

FEx Net 2022 Collated SAQs: Neurology + Neurosurgery Answers

- | | |
|---------------------------------|---------------------|
| 1. <u>Agitation</u> | 28. <u>SAH</u> |
| 2. <u>Agitation</u> | 29. <u>SAH</u> |
| 3. <u>Agitation</u> | 30. <u>SAH</u> |
| 4. <u>Agitation</u> | 31. <u>SAH</u> |
| 5. <u>Colt Retrieval</u> | 32. <u>SAH</u> |
| 6. <u>Collapse</u> | 33. <u>Seizure</u> |
| 7. <u>Collapse</u> | |
| 8. <u>Confusion</u> | 34. <u>Seizure</u> |
| 9. <u>CSF Analysis</u> | 35. <u>Seizure</u> |
| 10. <u>Diplopia</u> | 36. <u>Seizure</u> |
| 11. <u>Diplopia</u> | 37. <u>Seizure</u> |
| 12. <u>Dizzy</u> | 38. <u>Seizure</u> |
| 13. <u>Dizzy</u> | 39. <u>Seizure</u> |
| 14. <u>Dizzy</u> | 40. <u>Seizure</u> |
| 15. <u>Dizzy</u> | 41. <u>Stroke</u> |
| 16. <u>Facial Palsy</u> | 42. <u>Stroke</u> |
| 17. <u>GBS</u> | 43. <u>Stroke</u> |
| 18. <u>GBS</u> | 44. <u>Subdural</u> |
| 19. <u>GBS</u> | 45. <u>TIA</u> |
| 20. <u>Headache</u> | 46. <u>Vertigo</u> |
| 21. <u>Headache</u> | 47. <u>Vertigo</u> |
| 22. <u>Headache</u> | 48. <u>Vertigo</u> |
| 23. <u>Headache</u> | 49. <u>Vertigo</u> |
| 24. <u>Headache</u> | 50. <u>VP Shunt</u> |
| 25. <u>Headache</u> | 51. <u>VP Shunt</u> |
| 26. <u>Involuntary movement</u> | 52. <u>VP Shunt</u> |
| 27. <u>Leg Weakness</u> | |

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Question 1**General points:**

- 1) **Maintain perspective.** Answer this question for **this** patient. The question is about increasing confusion in an 82 year old lady from a nursing home. It is NOT a generic question about the confused patient. Think about the patient as though you were looking after her in your ED.
- 2) **Answer the question that is asked.** If the question states, "Give 2 examples", then give 2 examples only. If you write 3 examples, the third one will not count towards your marks. Also, if you write 2 examples on the one line, then only one of them may be counted or alternatively the one on the next line will not count.

Question 1:

The 5 categories should be relevant to this patient. Examples should not be repeated between categories.

Categories that I think should be considered:

- 1) Infective e.g. UTI, pneumonia, meningitis
- 2) Metabolic / Endocrine e.g. hyponatraemia, hypoglycaemia,
- 3) CNS – e.g. neoplasm or complication of it, stroke (infarct), subdural
- 4) Drug related
 - a. anticholinergic medications e.g. tricyclics, phenothiazine antipsychotics,
 - b. serotonin syndrome
 - c. medication changes e.g. missed or reduced doses of sedative medications
- 5) Gastrointestinal e.g. ischaemic gut, bowel obstruction
- 6) Cardiovascular e.g. silent MI, arrhythmia (e.g. AF), pulmonary embolus

Psychiatric causes such as dementia, Parkinson's disease, depression are not causes that I would consider on my differential list to explain why this lady has become agitated and confused. Similarly environmental causes such as hyperthermia are very unlikely. Hyperthermic patients are unlikely to be combative and agitated. Some candidates listed opiate toxicity. Again. I do not think this is a likely cause as opiate toxic patients are unlikely to be combative and agitated. Opiate withdrawal may be an appropriate

Question 2:

It is important that doses are appropriate for an 82 year old lady. For example, some candidates wrote 5 – 10 mg of intravenous midazolam. Would you give this dose to an elderly woman in a single bolus? I very much doubt it. I would think that you would give 1-2 mg IV titrated to effect. Also some candidates wrote drugs as a mg /kg dose. As an examiner, I want to know what dose you are going to give **this** patient.

Candidate number _____

With regard to adverse effects, some candidates wrote sedation. Isn't this the aim? However, I think it would be reasonable to write excessive sedation.

Question 3:

This question requires you to write the feature and how it differs in both delirium and dementia. Some candidates wrote how the feature is affected by delirium but not dementia.

The features that could have been listed:

- 1) Clouding of consciousness in delirium; normal conscious level in dementia.
- 2) Delirium fluctuates in severity; dementia does not
- 3) Delirium is usually reversible; dementia usually is not
- 4) Delirium has a short onset; dementia has a much longer onset.

Delirium may be associated with acutely abnormal vital signs in particular fever; dementia is associated with normal vital signs

Question 2

1.

Drug Use
Recent trauma
Immunosuppression
Abrupt onset
Hx malignancy
Weight loss
Visual hallucinations
(Many others)

2.

BSL	exclude hypo/hyperglycaemia as cause of agitation
CT head	exclude mass lesion/bleed
CXR	exclude pneumonia
Urine Drug Screen	look for substance induced MH disturbance
Thyroid Function tests	exclude thyrotoxicosis
Electrolytes	exclude renal injury / hyponatremia as cause

3.

First aid – copious wound irrigation
Remove from clinical duties
Report to infection control/similar
Test source and victim for HepB/HepC/HIV
HepB immunisation (passive) if victim not immunised
Antibiotics if suspect deep structures involved (Augmentin) – human bite
Incident report completed for QI / review restraint procedures

Question 3

1.

Abnormal vital signs (Fever, tachycardia, hypotension)

Disorientation

Inability to attend (concentration)

Signs of infection – eg crackles, tender abdomen

Neurological signs

-many other possibilities

2.

Failure to take medications

Similar presentation to previous exacerbations schizophrenia

Gradual deterioration

3.

Call security

Attempt verbal de-escalation

Oral sedation – diazepam 5mg

If not successful then

- Physical restraint – 5 point with security
- Chemical restraint – droperidol 5-10mg IM / IV

Question 4

1.

Large Rt subacute **Subdural Haemorrhage**

Extra-axial collection

Crossing suture lines

Sulcal Effacement

Midline Shift

Subfalcine Herniation

2.

INR – assess capacity for withdrawal

Electrolytes – exclude hyponatraemia

FBE – exclude thrombocytopaenia

ECG – assess AF control given confusion and possible compliance issues

Renal Function – exclude renal injury given confusion and possible compliance issues, presence of nephrotoxic meds

CXR – assess cardiac status given med Hx and need for OT

Urine M/C/S – exclude precipitants for fall ie cause of subdural - UTI

Gp&Hold – if any indication for transfusion in setting of OT

3.

Prothrombin Complex Concentrate (Prothrombinex or equivalent) 50u/kg

End-Point INR <1.5

Question 5

1.

Other ED directors

Ambulance Directors

Neurology

Radiology and Interventional Radiology

Intensive Care

2.

Current ACEM Guideline/Policy Statement

Regional practice

Other college statements (ie RACP - neurologists)

Recent peer-reviewed RCTs/ similar journal articles for clot retrieval

3.

