Final FRCR Part A – Guidance for Candidates

The following guidance is intended to help you understand the single best answer (SBA) format used in the Final FRCR Part A examination. It will also provide advice on how to approach individual questions and how best to prepare for this examination.

1 The SBA question

1.1 Structure

Each question consists of the following 3 components:

- Stem or clinical vignette
- Question
- 5 options (A – E): all of which may be plausible in varying degrees but one is clearly the single best answer and the other four are distractors.

1.2 How to read the stem

- The information in the stem is relevant and not there to mislead.
- Information should be interpreted in the same way that you would in your every day practice. For example, if it is stated that a patient with a liver or bone or brain lesion has no history of malignancy, it does not exclude metastasis as a cause for the lesion but the likelihood of the lesion being a metastasis would depend on the other information provided for example the age of the patient, smoking history etc.
- The information provided is relatively brief and you should realise that some information may not be available to you – much like in your day to day work.
- Pay attention to the age and sex of the patient and the information provided about the clinical setting, including the presenting symptom, length of the history, family history, immune status etc.
- Pay attention to the imaging findings and any anatomical information provided.
- If it helps, underline the key words in the stem to help you focus on the pertinent information.

1.3 How to read the question

- Common formats include:
    - What is the most likely diagnosis?
    - What is the LEAST likely diagnosis?
    - What is the most appropriate next imaging investigation?
- To avoid confusion, the word LEAST will be capitalised if it appears in the question to draw your attention to it.
- Underline part of the question if that helps reinforce exactly what is being asked:
    - What is the <u>most likely</u> diagnosis?
    - What is the <u>LEAST likely</u> diagnosis?
    - What is the <u>most appropriate next</u> imaging investigation?

Take the question very literally - the examiners mean exactly what they say in the question. Don't be tempted to pick the answer that makes you look conscientious if that's not literally the most likely of the options.

- 'Most likely' is not the same as 'most important'
- 'Most likely' is not the same as 'the diagnosis I would least like to miss'
- 'Most likely' is not the same as 'until proven otherwise'

1.4 How to read the options (best answer + four distractors)

- Each option is usually a single line of text but occasionally longer or in table format.
- Don't pick the first plausible answer you see.
- You are not only looking for an answer that is plausible you are looking for the answer that is most correct *in the particular clinical context provided in the stem.* Always consider carefully all the information provided which is likely to include some of the following:
    - Age and sex of the patient
    - Presentation including length of history
    - Past medical history
    - Family history
    - Imaging findings
    - Results of other examinations
    - Immune status etc.
- Don't worry if the answer that comes to mind when you first read the question is not in the list of options – you need to pick the best of the available options.

2 How to prepare for the examination

- Use good radiology text books and radiology web-resources including R-ITI.
- Read review articles.
- When possible, take modules for which you have already done the clinical attachment.
- Attend MDTs.
- Don't rely on Final FRCR Part A examination question books. These books are not generally written by people involved with the examination and the standard of the questions is unlikely to be a good indication of what you will encounter.
- Don't use 'past papers' handed down by other trainees. The individuals who wrote down the questions broke examination regulations and may have misremembered the questions. Questions are not reused for some time after appearing in a paper and are very often altered before being reused. The topics need to be learnt but the 'past paper' questions and answers are very unlikely to appear in the real examination.

3 Examples of questions and how to go about answering them.

A number of example questions are provided. All these questions have previously appeared in the Final FRCR Part A but have now been withdrawn. Each question is followed by an explanation - written by an examiner - of how the question should be approached/considered.

Question 1

A 64 year old man, with a past medical history of alcoholic liver disease and pulmonary emphysema, presents with a three week history of a hoarse voice. Indirect laryngoscopy demonstrates left vocal cord palsy.

Which imaging investigation is most likely to demonstrate the cause of the vocal cord palsy?

