

# Illawarra Shoalhaven Local Health District Emergency Medicine Fellowship Program



## Topic-Based Quiz: Qs and As Procedures in EM

### Candidate Instructions

- Duration = 30min
- Props are included within the examination booklets
- Allocated marks for each question are shown
- Each mark is of equal weight
- There is no negative marking
- Write answers CLEARLY, and cross out any errors
- Answer within space provided
- Do not begin until instructed
- You may take examination book home with you



Good Luck!

Acknowledgement: Thank you to the trainees who have written these SAQs with the hope of making their colleagues sweat, but ultimately gain more exposure to exam practice. Good job.

**Question 1**

A 30 year old woman presents to the emergency department with fever and headache. She is photophobic and has neck stiffness. You are planning to do a lumbar puncture.

Name 4 contraindications to LP? (2 marks)

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What features should be present to perform lumbar puncture without neuroimaging prior (5 marks)

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List 3 CT findings would prohibit LP? (3 marks)

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The woman returns to the ED with a suspected complication post-LP. What clinical features would make you suspect the development of a spinal haematoma? (4 marks)

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What is the ideal investigation to confirm or exclude this complication? (1 mark)

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List 8 anatomical structures/layers you have to pass through to get CSF? (4 marks)

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## Question 2

You are managing a 63 year old woman with urosepsis and make the decision to start vasopressors. Given a goal MAP of 65mmHg you prepare to insert an arterial line for invasive BP monitoring.

List 3 absolute contraindications for radial arterial line insertion (3 marks)

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Complete the following table regarding complications of arterial line insertion by site (4 marks)

	Radial	Brachial	Femoral
Temporary Occlusion			
Distal ischaemia			
Local Infection			

List 2 advantages of US-guided arterial access versus blind or palpation technique (2 marks)

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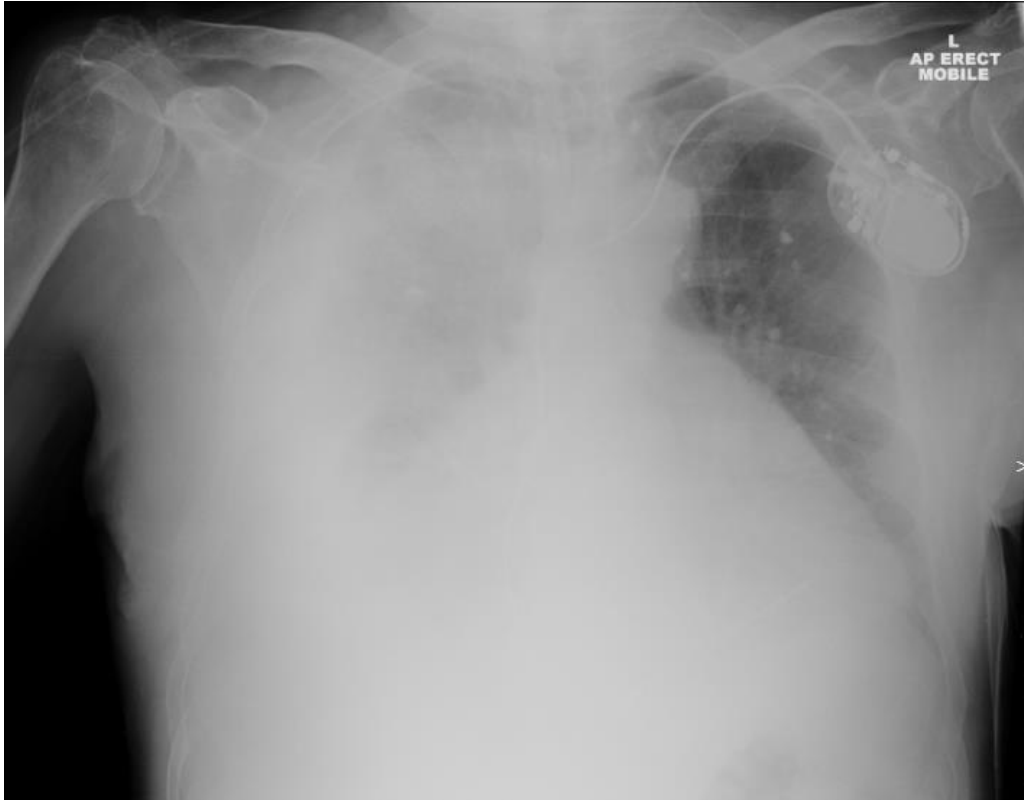
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**Question 3**