Clinical stroke syndrome with NIHSS >2

Time point (accept anything up to 8 hours)

Patient Consent

Major vessel occlusion on CT (A) – up to first division of major named cerebral arteries

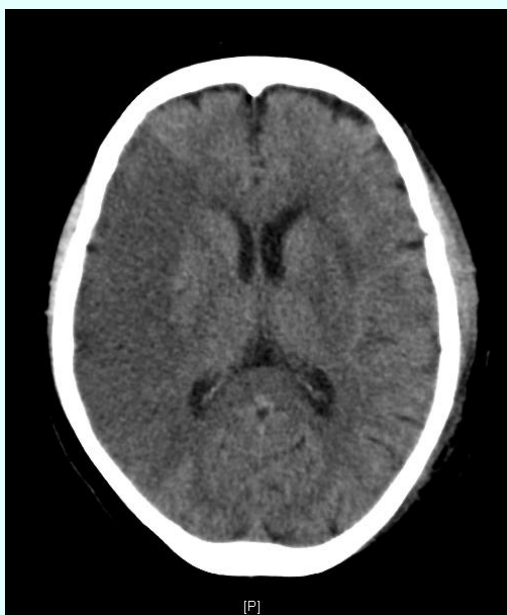
Age >18

No contraindications – pretty much any of the standard things here.

Question 6 :

Elderly female presented after being found on the floor of her bathroom. Her family found her lying on her left side. On arrival to ED, GCS 10, HR 85, BP 140/90

Brain CT, axial images



1. Describe the brain CT findings (1 mark)

- *Acute right MCA territory infarct*

- *No haemorrhagic complications*

2. List 3 clinical signs that would be expected based on the CT brain findings (3 marks)

- *Contralateral hemiplegia*
- *Hemisensory loss*
- *Homonymous hemianopia*
- *Eyes deviated to side of lesion*
- *Dysphasia*

3. What would be your management priorities? (4 marks)

- *Airway protection – ETT vs NP/OP airway depending on GCS*
- *Circulatory control – maintain adequate BP, decrease if systolic BP consistently > 220 mmHg or diastolic BP > 120 mmHg and aim for 10-15% decrease in BP*
- *Thrombolytic therapy – likely contraindicated due to unknown time of symptoms onset*
- *Maintain normal temp*
- *Pressure area care*
- *Seizure control and prophylaxis if required*
- *IV hydration*
- *Stroke Unit admission*

4. List 2 features on CT brain that are associated with a poor outcome from thrombolytic therapy? (2 marks)

- *Cortical hypodensity in >1/3 of MCA territory*
- *Sulcal effacement*
- *Mass effect*
- *Cerebral oedema*

Question 7 (18 marks)

An 81-year-old man is brought in by ambulance to your tertiary emergency department with a reduced level of consciousness. Neighbours broke into his home after not seeing him for 2 days to find him in bed, unresponsive and incontinent of urine.

On assessment his airway is patent, respiratory rate is 17 breaths/minute, saturations are 95% on 2L oxygen, heart rate is 93 bpm, BP is 117/85mmHg and temperature is 36.4 degrees Celsius. Neurological assessment reveals a Glasgow Coma Scale of 6 (E1 V2 M3); pupils are 2mm and sluggish, there is left-sided hemiplegia. His bedside glucose is 7.1

A non-contrast CT brain is performed. Two slices from CT are shown in the Props Booklet (Figures 1a and 1b):

- a. List two positive and two negative findings on this single slice CT scan (4 marks)

Hyperdensity midbrain and pons consistent with acute bleed
dilatation of lateral horns – likely related to mass effect from bleed, probably Hydrocephalus
No tonsillar herniation
No intraventricular blood
No signs of trauma (soft tissue swelling or bony fracture) on non-dedicated limited views

- b. Provide a unifying diagnosis (1 mark)

acute/subacute **intracranial haemorrhage** –spontaneous.

You learn that he has no significant past medical history and takes no regular medications. He lives alone and up to now has been independent in his activities of daily living.

The patient's brother and sister arrive and would like to know what happened to him and what his prognosis is.

- c. List important information that should be included in your discussion with his relatives (5 marks)

Diagnosis: acute brainstem bleed/ bleeding on the brain
Prognosis: most likely to be a life-ending event, if survived will have severe neurological deficits.
Patient's wishes: any previously expressed wishes. Values independence
Plan: Ceilings/goals of care discussion
Expected course of illness/ disposition

Following your discussion, a decision is made to palliate the patient who seems to be comfortable and shows no signs of distress. He is accepted for admission under the palliative care team who ask you to complete his medication chart, including dose he may require on a 'as needed' (p.r.n) basis.

- d. List the 'as needed' (p.r.n.) medications that should be charted for this patient with a indication for each and a dosing regimen. (8 marks)

Indication (1 mark)	Medication (0.5 mark)	Dosing regime (0.5 mark)
Pain/dyspnoea	Morphine (fentanyl)	2.5-5mg sc 30minutely (25-50mcg 30minutely)
anxiety/agitation	Midazolam (haloperidol)	2.5- 5mg sc hrly (0.5-1mg sc 3hrly)
nausea/vomiting	Haloperidol (ondansetron) (metoclopramide)	0.5-1mg sc 3hrly (4mg sl 8hrly/) (10mg sc 4hrly)
Respiratory secretions	Hyoscine butylbromide	200-400mcg sc 2hrly

Question 8 (12 marks)

A 60-year-old woman presents to your Emergency Department complaining of a severe gradual onset headache, blurring of her vision and new onset confusion.

Her vital signs are:

GCS	13 (E3V4M6)
RR	20/min
SaO ₂	96% in room air
HR	60
BP	190/130mmHg
Temp	37.0C

You diagnose her with Hypertensive Encephalopathy.

- a) List 4 differential diagnoses, other than Hypertensive Encephalopathy, you would consider for this woman's presentation (4 marks)

Intra-cranial haemorrhage (traumatic or atraumatic); sub-dural haematoma, extra-dural haematoma. <i>Do not accept subarachnoid haemorrhage</i>
Meningo-encephalitis
Other intra-cranial infection; abscess, cerebral toxoplasmosis
Space-occupying lesion; Primary or secondary neoplastic lesion
Carotid artery dissection
Haemorrhagic CVA <i>Do not accept stroke or CVA</i>
Migraine
Hypoglycaemia
Toxicological; CO poisoning

- b) What is the definition of a Hypertensive Emergency? (1 mark)

Systolic Blood Pressure >180 or Diastolic Blood Pressure >120 AND End-organ dysfunction.
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- c) What is the definition of a Hypertensive Urgency? (1 mark)

Systolic Blood Pressure >180 or Diastolic Blood Pressure >120 WITHOUT end-organ dysfunction

- d) Complete the following table with 4 drugs you could use to treat this woman's hypertension including route, a pro and a con for each (4 marks)

Drug/Route	Pro	Con
Nitroglycerin SL Top	Fast onset Doesn't require intravenous line	Can cause headache Tachyphylaxis Do not use with sildenafil Reflex tachycardia
Nitroglycerin IV infusion	Titrateable Rapid onset *Must use different pro/con if uses both IV and other formulation of GTN*	Can cause headache Tachyphylaxis Do not use with sildenafil CI with Aortic stenosis
Magnesium IV infusion	Relatively safe Familiarity	Risk of hypermagnesia Time of onset Less predictable effect
Hydralazine IV	Rapid onset Familiarity	Reflex tachycardia Urinary retention
Sodium Nitroprusside IV infusion	Rapid onset/offset Titrateable	Requires central access Toxic metabolite Avoid light
Beta-blockers: Metoprolol IV Esmolol IV Labetolol IV	Rapid onset Titrateable Familiarity	Bradycardia *only accept bradycardia as pt has HR of 60
Phentolamine IV	Rapid onset	Tachycardia/risk arrhythmia GI upset
Nimodipine IV infusion (1mg/hr)	Pronounced reduction in BP Titrateable	Tachycardia Headache Nausea

*do not accept oral drugs

- e) State your treatment goal for this woman's hypertension (2 marks)

Decrease MAP by 15-25%
Within 1-2 hours

References

Tintanelli's Emergency Medicine 7th Edition; Chapter 61 Systemic and Pulmonary Hypertension
Textbook of emergency Medicine 4th Edition, Peter Cameron, Chapter 5.9 Hypertension
UpToDate, Drugs used in treatment of hypertensive emergencies; Elliot and Varon
2013 ACEP clinical policy

Question 9**Overall – Anna Davis**

Handwriting still makes a difference

When there are multiple points (eg list 5 order makes a diff and adds emphasis to important points

Gave a lot of 10s/14 which was my bare minimum to pass

Breakdown - part 1 out of 5, part 2 out of 2, part 3 out of 3, part 4 out of 4. Total 14.