A contrast-enhanced CT scan from the skull base to the carina
B contrast-enhanced MR scan of the skull base
C high-resolution contrast-enhanced CT scan-of the larynx with coronal and sagittal reconstructions
D high-resolution contrast-enhanced MR scan of the larynx
E PA chest radiograph

Correct response: A

Hoarseness due to left sided vocal cord palsy implies an abnormality of the left vagus nerve or its recurrent laryngeal branch that courses around the aortic arch in the upper mediastinum. The decision on the most appropriate imaging modality has to take into account the most likely cause of the nerve abnormality in this particular patient. The way the question is phrased (Which imaging investigation is most likely to demonstrate the cause of the vocal cord palsy?) makes it clear that you should choose the investigation that has the highest sensitivity for the most likely cause of the palsy. An elderly man with alcoholic liver disease and emphysema is likely to have a significant smoking history. Lung cancer with direct mediastinal invasion or mediastinal nodal involvement affecting the recurrent laryngeal nerve is therefore the most likely cause of the vocal cord palsy. All the examinations listed in the options in this question are appropriate investigation in someone with a hoarse voice depending on the specific circumstances. However, only (A) and (E) are likely to detect a mediastinal lesion causing recurrent laryngeal nerve palsy and (A) has a higher sensitivity than (E).

Question 2
A 72 year old woman presents with a left homonymous hemianopia.

What is the most likely cause for this?

A branch retinal artery occlusion in the left eye
B left posterior cerebral artery (PCA) territory infarction
C left posterior parafalcine meningioma
D right posterior cerebral artery (PCA) territory infarction
E right posterior parafalcine meningioma

Correct response: D

Questions combining pathology and anatomy are very common, particularly in the Neuroradiology module. These questions tend to favour the successful candidates well because they test more than one aspect of your knowledge.

To answer this question correctly, you need to know that a homonymous hemianopia is a visual field defect affecting half the visual field of both eyes in a similar way and that it is caused by a lesion to the optic pathway distal to the optic chiasm and on the contralateral side to the field defect.

You can exclude option A because it would affect the visual field in only one eye while options B and C can be excluded because those lesions are on the same side as the visual field defect.

Options D and E are both anatomically plausible. To choose between the two, you have to know something about the likelihood of such a lesion causing the symptom and the relative incidence of the two conditions. PCA territory infarction is much more common than a parasagittal meningioma and most people with a PCA territory infarct will have some form of homonymous hemianopia or quadrantanopia while only a relatively small proportions of patients with parafalcine meningiomas in that region will experience a visual field defect.

Question 3
A 46 year old woman presents with a one week history of left hemi-sensory disturbance affecting the limbs and trunk. She has no previous history of neurological problems. MR scan of the brain and cervical spine demonstrates multiple small (<1 cm) white matter hyperintensities (on T2-weighted images) in the brain but no compressive or intrinsic abnormality of the cervical cord.

Having at least one lesion in which structure is most specific for the diagnosis of MS?

A cerebral periventricular white matter
B internal capsule
C middle cerebellar peduncle
D occipital lobe deep white matter
E temporal lobe deep white matter

Correct response: C

This question requires knowledge about the typical distribution of demyelinating lesions in MS compared to the much more common white matter lesions seen as part of small vessel disease.

Small vessel disease affects predominantly the periventricular and deep white matter of the cerebral hemispheres with occasional ill-defined relatively symmetrical hyperintensity in the pons but not elsewhere in the infra-tentorial compartment.

In MS, the lesions visible on MR scan are most commonly seen in the periventricular white matter including the corpus callosum but deep and subcortical white-matter lesions as well as brainstem and cord lesion are also common.

Small vessel disease commonly affects the locations given in options A, B, D and E but option C is not a recognised location for small vessel disease. Middle cerebellar peduncle lesions (C) are seen relatively commonly in MS and because it is not a location where you expect to see small vessel disease, a single lesion in this location has a higher specificity for MS than a single lesion in any of the other named locations.

Question 4
A 27 year old man presents with a one month history of headache, nausea and vomiting. He is referred to a neurologist who finds a raised haematocrit and requests an MR scan. The MR scan shows a peripheral left cerebellar hemisphere part cystic and part solid lesion with an enhancing mural nodule, in contact with the pial surface.

What is the most likely diagnosis?

A gangliocytoma
B haemangioblastoma
C metastasis
D pilocytic astrocytoma
E pleomorphic xanthoastrocytoma

Correct response: B

All the lesions listed in the options can occur in the cerebellum. The imaging description best fits with options B, C or D. Pilocytic astrocytoma usually occur at a much younger age. In a young man with no history on malignancy such as testicular carcinoma, a metastasis is less likely than a haemangioblastoma. There is the additional history of polycythaemia which is a recognised paraneoplastic phenomenon associated with some haemangioblastomas due to ectopic erythropoietin production by some of these tumours. In other words, the combination of the age of the patient, the imaging findings and additional clinical information (polycythaemia) make haemangioblastoma the best answer.