A 72 year old gentleman was changing a lightbulb on a step ladder in his bathroom. Naturally, he overbalanced and fell with arm extended taking the impact of the rim of the bath to his right chest wall. He has a PPM for slow atrial fibrillation for which he also takes warfarin. His INR yesterday was 2.5

A mobile Chest Xray is performed and is below



Describe the most clinically significant finding on the x-ray (1 mark)

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You plan to place a chest drain in this patient. What type (and size) of chest drain would you use in this patient and justify your choice (2 marks)

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## Topic-Based SAQ Quiz: Procedures in EM

The patient needs his warfarin reversed prior to the procedure. Please chart the drugs/products and their doses as well as state your target INR for the procedure (4marks)

Target INR

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Medication/Product	Dose

Outline the key steps in performing open tube thoracostomy (8 marks)

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What are 4 common complications of tube thoracostomy (2 marks)

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#### Question 4

A 28 year old lady; 32 weeks pregnant, was brought to your rural ED feeling breathless and has collapsed in the waiting room without signs of life. CPR is commenced. She has received 2 minutes of CPR when she arrives in the resus bay and the monitor shows pulseless electrical activity (PEA). She has an LMA in-situ. There is not an obstetric service at your hospital.

List the 2 main modifications to ALS in the setting of advanced pregnancy (2 marks)

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You make a decision to perform resuscitative hysterotomy while your team continues with the ALS algorithm. It will take you about 2 minutes to prepare for this.

What is the suggested time frame for commencing and completion of resuscitative hysterotomy? (2 marks)

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In the literature relevant to resuscitative hysterotomy, what is the longest duration between onset of cardiac arrest and delivery of the newborn that ended in: (2 marks)

Maternal survival with good neurological outcome 

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Foetal survival with good neurological outcome 

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From what gestation should resuscitative hysterotomy be performed? List 2 ways of confirming this gestation (2 marks)

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Topic-Based SAQ Quiz: Procedures in EM

What are the potential physiological benefits of resuscitative hysterotomy? (3 marks)

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Outline the key steps in performing a resuscitative hysterotomy. (5 marks)

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The patient obtains return of spontaneous circulation (ROSC) and there is profound haemorrhage from the exposed uterus. List 4 interventions that may reduce haemorrhage. (4 marks)

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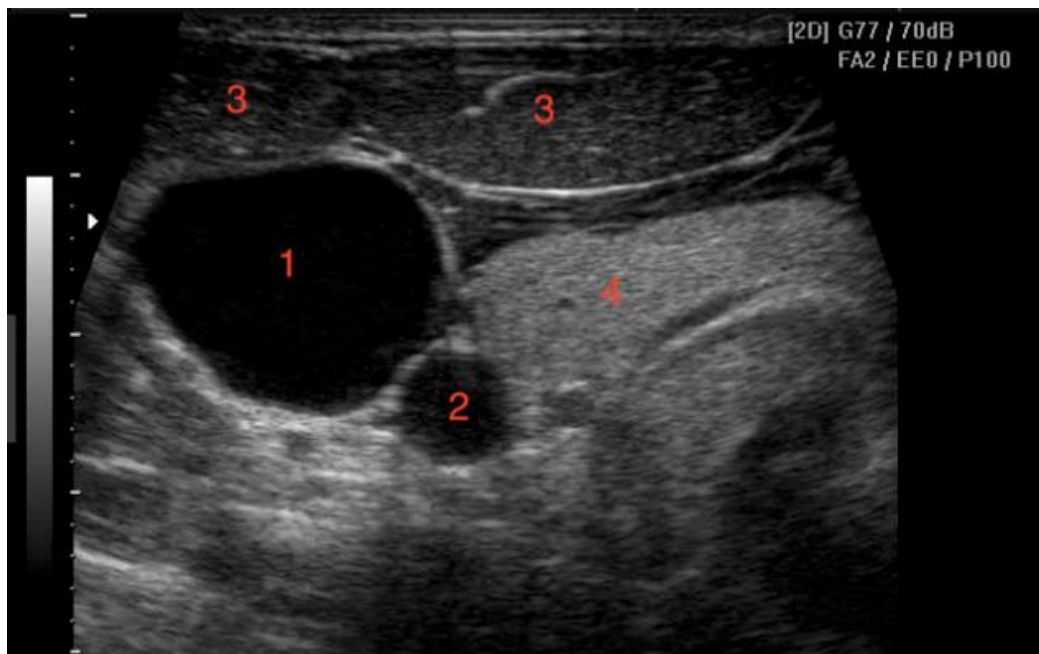
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### Question 5