1. List 5 contraindications to a lumbar puncture

1. Expected candidates to know 5 contraindications to LP

Many candidates said the same indication but broke it up into several parts which I thought was not as good as grouping them

eg Better candidates said suspected coagulopathy eg low platelets, raised inr (very few mentioned a MP rash which I would think would be important) compared with those who listed different sorts of coagulopathy separately

Another example - infection around LP site is 1 point though some listed cellulitis and abscess around lumbar area as separate

Better answers were put in order of most important eg suspected raised intracranial pressure prior to spinal surgery seemed a better perspective

Mine in order

Suspected raised intracranial pressure - altered conscious state, unilateral dilated pupil, papilloedema, hypertension bradycardia

focal neurological signs

coagulopathy as one - not broken up into 5 different sorts to cover answer

seizures

abnormality at LP site eg infection or spinal anatomy that would preclude lp eg spina bifida, spinal fusion

Others

Patient refusal

Previous complications of LP

Other infection eg pneumonia to explain Sx

Patient agitation???

Not correct

Will not change management

vomiting

2. Most likely diagnoses

Was generally answered well, would have thought you would put viral first then partially treated bacterial meningitis didn't mark down for order

Pass fail was mentioning both viral and bacterial meningitis

partially treated bacterial meningitis is better than just bacterial meningitis

aseptic meningitis was not sufficient

If bacterial meningitis was only mentioned in section 4 s then I allowed them to pass but I thought it was not as good

3. List the features of CSF that support your diagnosis

Best answers conveyed that these results were not 100% diagnostic.

best answers conveyed which features suggested viral and which suggested partially treated bacterial.

eg high protein suggest meningitis, lymphocytes most prominent WCC sugg viral, PMN may only be marginally raised in partially treated as compared to untreated bact meningitis, glucose low end of normal common in partially treated bact

Didn't get full marks but still passed if just listed each feature ie high protein, high lymphocytes as it didn't demonstrate understanding as well

2 pros

Mine in order

antibiotics will treat partially Rx bacterial meningitis which if untreated has high morbidity and mortality

Likely few side effects, can be ceased after culture and PCR exclude bacterial meningitis with little sequelae

Others not quite as good

treats partial bacterial meningitis

treats other source of infection

Cons

Potential for side effects including anaphylaxis

bacterial resistance

Requires hospital stay and complications associated with this

Others

not indicated if viral

Question 10 (16 marks)

A 35 year old woman presents diplopia. She has binocular double vision on both horizontal and vertical gaze. You suspect she has a third cranial nerve palsy.

- i. Describe the typical examination findings of a third nerve palsy (3 marks)
 - Binocular horizontal, vertical or oblique diplopia
 - Paralysis of adduction, elevation & depression → eye looks “down & out”
 - Ptosis
 - Pupil dilation (may or may not be present)
- ii. The location of the site of a third nerve lesion can be predicted by the presence of other symptoms and examination findings (6 marks)

Location of lesion	Associated symptoms/signs
Brainstem/midbrain (e.g. around oculomotor nuclei)	Dizziness, vertigo, ataxia, aphasia “Crossed signs” - contralateral cerebellar deficits or contralateral hemiparesis
Intra-cranial course (e.g. along lateral wall of cavernous sinus)	Involvement of other CN - 4 th , 5 th , 6 th
Orbital (superior orbital fissure, orbital apex)	Orbital signs – chemosis, conjunctival injection, proptosis, visual loss, 4 th , 6 th

- iii. In the setting of a 3rd nerve palsy, the presence or absence of ipsilateral pupil dilation helps to distinguish between a compressive aetiology (eg. expanding aneurysm) and a microvascular/ischaemic aetiology. Explain. (2 marks)

Pupil constriction is mediated by parasympathetic fibres that accompany CN III – they travel peripherally & are more susceptible to compression resulting in pupil dilation (from unopposed sympathetic supply)

- iv. List 5 causes of anisocoria (other than 3rd nerve palsy) (5 marks)
 - Physiologic
 - Structural defects of iris – congenital iritis, traumatic, surgical
 - Acute angle closure glaucoma
 - Horner’s syndrome
 - Pharmacologic – cycloplegics (atropine, tropicamide, cyclopentolate), aerosolized anticholinergic (ipratropium), plants
 - Traumatic
 - Adie’s pupil

Question 11

Diagnosis	Clinical Examination Finding	Investigation
Myasthenia Gravis	Fatigability (any) Ptosis	CT Thymus Tensilon Test Resp Monitoring
GBS	Hyporeflexia Ascending Weakness Miller Fisher Eye signs	Mostly Clinical by LP would show raised protein on most occasions
MS	Cerebellar Signs Hyperreflexia Optic Neuritis	MRI LP
Toxins accidental (Lead)	Evidence of other ingestions	Lead Level FBC and Film (Basophilic Stippling)
CVA (less likely NOT sudden onset)	Unilateral / Localising Signs	CT B MRI
DSH - Toxins	Various Toxins (Neuro)	Tox Bloods
Cord Problems - Syring - Transverse Myelitis	Hyperreflexia Central Cord Findings Spasticity	MRI
Infection - Botulism	Global Weakness	Cultures

ii) Resp Monitoring

- Sats are incorrect - (less reliable)
- Serial Gases
- CO₂
- Spirometry
- Peak Flow

Question 12 (Jon Dowling)

List your 4 most likely differential diagnoses

a. Vertigo

- - Peripheral Vertigo – BPPV, labyrinthitis, Menierres, vestibular neuronitis, ear pathology
- - Central Vertigo – vertebrobasilar ischaemia/haemorrhage, SOL, Demyelination

b. Cardiovascular – hypotension, dehydration, arrhythmia, “pre-syncope”

c. Other – hypoglycaemia, hypoxia, sepsis, toxin (eg ethanol),

- Marks – one each for each point, minimum one example from a,b and c, plus one other in a reasonable order. One mark removed if in unreasonable order
- One CVS cause mandatory

2. The patient describes true vertigo. List six (6) key features on assessment that differentiate between a peripheral and central cause for her symptoms. □ Include three (3) historical and three (3) on physical examination

- Historical:
- Sudden onset, severe, worse on head movement, associated nausea fatigue of symptoms– suggest peripheral
- Other neurological symptoms – central
- Tinnitus/hearing loss – peripheral
- Paroxysmal – suggest peripheral
- Recent viral illness – suggest peripheral
- Cardiovascular risk factors suggest central

Exam:

- Any abnormal neurological exam – central
- Nystagmus – up or down beat rotatory nystagmus suggest peripheral, vertical or multiple direction nystagmus suggest central, fatigue of nystagmus suggests peripheral
- HINTS test – negative head impulse test, nystagmus that changes direction and positive test of skew suggest central
- Abnormal ear exam – suggest peripheral
- Positive Hallpike, may be treated with Epley – suggest peripheral
- Marking – 0.5 mark each any three from each list with appropriate interpretation (cannot just list the hx or exam without understanding what it implies). Must include abnormal exam and nystagmus.
- Half marks rounded down.