Question 5
A skull radiograph is performed for assessment of asymmetric head shape in a two year old child. On the Townes' view, there are two symmetrical 7 mm well circumscribed lucencies posteriorly within the skull vault, one on either side. There is no mass demonstrated on ultrasound.

What is the most likely diagnosis?

A eosinophilic granuloma
B fibrous dysplasia
C osteogenesis imperfecta
D parietal foramina
E sinus pericranii

Correct response: D

It is important to be aware of normal anatomical variants that can be confused with pathology. All the options provided in this question can cause lytic skull lesions but symmetrical small well circumscribed lucencies are very typical of parietal foramina and rare in the other conditions. There is the additional reassuring information that there is no associated soft tissue mass.

Question 6
A 13 year old boy presents with a long history of temporal lobe epilepsy. An MR scan of the brain reveals atrophy and high signal of the left hippocampus on T2-weighted and FLAIR images. There is a history of prolonged febrile convulsions in childhood.

What is the most likely diagnosis?

A Hashimoto's encephalopathy
B hippocampal glioma
C immune mediated limbic encephalitis
D mesial temporal sclerosis
E previous herpes simplex encephalitis

Correct response: D

All the conditions listed in the options can cause temporal lobe epilepsy. You have to decide which of the conditions is most common at that age and most compatible with the additional history of prolonged febrile convulsions in childhood.

Hashimoto's encephalopathy is much rarer than the other conditions and can therefore be easily discounted while immune mediated limbic encephalitis is also very rare and usually occurs in an older age group.

A hippocampal glioma would not be associated with hippocampal atrophy and the patient is relatively young for a supratentorial glioma.

Previous herpes simplex encephalitis is a plausible but very unusual cause of temporal lobe epilepsy with an onset in childhood. It would also be unusual following HSV encephalitis to have damage limited to the hippocampus.

The history and imaging findings are classical for mesial temporal sclerosis and this is also the commonest underlying abnormality identified in children with temporal lobe epilepsy.

Question 7
A 12 year old girl presents with a painless lump near the angle of the jaw. Ultrasound scan shows a thin-walled unilocular 3 cm cyst just posterior to the left submandibular gland and anterior to the sternocleidomastoid muscle. The thyroid and salivary glands appear normal on the scan.

What is the most likely diagnosis?

A cystic hygroma
B first branchial cleft cyst
C second branchial cleft cyst
D third branchial cleft cyst
E thyroglossal duct cyst

Correct response: C

All the options represent cystic neck lesions that can present in childhood.

To get this question right, you need to know the typical anatomical location of the different lesions.

Thyroglossal duct cycts are more common than the other lesions mentioned but do not occur in that location.

The different branchial cleft cysts are found in different locations in the neck. In this case, the location (between the submandibular gland and the sternocleidomastoid muscle) is typical for the commonest of the branchial cleft cysts namely second branchial cleft cysts.

Cystic hygroma unlike the other lesions mentioned can occur in many different locations in the neck but are usually multiloculated.

Question 8
A 38 year old woman wakes with new onset of right arm symptoms with no identifiable history of trauma. There is hyperaesthesia affecting the right shoulder and lateral aspect of the upper arm and diminished right deltoid and pectoralis reflexes. MR scan of the cervical spine demonstrates an acute right cervical foraminal disc bulge.

At which level is the disc most likely to be demonstrated?

A C3/4
B C4/5
C C5/6
D C6/7
E C7/T1
F T1/T2

Correct response: B

This is an applied anatomy question. To get it right you have to know either the dermatomes or myotomes of the cervical nerve roots and you need to know that the nerve roots in the cervical spine (unlike the lumbar spine and thoracic spine) exit above the vertebra of the same number. In other words, you need to know that radiculopathy of the the C5 nerve root best explains the symptoms and signs in this patient and that the C5 nerve root exits above the C5 vertebra and therefore will be compressed in the C4/5 exit foramen.

Question 9
A 32 year old woman with no past medical history presents to the cardiology outpatient clinic with increasing shortness of breath and limited exercise tolerance. Chest radiograph demonstrates an enlarged heart, prominent hila and pulmonary plethora.

Which form of congenital heart disease is the patient most likely to have?