A 63 year old man on immunosuppressive therapy presents with severe pancreatitis. He has been intubated for severe respiratory failure secondary to ARDS (his  $paO_2$  is 65 on  $FiO_2$  of 0.8). Despite fluid resuscitation his blood pressure is 63/40 and metaraminol is started peripherally. His lab results reveal platelets 57, INR 5, fibrinogen 0.9 and d-dimer 10 which makes you suspect disseminated intravascular coagulation

A central line is placed. From the ultrasound image below, list the numbered anatomical landmarks (2 marks)



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You have decided this location is the most appropriate given the patients clinical state. List and justify why this location (IN THIS PATIENT) is preferable; as compared to:

- Subclavian (2 marks)

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- Femoral (1 mark)

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## Topic-Based SAQ Quiz: Procedures in EM

Your registrar places a right internal jugular CVC. Flow from the initial puncture appeared to be venous, however when transduced a typical arterial waveform is present.

List 2 circumstances in which regurgitant blood flow may be unreliable in discerning venous placement (2 marks)

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List 2 methods that can be used to confirm venous placement prior to dilation (2 marks)

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List 3 potential complications that may arise from misplacement into the carotid artery? (3 marks)

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## ANSWERS

### Question 1

Name 4 contraindications to LP? (2 marks)

- Infection at LP site
- Suspected spinal epidural abscess
- Trauma at site
- Focal neurological signs
- INR>1.5
- Platelets <20
- Administration of heparin or enoxaparin in last 24hrs
- Trauma to lumbar vertebrae

What features should be present to perform lumbar puncture without neuroimaging prior (5 marks)

- Age <60yo
- Not immunocompromised
- No history of CNS disease
- No seizure within 1 week of presentation
- No altered LOC
- Normal Neurological exam

List 3 CT findings would prohibit LP? (3 marks)

- Midline shift
- Intracerebral mass
- Obstructive hydrocephalus
- Compression basilar cistern
- Posterior fossa mass

The woman returns to the ED with a suspected complication post-LP. What clinical features would make you suspect the development of a spinal haematoma? (4 marks)

- Severe or persistent back pain post procedure
- Radicular pain
- New neurological symptoms
- Sphincter disturbance

What is the ideal investigation to confirm or exclude this complication? (1 mark)

- MRI lumbosacral spine

List 8 anatomical structures/layers you have to pass through to get CSF? (4 marks)

- Skin,
- subcutaneous tissue
- supraspinous ligament
- interspinous ligament,
- ligamentum flavum
- epidural space
- dura mater
- arachnoid mater
- CSF is in the subarachnoid space

## Question 2

List 3 absolute contraindications for radial arterial line insertion (3 marks)

- Raynaud's syndrome
- Thromboangiitis Obliterans (Burger Disease)
- Full thickness burns or infection over site
- Inadequate collateral flow

Complete the following table regarding complications of arterial line insertion by site (4 marks)

	Radial	Brachial	Femoral
Temporary Occlusion	20%		1.5%
Distal ischaemia	0.1%	0.15%	0.2%
Local Infection	0.7%	0.05%	0.8%