3. List three (3) investigations that may be appropriate and justify when you would perform them.

Investigation	When performed
CT	Time critical if any concerns vascular event, may assist with potential time critical intervention eg thrombolysis, surgical decompression
MRI	May be useful if Central symptoms with normal CT, limitations on availability
ECG	AF, ease of access and cheap
Bloods	EUC if vomiting, platelets and clotting if ? central cause

Errors

Q1

- Not reading the Question
- The patient presented with dizziness. If your 4 answers were vertigo, vertigo, vertigo and vertigo then you don't deserve to pass
- Not including at least one CVS cause
- Writing more than 4 answers

Q2

- Saying the same symptom twice
- Frequent use of headache as a differentiator without qualification
- Writing a list without reference to whether it relates to peripheral or central cause
- Inappropriate use of the HINTS exam

Q3

- Writing examination (eg HINTS or Hallpike)
- Unreasonable Ix in the setting of presentation (eg LP to look for meningitis)
- Audiometry
- Non specific justification eg "ECG – routine on arrival", "FBC to look for infective cause"

Question 13 (15 marks)

One of the ED JMOs approaches you for advice about a 45-year-old female who presented with tinnitus and vertigo. You ask if she has any cerebellar signs but the JMO replies 'I forgot to check. What should I look for?'

- i. What are the components of the cerebellar examination? (4 marks)
 - *Speech*
 - *Past pointing*
 - *Intention tremor*
 - *Nystagmus*
 - *Dysdiadochokinesis*
 - *Ataxia*
 - *Romberg's negative*

- ii. The patient examines normally except for some decreased hearing in her left ear. What are the 'tuning fork hearing tests' and how do you interpret them? (8 marks)

Name of test	How do you perform it?	How do you interpret it?
Rinne's	Place a (512 Hz) vibrating tuning fork against the patient's mastoid bone on that side and ask the patient to tell you when the sound is no longer heard. Once the patient signals they can't hear it, place the still-vibrating tuning fork 1–2 cm from the auditory canal. Then ask the patient again to indicate when they are no longer able to hear the tuning fork. (NB it's a good idea to then place the fork close to your own ear after the patient indicates that the sound has subsided, to compare to your own	People with normal hearing, and those with sensorineural hearing loss, will hear the tuning fork by air conduction after they can no longer hear it through bone conduction. People with conductive hearing loss will not be able to hear the tuning fork after it is moved from the mastoid to the pinna! That's because their bone conduction is greater than their air conduction. Something is inhibiting the passage of sound waves from the ear canal, through the middle ear apparatus and into the cochlea (i.e., there is a conductive hearing loss)... but the nerves are fine,

	hearing (this will differentiate normal hearing from sensorineural hearing loss)	
Weber's	Place a vibrating tuning fork (256 or 512 Hz) in the middle of the forehead, or on top of the head equi-distant from the patient's ears. Ask the patient in which ear the sound is heard louder.	• Normal hearing: sound is heard equally in both sides. • Conductive hearing loss: the defective ear hears the sound better • Sensorineural hearing loss: the normal ear hears the sound better

Your tests confirm that she has sensorineural deafness in the left ear. This patient denies any head injury or other trauma and she is otherwise well.

iii. Please list the atraumatic causes of this presentation (3 marks)

- *Idiopathic- this is the majority of cases*
- *Medications: aspirin, aminoglycosides*
- *Vascular e.g. vasculitis, small vessel disease affecting 8th cranial nerve e.g. in diabetics*
- *Inflammatory eg sarcoidosis*

Question 14 (14 marks)

You are assessing a patient with vertigo.

a) Describe 4 features of nystagmus that is present that suggests a central cause (4 marks)

Direction-changing

Vertical or purely rotational direction

Non fatiguable/sustained

No latency to onset (< 6 seconds after Dix Hallpike)

Fixation does not inhibit or worsens

Spontaneous

Examiners comments

Nystagmus can still change with movement when due to a central cause – it is just more obviously worse with head movement when peripheral.

b) Complete the following table of expected findings for a patient who has central vertigo. (4 marks)

Other component of the HINTS exam (2 marks)	Findings in central vertigo (2 marks)
Head impulse test	• Normal test – eyes remain on target or • No saccadic correction
Test of skew	• Vertical deviation seen

Examiners comments

The findings of each test were asked for (i.e. what would you see). “Positive” or “Negative” responses did not get a mark.

c) List six (6) other findings on history or examination that are **not** part of the HINTS examination that would suggest a central cause of vertigo. (6 marks)

Difficulty walking/ataxia

Past pointing

Dysdiadochokinesis

Headache or neck pain

Speech disturbance

Visual loss

Hypotonia

Arm drift/rebound

Normal hearing

Non cranial nerve VII or VIII deficits

Sensory or motor limb deficits (both do not get 2 marks)

No worsening on head movement

Absent/minimal nausea or vomiting

Examiners comments

A positive Romberg’s test is more common with a vestibular (peripheral) cause, than a central one but is so poorly sensitive (c 20%) to not be of any use, so was not given a mark. It is also a test of proprioception, not of cerebellar or vestibular function.

Hearing loss is more suggestive of a peripheral cause – a significant number of candidates incorrectly indicated it was suggestive of a central cause.

Risk factors for cerebrovascular disease were not considered important enough to be given a mark. Many elderly

Question 15:

Questions:

1- List three (3) peripheral and three (3) central causes for his symptoms:

(6 Marks)

Central cause	Peripheral cause
Acute cerebellar haemorrhage	BPPV
Posterior circulation CVA	Vestibular neuritis
Posterior fossa tumour	Meniere's disease

2- List 2 features on history and examination that would support a Central VS Peripheral causes. (8 marks)

	History	Examination
Central cause	Gradual onset Longer duration Less intense	Vertical nystagmus Cerebellar signs – ataxia, dysdiadochokinesis
Peripheral cause	Acute onset usually shorter duration More intense symptoms Fatigueability	Horizontal/rotatory nystagmus Dix-Hallpike positive

3- List two (2) key diagnostic investigations you could perform and their respective utility (4 marks)

Investigation	Utility
CT Brain	Easily accessible, rapid Radiation risk Detects large posterior circulation bleeds Not sensitive for posterior circulation pathology
MRI Brain	No radiation risk Not as easily accessible Takes time and cooperation from patient Ideal and more sensitive to detect posterior circulation strokes

Question 16 (14 marks)

- i. List the clinical features of an isolated 7th nerve palsy due to a peripheral lesion (3 marks)

- Weakness of facial musculature upper and lower
- May have decreased taste ipsilateral affecting anterior 2/3 tongue
- Ipsilateral hyperacusis
- Ipsilateral reduced tear production

- ii. List 5 potential causes of an isolated 7th nerve palsy due to a peripheral lesion (5 marks)