A aortic coarctation
B atrial septal defect
C hypoplastic left heart syndrome
D tricuspid atresia
E ventricular septal defect

Correct response: B

The x-ray description is typical of an intracardiac shunt with blood shunting from left to right. As a result of the shunt, there is increased blood flow through the lungs and hence pulmonary plethora. This means that options B and E are possible correct answers. An ASD can be tolerated well into adult life by some patients, so it is renowned as a form of congenital heart disease that can present in this way. A VSD is much less likely to be an incidental finding in an adult as it would either have presented with cardiac dysfunction well before this point, been identified as a murmur or spontaneously closed. Option B is therefore the most likely form of congenital heart disease in this scenario.

Hypoplastic left heart syndrome and tricuspid atresia are forms of congenital heart disease that require urgent surgery on the first days of life and we are told that the patient has no past medical history. Aortic coarctation could present in a patient of this age and while there may be collaterals identified such as those causing rib notching, the coarctation is unlikely to produce pulmonary plethora.

Question 10
A 50 year old man presents with several months of increasing breathlessness on exertion. His chest radiograph demonstrates mild cardiomegaly and enlarged pulmonary arteries. A contrast-enhanced CT scan is performed.

Which sign is most specific for chronic pulmonary embolic disease?

A bronchial artery hypertrophy
B pericardial effusion
C pulmonary artery webs
D right ventricular hypertrophy
E thickened interlobular septa

Correct response: C

The key to this question is the word specific. In other words, which sign is most likely to be related to pulmonary embolic disease rather than any other condition.

Bronchial artery hypertrophy can be seen in forms of airway disease and is commonly seen in patients with bronchiectasis. It is not a specific sign of PE and would not be used as a distinguishing feature.

A pericardial effusion is not directly linked with PEs. Pleural effusions may be seen where there is associated pulmonary infarction but a pleural effusion would not be a specific sign of PE either.
Pulmonary artery webs are a well-recognised feature of chronic thromboembolic disease and are a specific sign.

Right ventricular hypertrophy is usually a marker of pulmonary hypertension, of which pulmonary embolic disease is only one cause. Chronic lung diseases and left sided cardiac diseases are more common causes. RVH may be a consequence of pulmonary valve stenosis or may be a result of myocardial infiltration

Thickened interlobular septa tend not to be seen in pulmonary embolic disease as there tend to be features of lung hypoperfusion if anything.

Question 11
In high speed impact deceleration injuries, what is the most common site for transection of the aorta presenting to an emergency department?

A ascending aorta/aortic arch junction
B between the left subclavian artery and ligamentum arteriosum
C distal descending thoracic aorta
D junction of the descending thoracic aorta and abdominal aorta
E just above the aortic valve

Correct response: B

The classical site of an aortic transection is in the region of the isthmus of the aorta in the region of the ligamentum arteriosum in the distal aortic arch or proximal descending aorta. The decelerating force means that the weight of blood in the aorta causes the aorta to move anteroposteriorly very rapidly and this is prevented where the aorta is fixed in position. This happens at the level of the aortic valve, at the ligamentum arteriosum and at the diaphragmatic hiatus. The aorta is not fixed at the distal ascending aorta so answer A is incorrect.

While answers B,C,D and E are plausible, in practice the only site where a transection is seen is around the ligament arteriosum, so answer B is the would be the best answer. Aortic transections at the aortic valve of at the level of the diaphragm are rarely seen, possibly because these patients do not survive to reach hospital and the CT scanner.

Question 12
A 50 year old woman is investigated for progressive exertional dyspnoea over several months. A CT scan of her chest reveals a mosaic pattern of ground glass attenuation throughout both lungs. The central pulmonary arteries are dilated and there is a calcified, intraluminal plaque-like lesion arising from the wall of the right pulmonary artery.

What is the most likely diagnosis?

A chronic pulmonary thromboembolic disease
B CREST syndrome
C Kawasaki disease
D primary pulmonary hypertension
E Takayasu's disease

Correct response: A

The description of the CT states that the pulmonary arteries appear dilated in keeping with pulmonary arterial hypertension and that there are intraluminal plaques. The latter would not be seen in option D.

Kawasaki disease occurs in children with the majority being under five years of age and predominantly involves the heart causing coronary artery aneurysms. Takayasu's disease occurs below the age of 40 years, although does have a female predominance. It is a vasculitis that causes stenosis within large vessels such as the aorta and its branches as well as the pulmonary arteries. It would not be expected to involve the smaller pulmonary arterial branches and would therefore not account for the mosaic attenuation of the lungs. CREST is associated with interstitial changes.