*Note: These numbers are very specific. The learning goal here is to gain an understanding of the numbers and comparisons. Unlikely this specific on the exam. But comparisons very likely an SCQ or SAQ table.Q*

List 2 advantages of US-guided arterial access versus blind or palpation technique (2 marks)

- Improved first pass success
- Reduced haematoma formation
- Reduced nerve injury (hard to prove given low incidence in observational data)

## Question 3

Describe the most clinically significant finding on the x-ray (1 mark)

Complete opacification of right hemithorax

- Massive hemothorax is most appropriate answer

You plan to place a chest drain in this patient. What type (and size) of chest drain would you use in this patient and justify your choice (2 marks)

In the setting of traumatic hemothorax a large bore intercostal catheter ~ 22-26Fr is recommended

- Current ATLS do not teach 'pig tail'
- Current opinion suggest pigtail catheter may have equipoise, however, evidence does not support as yet

The patient needs his warfarin reversed prior to the procedure. Please chart the drugs/products and their doses as well as state your target INR for the procedure (4marks)

Target INR

- INR < 1.5

Medication/Product	Dose
Prothrombinex	50iu/kg – 3500iu (70kg male)
Vitamin K	10mg IV
Fresh Frozen Plasma (FFP)	1u (if using prothrombinex) 15mL/kg if no Prothrombinex

Outline the key steps in performing open tube thoracostomy (8 marks)

Rule of 4's and 5's

- 4th-5th intercostal space
- 4-5cm incision
- On a 45-degree angle

Insertion point: "triangle of safety"

- Mid to anterior axillary line
- Posterior to lateral border of pectoralis major/pectoral groove, anterior to latissimus dorsi
- If in doubt – landmark is bottom of axillary hair line

Position patient

- Supine or 30 degrees head-up
- Abduct ipsilateral arm, place hand behind head if able

Anaesthetise the skin over the planned incision point

- Also infiltrate the subcutaneous tissue, muscle, periosteum and parietal pleura with 10-20ml of local anaesthetic

Make a generous (4-5cm) diagonal incision along axis of rib, directly overlying 5th or 6th rib, with the aim of tunnelling tube upwards "above the rib below"

- Incision must be large enough to admit your finger and the tube simultaneously
- Blunt dissect the subcutaneous tissue overlying the intercostal muscles using large curved Kelly forceps, aiming for the superior border of the rib
- Push through the muscles and pleura at the superior edge of the rib with the forceps and enter the pleural space until loss of resistance and/or audible rush of air – the chest is decompressed at this point
- Insert gloved finger to check the pleural space has been entered and for pleural adhesions (avoid tearing these when tube inserted due to risk of bleeding)

Grasp the tube with the clamp and insert into the pleural space

- Aim tube apical (superiorly) and posterior until all side holes are inside the chest (usual insertion depth in adult is 12-16cm)

Attach to underwater seal drain system

- Secure chest tube with silk suture, and dress with large transparent dressing (e.g. tegaderm)

Obtain post-insertion chest x-ray

What are 4 common complications of tube thoracostomy (2 marks)

Lung laceration  
Laceration of intercostal vessels and nerves  
Laceration of long thoracic nerve  
Inadvertent solid organ puncture  
Re-expansion pulmonary oedema  
Infection / empyema (longer term)  
Bleeding  
Failure to drain / blocked tube

#### Question 4

List the 2 main modifications to ALS in the setting of advanced pregnancy (2 marks)

- Manual left uterine displacement (preferred over left lateral tilt)
- Early resuscitative hysterotomy

You make a decision to perform resuscitative hysterotomy while your team continues with the ALS algorithm. It will take you about 2 minutes to prepare for this.