- Cerebropontine angle mass eg acoustic neuroma, facial neuroma, meningioma, cholesteatoma, metastasis
- Temporal bone fracture
- Parotid disorder or neoplasm
- Facial laceration
- Mastoid surgery
- Acute or chronic suppurative otitis media
- Malignant otitis externa
- Guillain Barre syndrome
- Lyme disease
- Sarcoidosis
- Bell's palsy
- Ramsay Hunt syndrome
- Nasopharyngeal malignancy
- Collagen vascular disease
- Diabetes
- Botulism

- HIV
- Syphilis
- Acute porphyrias
- EBV

iii. What treatment should be advised in idiopathic Bell's palsy (2 marks)

- Eye care to prevent corneal exposure; artificial tear 1-2 hourly with lubricating ointment at night
- Steroid therapy; high dose 60mg daily for 5 days then taper
- Antivirals – controversial, but acceptable

iv. What is the prognosis for recovery from idiopathic Bell's Palsy (2 marks)

- 86% complete recovery at 2 months; incomplete paralysis favours a better outcome

v. What factors are associated with a poorer outcome (2 marks)

- Pregnancy
- Diabetes
- Associated taste disorder
- Older age

Question 17 (11 marks)

A 63 year old man presents to the ED with bilateral leg weakness. He has had a recent diarrhoeal illness and you suspect Guillain-Barre syndrome.

Please describe the differences in clinical features between GBS and spinal cord compression (8 marks)

	Guillain-Barre Syndrome	Spinal Cord Compression
History	Prior infectious illness Others potentially ok	No prodrome
Exam Finding 1	Arreflexia (LMN) Sensory typically preserved	Hyperreflexia (UMN) Sensation impaired (level)
Exam Finding 2	Ascending Respiratory muscle involvement	Fixed level No respiratory muscle involvement unless above C5
Diagnostic Investigation	MRI not showing lesion (can show enhancement of anterior spinal nerves) CSF showing albumin-cytological dissociation (e.g. high protein, low WCC) EMG / nerve conduction FVC not accepted answer as below	MRI shows lesion Normal CSF

Describe the use of forced vital capacity (including threshold values) in the monitoring of a patient with GBS and suspected diaphragmatic weakness (3 marks)

FVC result	Management/Disposition
<15mL/kg	Indication for mechanical ventilation
15-20mL/kg	Close monitoring in intensive care setting
>20mL/kg	Observe, ward-based setting if no other indication for ICU

Candidate Name: _____

Question 18

1.

Spinal cord compression / cauda equine compression – tumour, abscess, haematoma

Transverse myelitis

Traumatic spinal cord injury

Spinal cord infarct – embolic/thrombotic

Myopathies – eg myasthenia gravis

Electrolyte – hypoK periodic paralysis

Toxins – tick paralysis, botulism

Pass 4 of 6

2.

Symmetrical ascending weakness

Loss of reflexes

Minimal sensory loss

Pass 2 of 3

3.

LP – raised CSF protein with raised WCC

Nerve conduction studies – consistent with peripheral demyelination

Anti-ganglioside antibodies – raised

(will accept MRI – no spinal cord pathology found)

(also C. jejuni serology - positive)

Pass 2 of 6

4.

Respiratory failure – monitor FVC regularly

Autonomic dysfunction – cardiac monitoring, regular BP measurement

Pass 2 of 4

Total pass 10/19 corrects to **5/10**

Question 19

A previously well 26 year old woman presents with a 10 hour history of gradual onset of tingling and weakness in her arms and legs. This is associated with low back ache. She has recently returned from a two week holiday in Spain, during which time she suffered a self limiting diarrhoeal illness that she attributed to the hotel food. Her vital signs are: HR=100, BP=130/80, RR=36, T=37.0

On clinical examination you suspect a diagnosis of Guillian-Barre syndrome.

List four differential diagnoses for her presentation.
(4 marks)

(**spinal cord pathology**, hypokalaemic periodic paralysis, tick paralysis, myasthenia gravis, polio, MS, poisoning eg lead)

What further testing is indicated? Briefly justify your choices.
(4 marks)

Respiratory function testing / ABG – risk / evidence of respiratory failure
LP – aid diagnosis - expect normal cell count with possible mildly elevated protein
Stool test or serology for Campylobacter – some prognostic utility
CT brain, MRI , serum biochemistry – exclude differentials

What features on clinical examination would suggest the need for intubation and ventilation in Guillian-Barre syndrome?

(2 marks)

(bulbar weakness, inability to lift the head, upper limb weakness, tachypnoea)

Question 20 (13 marks)

What are the components of the Ottawa Subarachnoid Haemorrhage rule? How can it be used? (5 marks)

Ottawa Subarachnoid Hemorrhage (SAH) Rule for Headache Evaluation ☆

Rules out SAH in patients with headache.

INSTRUCTIONS

This rule has very specific inclusion and exclusion criteria that must be followed closely for appropriate application:

Only apply In: Alert patients ≥ 15 years old, new severe atraumatic headache, maximum intensity within 1 hour.

Do not use In: Patients with new neurologic deficits, prior aneurysm, prior SAH, known brain tumors, or chronic recurrent headaches (≥ 3 headaches of the same character and intensity for >6 months).

Age ≥ 40	No 0	Yes +1
Neck pain or stiffness	No 0	Yes +1
Witnessed loss of consciousness	No 0	Yes +1
Onset during exertion	No 0	Yes +1
Thunderclap headache (peaking pain within 1 second)	No 0	Yes +1
Limited neck flexion on examination	No 0	Yes +1

Ruled Out

This patient can be ruled out for subarachnoid hemorrhage by the Ottawa SAH Rule, which was 100% sensitive for SAH in its validation.

Copy Results
Next Steps

Given the patient presented >6 hours after the onset of the headache, name two options for the next investigation, along with a pro and con of each (4 marks)

Ix: LP	Ix: CT angiogram
Pro: • Diagnose SAH with xanthochromia	Pro: • Diagnose aneurysm (manageable cause) • Diagnose alternate cause e.g. vertebral dissection (potentially venous sinus thrombosis but limited sensitivity)
Con: • Invasive • Some centres may not have access to xanthochromia study (particularly spectrophotometry)	Con: • Aneurysm rate 1-2% and may be asymptomatic

Name 4 acute complications of subarachnoid haemorrhage (4 marks)

- Re-bleeding
- Seizures
- Hydrocephalus
- SIADH – hyponatraemia
- Cerebral vasospasm

Question 21 (14 marks)

A 36 year old woman presents with a very sudden onset severe headache 5 hours ago. It is suspicious for subarachnoid haemorrhage (SAH).

(i) Apart from headache, list 4 other clinical features that may be present in SAH (4 marks)

- Onset during strenuous exercise
- Neck pain
- Neck stiffness
- Photophobia
- Transient or prolonged decrease in consciousness
- Seizures
- Nausea/vomiting
- Focal neurological signs

(ii) Complete the table providing estimates where indicated (3 marks)

Situation	Estimate
Prevalence of confirmed SAH in a patient with a classic history of “thunderclap” headache	25% (20-30)
Sensitivity of new generation CT scanning in detecting SAH in this setting	About 98% (90-99)
Incidence of “traumatic tap” when performing a lumbar puncture (LP)	15-20%

(iii) The CT scan of this patient is reported as normal and a decision made to perform a lumbar puncture to look for xanthochromia. Name the two red cell breakdown products that can cause yellow discolouration of CSF (2 marks)

- Bilirubin
- Oxy-haemoglobin

(iv) List 5 criteria that indicate that a CT scan should be carried out prior to lumbar puncture (5 marks)

- Signs of RICP – papilloedema, bradycardia/hypertension
- GCS < 14 (this number variable)
- Immunosuppression
- Focal neuro deficit
- New onset seizures
- History of CNS disease (mass lesion, AVM etc)
- Older age
- Suspected SAH

Question 22 :

A 48 year old female presents with GCS 15 complaining of rapid onset pain, initially in the back of the neck then escalating in intensity over 15 minutes and becoming bilateral and frontal. She is otherwise well.