Option A is the only diagnosis in this list that would cause mosaic attenuation of the lungs (due to segmental and subsegmental pulmonary arterial occlusion), pulmonary arterial hypertension and plaques within the pulmonary arteries.

Question 13
A 50 year old woman undergoes a prone chest HRCT scan for investigation of progressive shortness of breath. This demonstrates fine subpleural reticulation and ground glass change in the middle lobe and lingula, with coarser subpleural reticulation and honeycombing in both lower lobes. The oesophagus is noted to be dilated.

What is the most likely diagnosis?

A achalasia
B asbestosis
C chronic extrinsic allergic alveolitis
D rheumatoid arthritis
E scleroderma

Correct response: E

The features describe a lower zone predominant pulmonary fibrosis. All of the above answers could produce this appearance, although chronic EAA is more typically renowned as causing upper zone fibrosis. The presence of oesophageal dilation can be associated with scleroderma through the CREST syndrome and can be seen in achalasia. A 50 year-old female is more likely to have a connective tissue disease-related fibrosis than asbestosis or fibrosis related to achalasia and presumably aspiration. Overall, this makes option E most likely.

Question 14
A 24 year old woman is known to suffer from HlV. She has recently developed a cough and a chest radiograph shows bilateral lung opacities. HRCT scan demonstrates a ‘tree in bud' appearance in the lung and atypical mycobacteria are subsequently grown from her sputum.

Where is the anatomical location of this 'tree in bud' appearance?

A pulmonary alveoli
B pulmonary arteriole
C pulmonary bronchiole
D pulmonary interstitium
E pulmonary lymphatic

Correct response: C

This is a test of your knowledge of anatomy and patho-anatomical correlation. The ‘tree-in-bud’ appearance is of a branching structure with apparent small nodules attached and it represents dilated and fluid filled small airways. The branching nature of this appearance must relate to some branching anatomical structure, so even if you did not know the answer, you can deduce that this must represent either a branching airway or a branching vessel. Branching vessels would be less likely to have nodules associated with them. The lymphatic and the interstitial abnormalities tend to produce a lacy or reticular appearance rather than a branching structure. Pulmonary alveoli cannot be resolved on CT scan. Option C is therefore the most likely answer.

Question 15
A 45 year old man with a history of recurrent lower respiratory tract infections develops a gradual onset of dyspnoea and cough. A chest radiograph shows bilateral central consolidation with a basal predominance. A high resolution CT scan shows patchy ground glass and associated smooth septal thickening with no lymphadenopathy, cardiomegaly or pleural effusions.

What is the most likely diagnosis?

A alveolar proteinosis
B desquamativeinterstitialpneumonitis
C pneumoconiosis
D pulmonary oedema
E sarcoidosis

Correct response: A

The HRCT description is that of crazy paving, so this narrows the differential diagnosis considerably. Alveolar proteinosis is the classical cause of this, so answer A is certainly an option. DIP tends to produce lower zone predominant ground glass change, so this is less likely to be correct. Pneumoconioses are not usually associated with a crazy paving appearance. Sarcoidosis is usually a nodular process in the lungs although conglomerate consolidation can be seen but a crazy paving appearance is less likely. Pulmonary oedema is a recognised cause of a crazy paving appearance, so this is also a possible correct answer.

Of the choice of A vs E, option E would be unlikely in the absence of cardiomegaly and pleural effusions, so option A is the best answer.

Question 16
A three year old boy undergoes a chest radiograph for a persistent cough. No consolidation is seen, but there is a mass in the right paracardiac region. Subsequent imaging confirms a scimitar syndrome.

What is the most likely site for the scimitar vein to drain into?

A azygos vein
B IVC
C left atrium
D portal vein
E right atrium

Correct response: B

Scimitar syndrome, also known as hypogenetic lung syndrome or pulmonary venolobar syndrome, is a constellation of findings associated with right lung hypoplasia and anomalous pulmonary venous drainage.

The anomalous venous drainage is usually to the inferior vena cava below the diaphragm and produces the scimitar sign (a retrocardiac vessel directed inferiorly). Anomalous venous drainage can less typically be seen to the suprahepatic portion of the IVC, hepatic veins, portal vein, azygos system, coronary sinus or left atrium.

Therefore although all stems are possible, option B is the most likely and is the correct answer.

Question 17
A 20 day old neonate, born at 26 weeks' gestation, undergoes a chest radiograph due to increased oxygen requirements. CRP and blood count are normal. The radiograph demonstrates mild cardiomegaly and perihilar lung opacification.