What is the suggested time frame for commencing and completion of resuscitative hysterotomy? (2 marks)

- Start by 4 minutes, complete by 5 minutes
- Literature suggests this rarely done
- Consensus = as soon as effective ALS established

In the literature relevant to resuscitative hysterotomy, what is the longest duration between onset of cardiac arrest and delivery of the newborn that ended in: (2 marks)

Maternal survival = 37 minutes

Foetal survival = 57 minutes (case report of 45 minutes with good neurological outcome)

From what gestation should resuscitative hysterotomy be performed? List 2 ways of confirming this gestation (2 marks)

- Known dates
- Palpate fundus above umbilicus
- Bedside US

What are the potential physiological benefits of resuscitative hysterotomy? (3 marks)

- Alleviates aortocaval compression -> increases VR -> improves maternal cardiac filling pressure
- Improves effectiveness of chest compression
- Improves respiratory mechanics (diaphragm lowered)-> improves ventilation and reduces oxygen consumption

Outline the key steps in performing a resuscitative hysterotomy. (5 marks)

- Establish effective ALS with manual left displacement

- Don PPE / pour betadine only if immediately available (unlikely)
- Large midline incision fundus to 5cm above pubic symphysis – cut until you see uterus
  - Counter-traction either side of incision will make it easier
  - Do NOT be concerned with trauma to bowel/bladder
- Make midline incision in lower segment of uterus (thin part) until reach liquor
  - Extend incision with trauma shears, guard fetus with hand
- Retrieve baby with fundal pressure from assistant, clamp and cut cord at least 5-10cm
- Continue focus on maternal ALS and newborn life support

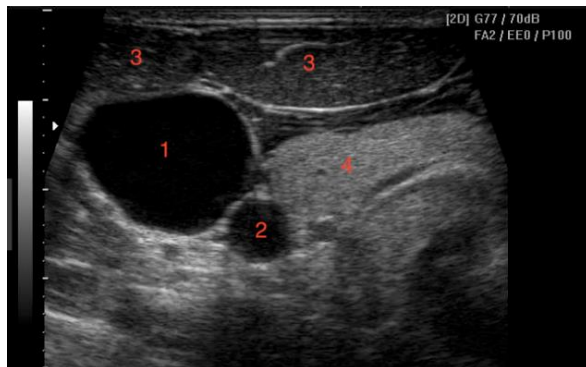
The patient obtains return of spontaneous circulation (ROSC) and there is profound haemorrhage from the exposed uterus. List 4 interventions that may reduce haemorrhage. (4 marks)

Causes of PPH = 4 Ts (in more practical order for addressing during resuscitative hysterotomy)

- Tissue = Retained placenta / tissue: Deliver uterus + swab out uterus
- Trauma = Genital tract trauma: Close uterus with 1-0 vicryl continuous
- Tone = Uterine atony: Uterotonic administration: e.g. ergometrine 250mcg IV, syntocinon 5u
- 'Thrombin' = Coagulopathy: Correct coagulopathy

### Question 5

A central line is placed. From the ultrasound image below, list the numbered anatomical landmarks (2 marks)



- 1 = internal jugular vein
- 2 = carotid artery
- 3 = sternocleidomastoid muscle
- 4 = thyroid gland

You have decided this location is the most appropriate given the patients clinical state. List and justify why this location (IN THIS PATIENT) is preferable; as compared to:

- Subclavian (2 marks)
  - Pneumothorax could be fatal given respiratory failure
  - Non-compressible site in setting of DIC
- Femoral (1 mark)
  - Infection risk is higher with femoral / immunosuppressed and already shocked

Your registrar places a right internal jugular CVC. Flow from the initial puncture appeared to be venous, however when transduced a typical arterial waveform is present.

List 2 circumstances in which regurgitant blood flow may be unreliable in discerning venous placement (2 marks)

- Low oxygen saturation
- Low systemic blood pressure

## Topic-Based SAQ Quiz: Procedures in EM

- Tricuspid regurgitation
- Cardiac tamponade

List 2 methods that can be used to confirm venous placement prior to dilation (2 marks)

- Check the PaO<sub>2</sub>
- Connect the line to pressure transducer and look for typical arterial pressure waveform
- Use ultrasound to confirm wire placement

List 3 potential complications that may arise from misplacement into the carotid artery? (3 marks)

- Haemorrhage – haemothorax, compressive haematoma with airway compromise
- CVA
- Arterial dissection
- Pseudoaneurysm
- Arteriovenous fistula
- Death