- a) Beyond a careful and thorough history and physical examination the three (3) most efficient investigations indicated in this case are – (1.5 marks)

Answer

CT scan

Lumbar Puncture

CT angiogram

- b) You are discussing lumbar puncture with the patient. What 4 risks must be highlighted in the consent process? (4 marks)

Answer -

- ***Back pain***
- ***Headache – post LP***
- *Infection*
- ***False positive results***
- *Haemorrhage*
- *Failed procedure*

Must have answers in bold or maximum score is 2.

- c) List 3 (three) evidence based strategies to minimise post LP headache. (1.5 marks)

- ***Atraumatic needle (e.g. Sprotte/Whitacre)***
- ***Small needle calibre***
- *Early mobilisation*
- *Replacement of the stylet before removal of the needle*

Must include answers in bold or maximum score is 1.

- d) Complete the table below with three (3) options (of different classes) for analgesia in this case and include a pro and a con for each (3 marks)

Medication	Pros	Cons
<i>Opiates – Morphine/Fentanyl/Codeine</i>	<i>Dosing titratable</i> <i>Good general analgesic</i>	<i>Respiratory depressant</i> <i>Limited efficacy in headache</i> <i>Dependence</i>
<i>Anti- emetics - Prochlorperazine</i>	<i>Effective in migraine and tension type headaches.</i> <i>Additional antiemetic effect.</i>	<i>High incidence of akathisia</i> <i>Technically should only be administered IM rather than IV.</i>
<i>Anti-emetics - Droperidol</i>	<i>Proven efficacy in headache management for migraine and tension</i> <i>No respiratory depression</i> <i>Lowers BP</i>	<i>Hypotension</i> <i>Sedation</i> <i>Akathisia</i>
<i>Anti- emetics Chlorpromazine</i>	<i>Proven efficacy in headache management for migraine and tension</i> <i>No respiratory depression</i> <i>Lowers BP</i>	<i>Hypotension</i> <i>Sedation</i> <i>Akathisia</i>
<i>Paracetamol</i>	<i>Additive effect with other avenues of analgesia</i> <i>Minimal side effect profile</i>	<i>Limited potency of analgesia</i>
<i>Non Steroidal Anti inflammatory Drugs</i>	<i>Additive effect with other analgesics.</i> <i>Efficacy in majority of migraine headaches</i>	<i>Limited potency</i> <i>Potential anti platelet effect</i>

Question 23

1.

unilateral throbbing headache
presence of visual aura
past Hx migraine
gradual onset

2.

Paracetamol 1g po
Ibuprofen 400mg po
Sumatriptan 6mg sc
Metoclopramide 10mg po/IV/IM
Chlorpromazine 25mg IV
Dihydroergotamine 0.25 – 1mg IV

3.

Amitriptyline
Propranolol
Pizotifen
Valproate
Topiramate
Verapamil

Question 24

1.

Unilateral

Throbbing nature

Preceding Aura/ scotoma

Nausea

Hx of similar headaches

Phono/photophobia

2.

Metoclopramide 10mg IV

Prochlorperazine 12.5mg IM or PO 5-10mg

Aspirin 900mg

Paracetamol 1gm

Sumatriptan 50-100mg PO or 20mg Intranasal or 6mg subcut

Steroid controversial (but recommended as 2nd line in pregnancy – prednisolone 50mg

3.

Sumatriptan 6mg subcut

Ketorolac IMI 30mg

Chlorpromazine 12.5mg IV

4.

Amitryptilline 10mg nocte

Candesartan 4mg daily

Pizotifen 0.5mg nocte

Propranolol 20mg nocte

Na Valproate 200mg nocte

Verapamil SR 90mg

Question 25

12 Marks

A 55yo woman presents to the emergency department complaining of headache and visual abnormalities.

1. List three causes of headache that may be associated with visual symptoms. (3 marks)

- **Migraine**
- **Giant cell arteritis**
- **Acute closed angle glaucoma**
- **Cavernous sinus thrombosis**
- Space occupying lesion
- Stroke

2. For each of your differentials listed above, provide a differentiating feature, an investigation, and a treatment. (9 marks) (JT - any three diagnoses, they don't need to have all these!)

Cause	Differentiating features	Investigations	Treatment
Migraine	History of migraines Classical visual aura Unilateral headache	1 st episode: CT (brain) +/- LP	Simple analgesia Tryptans Lots

Giant Cell Arteritis	Temporal tenderness Jaw claudication Elderly patient Papilloedema Decreased visual acuity Decreased temporal pulse Diplopia	ESR >50 Temporal artery biopsy	Steroids
Glaucoma	Acute severe pain with red eye, orbital or unilateral head pain Blurred vision Haloed	Raised Intraocular pressure (>20mmHg)	Pilocarpine Timolol Acetazolamide Analgesia antiemetic
Venous sinus thrombosis	Persistent, not severe Chemosis Proptosis	CT (venogram) MR (venogram)	Anticoagulation Maintain CPP
Space Occupying Lesion	Morning headaches B symptoms	CT (brain) - contrast	Chemoradiotherapy Surgery

Question 26 (17 marks)

A 50-year old man presents with abrupt involuntary movements of his right arm and leg.

- a) Which two (2) descending pathways are responsible for voluntary skeletal muscle movement of the body and what does each pathway control? (4 marks)

Descending pathway	What does it control?
Corticospinal tract	Skeletal Muscle
Corticobulbar tract	Cranial Nerves

- b) Which part of the nervous system is responsible for **involuntary** control of movement? (1 mark)

- Extrapyramidal System
- Basal Ganglia and Subthalamic Nucleus

c) Complete the following table (12 marks)

	Hemiballismus	Chorea	Partial seizure
List two (2) causes	• CVA • TBI • Amyotrophic Lateral Sclerosis • Nonketotic Hyperglycemia • Neoplasm • Tuberculoma • Demyelination • HIV	• Autoimmune post Group A Strep infection • Huntingtons Disease • Antipsychotic Drugs • CVA • Hyperthyroidism	• Drugs • Drug withdrawal • Infection • Head injury • Hypoglycaemia/metabolic • Structural lesion • Idiopathic
Area of the brain involved	• Subthalamic Nucleus of Basal Ganglia	• Corpus Striatum of Basal Ganglia	• Anywhere in brain
Typical features of the movements	• Large amplitude movement of proximal muscles • Irregular flinging movement of one side of the body	• Continuous random irregular movements • Flow from one part of the body to another with no pattern	• Uncontrolled shaking movements • Usually only part of the body involved • No impairment of consciousness • Rapid repeated contraction and relaxation of muscles

Question 27:

Something along the lines of (any 3 of)

1.

Any 3 of:

Cauda Equina Syndrome:

Hx: Low back pain, trauma.

Exam: areflexia, saddle anaesthesia, decreased anal tone, urinary retention etc.