What is the most likely diagnosis?

A Ebstein's anomaly
B patent ductus arteriosus
C surfactant deficiency disease
D tetralogy of Fallot
E ventricular septal defect

Correct response: B

In this question, consider all the relevant information given in the vignette.

A neonate with surfactant deficiency has respiratory symptoms that typically begin at 6 hours and peak at 24-48 hours and if this is the only factor involved, the neonate should be getting better by day 3. Although this baby was born at 26 weeks, the chest radiograph has been performed for deterioration at day 20 of life so option C can be excluded.

Ebsteins anomaly usually presents with massive cardiomegaly and both Ebsteins anomaly and Tetralogy of Fallot typically present with decreased or asymmetric lung vascularity and are less common than a VSD or PDA.

Both PDA and VSD are common lesions and may present with mild cardiomegaly and increased lung vascularity. A PDA however is more commonly seen in premature neonates with the incidence being several times higher than in full term neonates. Therefore on balance, option B is the most likely and the correct answer.

Question 18
A newborn baby with Trisomy 21 and born by breech delivery presents with respiratory distress, and is shown by chest radiograph to have a large right-sided pleural effusion. The infant is systemically well. The initial chest drain fluid is clear, becoming cloudy over the next few days.

Which combination is the most likely explanation for the baby's clinical presentation?

	Pleural fluid characteristics	**aetiology**
A	chylothorax	disruption birth trauma
B	chylothorax	thoracic duct abnormality
C	exudate	tracheo-oesophageal fistula
D	transudate	atrioventricular septal defect
E	transudate	congenital diaphragmatic hernia

Correct response: B

The description in the vignette is classic for a chylous effusion. The fluid will be clear/yellow to slightly cloudy in the unfed state and becomes milky with feeding.

The most common cause of chylothorax in older children is trauma to the thoracic duct, usually during cardiac surgery. Congenital chylothoraces are however more likely to be due to abnormal development or obstruction of the lymphatic system rather than a traumatic injury at delivery.

A congenital chylothorax due to a congenital malformation of the thoracic duct can be associated with chromosomal anomalies including Trisomy 21.

Question 19
During a prenatal scan, small cysts interspersed with echogenic parenchyma are demonstrated in the right hemithorax of the fetus. The chest radiograph following full term delivery is normal. A CT scan demonstrates a focal mixed solid and cystic region posteriorly in the right lower lobe. The region demonstrates blood supply and drainage from the pulmonary vessels.

What is the most likely diagnosis?

A congenital diaphragmatic hernia
B congenital pulmonary airway malformation
C cystic pulmonary interstitial emphysema
D pulmonary sequestration
E staphylococcal pneumonia with pneumatocele

Correct response: B

The abnormality was demonstrated on a prenatal scan therefore cystic PIE (C), typically resulting from overdistension of alveoli due to barotrauma, and staphylococcal pneumonia with a pneumatocele (E) can be excluded.

A pulmonary sequestration is a solid mass of lung tissue without connection to the tracheal-bronchial tree with varying systemic arterial supply so option D can also be excluded.

This leaves options A and B.

The vignette describes the chest radiograph as normal following delivery. In cases of small cyst CPAM, the chest radiograph following delivery may be normal but this would be very unusual with a congenital diaphragmatic hernia (CDH). CDH containing bowel are also more commonly left sided lesions. The correct answer is therefore B.

Question 20
A two year old child with sickle cell disease is admitted with low-grade fever, irritability and crying on passive movement of the arm. There has been a history of diarrhoea for three weeks, but no blood in the stools. The inflammatory markers are raised. MRI scan shows bone marrow oedema in the distal humerus and a partly septated effusion in the elbow joint. Abdominal ultrasound scan is unremarkable.

What is the most appropriate first step in management?

A arrange isotope bone scan to look for further lesions
B aspirate the elbow joint and examine fluid
C commence antibiotics
D treat as a bone infarct in the arm
E treat for sickle cell crisis

Correct response: B

This is a two stage question. You need to decide on the diagnosis and the first appropriate management step.

This is infection of the elbow joint as there is a joint effusion with oedema and pain on PASSIVE movement. Septic joints are very painful. This is not a sickle crisis or bone infarct.

A joint aspiration must be done first, to guide antibiotic treatment of septic joint effusions.

The commonest pathogen affecting the musculoskeletal system in patients with sickle cell disease is Salmonella, followed by Staphylococci, Gram negative bacteria and tuberculosis. Therefore correct answer is B.

