ensure not too low to ensure cardiac activity is not compromised.

Pass marks a 3/4 b 6/8 total 9/12

SAQ 5 Answers – one mark per instrument or method, one mark per pro/con.

- Suction catheter
 - Pros – soft and atraumatic, useful for smooth objects
 - Cons – can be noisy

- Alligator forceps
 - Pros - ? in this situation
 - Cons – difficult to grip onto hard smooth objects such as this, risk of trauma to ear canal, risk of pushing object deeper into canal

- Jobson-Horne probe/Wax curette/right angle probe/bent paperclip
 - Pros – good for hard smooth objects to get behind the foreign body
 - Cons – risk of trauma to ear canal if patient moves, risk of pushing object deeper into canal

- Tissue adhesive on wooden end of Q tip
 - Pros – good for hard smooth objects
 - Cons – risk of adhering the Q tip to the ear canal, risk of pushing object in further

- Katz extractor/balloon catheter
 - Pros – less risk of trauma than metal instruments, good for hard smooth objects to get behind the foreign body
 - Cons – limited availability, injury to ear canal, risk of pushing object deeper into canal

- Irrigation/Syringing
 - Pros – ? in this situation
 - Cons – contraindicated if grommets in situ or if TM perforation, unlikely to be successful for this foreign body, likely to push object deeper into canal

- Referral to ENT surgeon for removal
 - Pros – little risk to ED doctor, facilitates removal in OT under GA, removal is not a time critical emergency procedure
 - Cons – time and resource intensive compared to removal in ED, delayed removal

Pass mark 10/12

SAQ 6 (11 marks)

A febrile 72 year-old lady is brought by ambulance to ED with an acute abdomen.

She is known to have end-stage renal disease (secondary to diabetes) that is managed with chronic ambulatory peritoneal dialysis (CAPD).

She has no allergies and is MRSA positive.

You are concerned she has CAPD-associated peritonitis.

- a. Excluding CAPD-associated peritonitis, list 5 possible causes for this patient to have abdominal sepsis. **(5 marks)**

Bowel perforation (Cx of diverticular disease or colonic malignancy, perforated PUD)

biliary sepsis

ischaemic gut

appendicitis

urosepsis

- a. Complete the table below by stating findings specific to CAPD-associated peritonitis. **(3 marks)**

	Findings
History	gradual onset and constant pain (not colicky)
	cloudy dialysate bags
Examination	generalised tenderness Generalised signs of peritonism- no focal peritonitis

The patient has an acute abdomen but is normotensive and responding normally.

- b. State your 3 most important pharmacological treatments for this lady. **(3 marks)**

Fentanyl IV 25-50 microg

Vancomycin IP (30mg/kg up to 2g)

Gentamicin IP (0.6mg/kg up to 50mg)

(abx dosing not essential but the route is)

Pass mark a 4/5 b 2/3 c 2/3 total 8/11

SAQ 7 Topic - Increase in IV line infections in your ED (14 marks)- answers

You have been informed of the results of an audit which demonstrate an increase in IV line infections in your emergency department, and you have been asked to find solutions to this problem.

- a) List the factors which may contribute to an increase in IV line infections, with an example for each (6 marks)
- a. System factors
 - i. Lack of training in aseptic technique for insertion – hand hygiene, gloves, preparation of site with chlorhexidine, lack of availability of appropriate equipment, lack of guidelines/policy on reducing IV line associated infections
 - b. Process factors
 - i. Alcohol gel/handwashing not readily available, procedures/policy not followed for aseptic technique, cannula not replaced at appropriate interval, incorrect site selection for cannula, need for cannula not established
 - c. Patient factors
 - i. increasing severity of illness, granulocytopenia, compromised integrity of the skin, and presence of distant infection.
- b) List the key steps that can be used to prevent or minimise these events occurring, with an example for each. (8 marks)

QI cycle –

- a. Plan
 - i. Review of existing guidelines with involvement of ED/non-ED stakeholders, creation and implementation of a documented departmental process that emphasises aseptic technique
- b. Do
 - i. Education and enforcement of aseptic technique guidelines with spot checks, address specific process, individual and system factors
- c. Check
 - i. Further audits and revision of processes
- d. Act
 - i. Early detection systems/prevention of further problems, continue to check/maintain compliance with policy

Pass mark a 4/6 b 6/8 total 10/14

SAQ 8 (12 marks)

A 25 year old athlete is brought to your Emergency Department by a voluntary St Johns ambulance crew. He collapsed while competing in a marathon event and has only received basic first aid.