Cord Compression:

Hx cancer, trauma, IV Drug Use

Exam: hyperreflexia, thoracic back pain, spinal level

Guillain Barre Syndrome:

Hx: Ascending weakness, recent GIT illness

Exam: Areflexia, minimal sensory change

Multiple Sclerosis:

Hx MS, other focal neurology (?Optic neuritis)

Exam: UMN signs, incomplete neurology

Transverse Myelitis:

Hx: post viral illness

Exam: Spinal Level

Functional:

Inconsistent Hx and exam

3. At least:

***Patient has decision making capacity (1 mark)

AND

***Is able to make an informed decision without undue influence/ must be freely given (1 mark)

Also accept:

Detail around 'informed': (1 mark)

- Rationale for procedure
- Risks of procedure
- Risks of not having procedure done
- Any alternatives

Question 28**Describe four (4) relevant findings on his CT scan!**

- Only first 4 items marked!
- Must be relevant!
- Out of 4 marks total!
- SAH and description plus 3 others

What is the most likely diagnosis?!

- Out of 2!
- Subarachnoid haemorrhage (1)!
- PLUS gradation/classification/cause/size estimate

List four (4) *important* measures for neuroprotection in the emergency department?!

- First 4 only marked!
- Out of 4!
- Nimodipine, BP control, others!
- Max of 2 from others.

His BP is 200/100 mmHg. What antihypertensive will you use, include dose and route!

- Out of 2!
- Appropriate Drug (1)!
- Dose AND route (1)

What systolic BP range are you aiming for in mmHg?!

- Range requires high and low value!
- Total of 2 marks

Cut mark 64% or 9/14**Feedback/advice**

- Watch number of items requested
- Care with double point answers
- Show prioritisation
- Consultant level answer

Question 29 (13 marks)

A 38 year old male patient presents to your urban ED with sudden onset occipital headache and vomiting whilst lifting weights at the gym.

Vital signs GCS 14
 P 100 bpm
 BP 180/70 mmHg
 Temp 36 deg C

i. Interpret the CT images (4 marks)

CT IMAGES ARE SHOWN IN THE PROPS BOOKLET, PAGE 3

- Extensive SAH in the suprasellar cistern (-> prepontine cistern) -> foramen magnum & brainstem
- Left greater than right supraseller cistern
- Consistent with circle of Willis aneurysm rupture
- Early temporal horn dilatation indicative early hydrocephalus
- Risk / early obstructive hydrocephalus (given temporal horn dilatation or presence of blood around brainstem / FM)

ii. Outline 5 management priorities (5 marks)

- Place in resus/monitoring and 15 min neuro obs
- Analgesia, antiemetic - appropriate
- NBM

Candidate number _____

- Aggressive BP control – aim < 140 systolic, appropriate agent – hydralazine example
- Head up 30 degree
- Euglycaemia, euthermia
- Discussion with neuro surgical centre
- Liaise with retrieval
- Prepare for intubation

iii. List 4 strategies to minimize abnormalities in intracranial pressure if this patient was intubated (4 marks)

- Head up 30 degrees
- Avoid ETT tube tie - tape instead
- Fentanyl premed prior to intubation
- Normal oxygenation / sodium
- Avoid hypo/hyperventilation
- Mannitol / hypertonic saline
- Thiopentone coma
- Ca channel blockers to avoid vasospasm

Question 30

1.

Smoking

Hypertension

Alcohol abuse

Family Hx

2.

WFNS

1 – GCS 15

2 – GCS 13-14 no focal deficits

3 – GCS 13-14 + focal deficits

4 – GCS 7-12

5 – GCS 3-6

3.

SAH related

- Hydrocephalus
- Re-bleed
- Seizure
- (vasospasm not likely this early)

Non-SAH related

- Opiate toxicity
- CO2 narcosis from opiates
- Hypoxia from pulmonary oedema

4.

Intubate – protect airway, control O₂ and CO₂

CT scan – exclude hydrocephalus and rebleed

Discuss with Neurosurgeons – facilitate definitive management, or EVD if needed

BP management – limit rebleed / complications while maintaining adequate CPP, aim systolic 160-200 probably acceptable

nimodipine infusion – prevent vasospasm

Minimise raised ICP / neuroprotective measures– head up, remove obstructions to venous return from head (eg ties), Na high normal range, CO₂ 35-40mmHg, normal temp and glucose

Question 31 **13/18**

1

Subarachnoid blood

Extension to subdural space on right ie SDH

Blood in 4th ventricle

Midline shift to left

Parafalcine herniation

Loss grey/white differentiation – oedema

Also accept comment on localisation of haemorrhage right middle meningeal A territory

2

SAH

3

Non-cardiogenic **pulmonary oedema**:

Bilateral symmetrical pulmonary infiltrates

Peri-hilar predominance

Alveolar in pattern

Normal heart size

4

Urgent neurosurgical referral

BP control – eg hydralazine 5mg aliquots aim BP systolic 160mmHg

Nimodipine infusion to prevent vasospasm

Increase PEEP to manage APO – eg 10cm H₂O

5

Vasospasm

Re-bleed

Hydrocephalus

seizure

Question 32

Questions:

- 1- List the radiological abnormalities on the above scan. (4 marks) -3/4

Answer:

Extensive subarachnoid haemorrhage

Intra-ventricular haemorrhage – lateral ventricles, anterior horns, L) posterior horn

No apparent hydrocephalus

Evidence of cerebral oedema

No midline shift

2. List your immediate management priorities in this patient: (10 marks) -6/10

Answers:

Instigate neuroprotective measures. (2 marks)

Maintain pCO₂ 30-35,

Maintain pO₂ > 80

Head up 30 degrees

Maintain normothermia

Maintain normoglycaemia

Ensure adequate sedation +/- paralysis (1 mark)

Morphine/Midazolam infusion

Treat Hypertension: (1 mark for drug & 1 for endpoint)

Invasive arterial BP monitoring

aim for SBP 160

GTN infusion, titrated to above endpoints

Hydralazine (5mg aliquats to 20 mg)

B-Blocker (Metoprolol 2.5mg aliquats to 20 mg or HR 60)

SNP infusion

Expedite **Neurosurgery** review (1 mark)

- definitive Mx with early vs delayed clipping with CTA, 4-vessel angio or MRA prior
- ICP monitoring
- EVD for monitoring/CSF drainage if developing hydrocephalus

Monitor for vasospasm: **(Discriminator – if mention this get 2 marks)**

- Nimodipine Infusion (d/w neurosurgeons): start at 1mg/hr and titrate up to 4 mg

Supportive cares (2 marks)

IDC – hourly measures (DI or SIADH)

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NGT if intubated
Correct electrolyte abnormalities
Coagulation abnormalities
Maintenance fluid (isotonic)

3. What criteria would you use to estimate this patient's likely prognosis.
(4 marks) – 2/4

Scoring System (Need to mention 1/3 scoring systems to pass)

- WFNS – Grade 4 (GCS 8, focal motor deficit)
- Hunt & Hess criteria – Grade 4-5
- Fisher criteria – Grade 4

Likely **poor prognosis**, given low GCS with motor deficit and extensive CT findings and age > 50.

Passmark = 11/18 (adjust to /10) (6/10)

Question 33 (16 marks)

A 29 year old male is brought in by ambulance after a collapse at work. He is a machine operator at a nearby 24 hour factory. Colleagues report he collapsed to the ground whilst working. He was unresponsive and jerking all limbs for a brief period. His level of consciousness has improved on transport to ED.