Question 21
An eight year old girl presents to the emergency department with pain and tenderness of the forearm after falling while roller-skating. Radiograph demonstrates a fracture of the shaft of the ulna with angulation at the fracture site.

What is the most likely associated injury?

A anterior dislocation of the radial head
B associated radial shaft fracture and anterior dislocation of radial head
C bowing fracture of radius
D dislocated distal radio-ulnar joint
E supracondylar fracture

Correct response: A

Option A describes a Monteggia fracture – Bado type 1 which is commonest in children and young adults, and is typically caused by falling on an outstretched hand. Option B is also a Monteggia fracture but Bado type IV and much less common in children. Here the important clues to not in the vignetee are the age and the mechanism of injury. Practical experience of reporting paediatric trauma imaging will help here.

Question 22
A five month old baby presents for an ultrasound scan with a history of projectile non-bilious vomiting and weight loss. Ultrasound scan of the abdomen shows free fluid in the right upper quadrant and an ill-defined hypoechoic area in the right lobe of the liver. The radiologist notes some bruising on the right upper abdomen. The mother recollects that the baby rolled off the bed about two weeks ago.

What is the most likely diagnosis?

A accidental trauma and laceration of the liver
B haemangioendothelioma
C midgut malrotation with volvulus
D non-accidental injury
E pyloric stenosis

Correct response : D

Option B can be excluded because haemangioendothelioma usually presents with an abdominal mass. It might sometimes be an incidental diagnosis made at ultrasonography, However, haemangioendothelioma is usually a mixed-echogenicity lesion. The presence of free intraperitoneal fluid also points away from this diagnosis.

Option C can be excluded because midgut volvulus usually presents with bilious vomiting.

Option E can be excluded because the abdominal ultrasound, which is a very good test for diagnosing pyloric stenosis, has not shown this.

This leaves us with options A and D. The important clue to answering this question is the mismatch between the clinical findings and the history proffered by the mother. An accidental fall over a short distance, which did not prompt the mother to seek medical attention for 2 weeks, is unlikely to account for the liver laceration, free fluid and abdominal bruising noted by the radiologist. Hence, option D is the most likely diagnosis.

Question 23
A six month old boy is admitted with abdominal pain and red currant jelly stool. A diagnosis of intussusception is made on abdominal ultrasound scan.

What is the greatest contra-indication to air enema reduction?

A absence of Doppler flow within the mesentery of the intussusception
B ascites
C five day history of abdominal pain
D fluid trapped between bower loops in the intussusception
E Rigler's sign on abdominal radiograph

Correct response: E

Here it is important to look at all the possible answers as several are relative contraindications depending on other associated clinical factors. Bowel perforation – as evidenced by Rigler's sign - is however an absolute contraindication to air enema reduction. Having hand's on clinical experience will help with answering this type of question.

Question 24
A three month old boy has had two urinary tract infections treated by short courses of oral antibiotics. Renal ultrasound scan reveals bilateral hydronephrosis,

What is the most appropriate next investigation?

A DMSA
B indirect radioisotope cystogram
C MAG3
D micturating cystourethrogram
E retrograde urethrogram

Correct response: D

Here the important word to note is ‘next’. Although several of these tests may be carried out in this infant, what is being asked is what is the most important one to do first. Here paying attention to the history of bilateral hydronephrosis should alert you to the concern of underlying posterior urethral valves and therefore direct you to the correct answer of MCUG. If valves are present it is essential that these are detected and treated as soon as possible.

Question 25
A 28 year old woman, who has had previous free injection breast augmentation, presents with a new palpable lump. Clinical examination confirms an area of nodularity in the axillary tail. Ultrasound scan confirms numerous anechoic lesions, some with posterior acoustic enhancement.

What is the most likely diagnosis?

A fibroadenomas
B fibrocystic change
C oil cysts
D reactive intramammary lymph nodes
E silicone granulomas

Correct response: E

Free silicone injection as a method of breast augmentation is banned in many countries, but may be seen in women who have had this procedure performed abroad and present to the breast service with complications, so you should be aware of its imaging appearances. Typical appearances on ultrasound are of diffuse increased echogenicity and dirty acoustic shadowing “snowstorm appearance”, but in some women nodules as described in the vignette are also seen. Silicone is also often present in enlarged axillary nodes. In this question the most useful factor in selecting the most likely diagnosis is the history provided.