On arrival in the ED his observations are as follows:

GCS	11	(E3, V4, M4)
Temp	41.5	°C
HR	140	bpm
BP	85/40	mmHg
SaO2	98%	on room air

- a. List the three (3) MOST LIKELY differential diagnoses for this patient's presentation. (3marks)

Compulsory: Environmental – heat stroke, heat exhaustion (low GCS suggests heat stroke)

Any two of the following:

Metabolic – dehydration (likely), hypoglycaemia, thyroid storm, hyponatraemia

Infection – serious bacterial infection including CNS

Neurological – seizure, ICH

Drug ingestion/withdrawal – amphetamines, anticholinergics, thyroxine, NMSyndrome

Must have heat stroke to pass.

- b. Outline the three (3) initial treatments that you would commence with target end points (3 marks)

1. **Rehydration** – cool IV fluids 20ml/kg, rapid infusion (monitor for pulmonary oedema). Ensure adequate circulating blood volume.

2. **Cooling** – needs urgent cooling. Describe suitable method of cooling AND target core temp

Eg. Exposure, external cooling

3. Support airway/breathing, Consider ETT – modified induction with drugs/doses

4. Monitoring – continuous core temp, ECG, Urine output, Electrolytes, BSL

5. Seek and treat alternative causes – look for : source of sepsis, trauma/drugs

Blood tests are performed on the patient and some of the initial results are given below:

Hb	185	g/L	(115 - 165)
WCC	25	$\times 10^9/L$	(3.5 - 11)
Plt	40	$\times 10^9/L$	(150 - 450)
Na	146	mmol/L	(135 - 145)
K	5.7	mmol/L	(3.5 - 5)
Urea	22	mmol/L	(2 - 7)
Creatinine	410	umol/L	(60 - 110)
CK	27,000	IU/L	(60 - 220)

c. List the three (3) MOST IMPORTANT abnormalities and explain their significance. (3 marks)

High Ur/Creatinine acute renal impairment

High CK rhabdomyolysis

High K+ ARF/muscle breakdown

Elevated Hb Dehydration

Elevated WBC Dehydration/infection

Low plt tcp/DIC/coagulopathy

Must have 2 BOLD to pass.

Failure to note ARF AND Rhabdo = 1.5/3 maximum mark.

d. Following these investigation results state your next three (3) treatment steps for this patient. (3 marks)

Treat Rhabdomyolysis: IV fluid, consider urinary alkalisation with bicarb, if not improving may require dialysis.

Treat Acute Renal Impairment: IV fluid resuscitation and insertion IDC: target urine output 1-2ml/kg/hr.

Correct coagulopathy/blood products, monitor U+E

Empiric IV antibiotics

Correct electrolyte abnormalities: appropriate IV fluid resuscitation

Must have 2/3 bold to pass.

Pass marks a 2/3 b 2/3 c 2/3 d 2/3 total 8/12

SAQ 9 answer

A 34 year male presents to the Emergency Department with a widespread blistering rash.

- i) Except for Stevens-Johnson Syndrome or toxic epidermal necrolysis, give 6 differential diagnoses in this patient? (6 marks)

Sunburn
Kawasaki syndrome
Toxic shock syndrome
Staphylococcal scalded skin
Erythema multiforme
Pemphigoid (or bullous pemphigoid)
Pemphigus (or pemphigus vulgaris)
Subcorneal pustular dermatosis
Insect bites
Mustard gas
Boric acid toxicity
Herpes simplex
Herpes zoster

- ii) Give 4 causes of Stevens-Johnson Syndrome? (4 marks)

Herpes simplex
Mycoplasma
CMV
Penicillins
Cephalosporins
Sulphonamides
Phenytoin
Carbamazepine
Allopurinol
Lamotrigine
NSAIDs especially oxicams
Immunisations
Paracetamol (rare)

- iii) What is Nikolsky's sign? (2 marks)

Epidermis detaches from the dermis/burn bed with slight friction or rubbing of the skin with finger