Question 26
A 50 year old male smoker presents with swollen, red, stiff and painful fingers. His blood tests show a CRP level of 12 and a WCC level of 9. Hand and wrist radiographs show a smooth periosteal reaction affecting the distal radius, distal ulna and phalanges.

What is the most appropriate initial investigation?

A bone scan
B chest radiograph
C CT scan of the chest
D MR scan of the hand and wrist
E ultrasound scan of the wrist

Correct response: B

Hypertrophic pulmonary osteo-arthopathy (HPOA) is associated with a smooth periosteal reaction, classically at the wrists or ankles. In a 50 year old smoker lung cancer should always be considered as a potential diagnosis, particularly with clinical and radiological suspicion for HPOA. Whilst bone scan might demonstrate all areas of bone involvement and MR/ultrasound scans of the wrist might characterise the abnormal periosteal reaction, imaging of the chest is required. Chest radiograph rather than CT scan of the chest remains the first investigation that should be performed.

Question 27
A 15 month old girl is referred by her GP for bilateral leg radiographs for bowing of legs. She has been walking for three months and is able to bear her weight. Her blood results (CRP, WCC, and serum calcium and alkaline phosphate) are normal.

What is the most appropriate next step?

A AP and frog lateral radiographs of both hips
B AP radiograph of both knees
C AP radiograph of both legs
D AP weight-bearing radiograph of one limb
E no radiographs

Correct response: E

Physiological bowing of the legs is almost ubiquitous among young children. This is usually bilateral and symmetrical and gradually improves as the child grows, usually resolving by age 3 -4 years. There are many important negatives given in this question stem, most importantly the normal calcium and alkaline phosphatase excluding rickets.

Investigation for other causes of leg bowing such as Blounts disease would not take place before 2 ½ years at the earliest. Any investigation subsequently carried out would be of both limbs.

It can be difficult to select ‘no imaging’ but this can be the correct response.

Question 28
A 44 year old woman presents with three months of pain in her left sternoclavicular articulation and lower back. Radiograph and subsequent MR scan reveal expansion and new bone formation at the medial end of the left clavicle with associated mild bone oedema and synovitis. No collection is identified. The joint space is reasonable and the joint is congruent.

What is the most likely diagnosis?

A erosive arthropathy of the sternoclavicular joint
B osteoarthritis of the sternoclavicular joint
C osteomyelitis of the clavicle
D SAPHO syndrome
E septic arthritis of the sternoclavicular joint

Correct response: D

The important things to appreciate in this vignette are the **negatives**. The fact that there is no collection makes (E) and (C) less likely . A normal joint space eliminates (B), which would show joint space narrowing. The joint space is also unlikely to be normal in erosive arthropathy (A).

The important positive phrase is ‘ new bone formation’. This, along with the location at the medial end of the clavicle, are the classic descriptors for SAPHO.

Question 29
An eight year old child undergoes radiographs of the tibia and fibula following a fall. These show a 15 mm diameter eccentric oval diametaphyseal lucent lesion orientated in the long axis of the bone that has well-defined sclerotic margins.

What is the most likely diagnosis?
A chondromyxoid fibroma
B enchondroma
C fibrous cortical defect
D fibrous dysplasia
E osteoid osteoma

Correct response: C

These questions test a systematic approach to classifying bony lesions. Firstly the **description** of the lesion discounts option D which is not usually a solitary lucent lesion and (E) which has a typical imaging appearance with a lucent nidus.

The **age** of the patient relatively discounts (B), found in older patients. Also a well-defined sclerotic margin is uncommon in enchondroma.

This leaves options A and C as plausible answers, however option A is a very **rare** tumour, making C the correct response.

Question 30
An 12 year old boy presents with hip pain. A radiograph reveals a permeative lesion in the left ilium with a periosteal reaction and a 15 cm extra osseous soft tissue component.

What is the most likely diagnosis?

A acute lymphoblastic leukaemia
B chondrosarcoma
C Ewing's sarcoma
D osteomyelitis
E osteosarcoma

Correct response: C

The first thing to realise is that this question is describing the typical imaging features of a bone tumor (particularly the soft tissue component) which allows (A) and (D) to be quickly discounted as unlikely.

The important things to then pick up in the stem are the **age** of the patient, which discounts (B), usually presenting in older patients . Though (E) is a more common tumour it does not present in the pelvis so the **anatomical location** leaves Ewings as the correct response.