Vital signs GCS 15
 HR 90 bpm
 BP 126/84 mmHg
 Temp 37.5 deg C
 SaO2 100% (6L/min Hudson)

- i. List four possible causes for his collapse (4 marks)

- Cardiac arrhythmia
- Vasovagal syncope
- Seizure disorder ie epilepsy
- Trauma – HI
- CNS infection – meningitis/encephalitis
- CNS bleed – SAH, ICB
- Other intracranial – SOL, thrombo-embolic stroke,
- Metabolic - hi/lo BSL, hi/lo Na, low Ca, renal/hepatic failure
- Drugs/Toxins – ETOH, anticholinergics, sympathomimetics (amphetamine, cocaine, ICE), phenothiazines, organophosphates
- Drug withdrawal – ETOH, benzos, opioids, cocaine, anticonvulsants
- Pseudoseizure
- Electrocutation

- ii. List four features on history and examination that may suggest that this is a seizure rather than another cause for collapse (4 marks)

- Past history of seizures
- Time course – sudden onset/offset, brief – usually less than 2 minutes
- Description of attack – involuntary movement, incontinence, tongue biting (and location of tongue injury), drooling
- Amnesia
- Post ictal period – confusion, lethargy

- iii. List four reasons why you would order an urgent CT brain (4 marks)

- Focal neurological symptoms/signs
- Persistent reduced LOC
- Further unexplained seizure activity in ED
- Bleeding disorder
- Fever or suspected CNS infection
- Past H/O intracranial pathology or malignancy
- Suspected SAH

- iv. Describe four considerations in determining that this man is fit for discharge home (4 marks)

- No indication for admission – ie further seizures, need for urgent treatment of any underlying cause.
- Stable – no further seizures or reduced LOC
- Time of day
- Support at home/NOK
- Follow up / further investigation as appropriate for diagnosis
- Safety advice – driving, working with machinery as appropriate for diagnosis

Question 34

1.

Heat stroke (exposure)

Sepsis – meningitis

Hyperthyroidism

(DDx must address severe hyperthermia)

Pass 2 of 3

2.

Serotonin toxicity – hyper-reflexia, muscular rigidity, mydriasis etc

Anti-cholinergic syndrome – dry skin, flushed, mydriasis, delirium etc

Sympathomimetic toxicity – tachycardia, dilated pupils, hypertension etc

Neuroleptic malignant syndrome – rigidity, hypertension, CNS

1 mark for causes, 1 mark for each finding

Pass 7 of 12

3.

Remove clothing

Fans with mist

Ice packs to axillae / groins / neck

Cold IV fluids – 4 degrees N/S

Cold bladder irrigation

Pass 3 of 4

Total pass 12/19 corrects to 6/10

Question 35

1.

Midazolam 5mg aliquots IV

Phenytoin 15mg/kg IV over 30 min

Levetiracetam 1-2g IV

Valproate 800-1200mg

Phenobarbitone 10mg/kg

(only one mark for benzos)

2.

Metabolic – hypoglycaemia, hyponatremia

Head injury (of any type)

Encephalitis / meningitis (will not accept “sepsis”)

Drug intoxication eg amphetamines

Intracranial SOL – malignancy

Eclampsia

Intracranial haemorrhage spontaneous eg SAH

Primary epilepsy

3.

Hypoxic brain injury / cerebral oedema

Intracranial haemorrhage

Pulmonary oedema

Rhabdomyolysis / renal failure

Non-head trauma – eg spine fractures

(others will be acceptable)

Question 36

12 Marks

A 27-year-old woman presents to your suburban emergency department following a seizure. This is a first seizure and is described as tonic-clonic. The seizure self-resolved after 5 minutes.

Observations:

HR	105bpm
SpO2	99% RA
BP	123/84
GCS	12 (E3 V4 M5)

1. List eight (8) causes for a first seizure.(4 marks)

- Epilepsy
- Toxicological:
 - Drug withdrawal (alcohol, benzodiazepines, barbiturates)
 - Drug intoxication (Sympathomimetic, antipsychotic, antidepressant, theophylline, isoniazid, opiates)
- Space occupying lesion
- Stroke
- Trauma
- Intracranial haemorrhage (SAH, intracerebral bleed)
- Hypoxic seizure
- Hypoglycaemia
- Electrolyte disorder
 - Hyper/hypo-natraemia
 - Hypercalcaemia
- CNS infection (meningo-encephalitis, cerebral abscess, neurocysticercosis)

The patient has recurrent seizures whilst in the department.

The junior medical officer has given a loading dose of phenytoin as an IV bolus.

2. Describe the possible adverse effects of an IV bolus dose of IV phenytoin, and management of these effects(4 marks)

- Effects:
 - Sodium channel blockade
 - QRS widening
 - Dysrhythmia inc. VT
- Management:
 - Sodium Bicarbonate 2mmol/kg IV every 1-2 minutes
 - Multiple doses often required
 - Lignocaine 1.5 mg/kg IV
 - When pH >7.5

3. List two (2) IV anticonvulsants and their doses, other than phenytoin, that may be used in status epilepticus.(4 marks)

- Levetiracetam
 - 20mg/kg IV
 - If post ictal then over 20 minutes.
 - If seizing, then slow push.
- Valproate
 - 20mg/kg IV
 - 10 minute infusion
- Phenobarbitone
 - 20mg/kg IV
 - Maximum rate of 60mg/min.
 - 20-30 minute infusion

Question 37 (18 marks)

A 4 year old previously well girl, presents with a sudden onset generalised tonic-clonic seizure lasting 40 minutes, terminated with one dose of midazolam. Immediately afterwards she is GCS 3, and apnoeic.

- i. Briefly describe two methods for maintaining ventilation in this situation and the reason for your preferred method (4 marks)

- Bag valve mask
- +/- airway adjunct
- LMA
- Intubation and ventilation
- BVM preferred method because least invasive and patient likely to recover once post ictal phase and midazolam has worn off and high CO₂ washed out
- LMA second line if BVM +AA fails
- I and V if vomiting, potential aspiration

- ii. List 5 possible causes of apnoea in this situation (5 marks)

- Post ictal phase
- Midazolam
- Hypercapnoea (respiratory acidosis) from hypoventilation
- Hypoglycaemia
- Ongoing subclinical seizure
- Coning due to space occupying lesions

- ICH/SDH/SAH (can count separately)
- Tumour/abscess
- Coning due to cerebral oedema
- Electrolyte abnormalities
- Meningitis (unlikely as the child was well)
- Paralysis due electrolyte abnormalities (eg familial hypokalaemic paralysis)
- Cord injury during handling or seizure

The child improves to a GCS of 14 in 30 minutes. There are no focal neurological signs and no preceding illness or fever apart from the occasional headache. The child was born in Australia but spent 3 months in India returning 6 months ago. Her glucose and electrolytes are normal.

iii. List 5 possible causes for the seizure (5 marks)

- 1 mark per answer and extra mark if they mention neurocysticercosis or parasitic brain infestation
- Otherwise many causes

iv. Outline the Pros and cons of CT vs MRI of brain in this situation (4 marks)

	PRO	CON
MRI		
CT		

- MRI
 - PRO
 - Better pictures, better diagnostics, no radiation
 - CONS
 - Availability may make it too slow if there is a time critical problem going on. More likely to need a GA or sedation to keep still
 - Claustrophobia
 - Difficult to monitor pt in tunnel
 - Expensive
- CT
 - PRO
 - Quick and available in most departments.
 - Modern rapid scanners rarely need GA or sedation in children of this age
 - Good diagnostics esp for fractures and bleeds
 - CON
 - Not as good as MRI for soft tissue lesions/masses
 - Radiation cancer risk (?1:1000)

Question 38

1

Sympathomimetic toxidrome

- Dilated pupils, Hx use amphetamines, track marks
- Supportive – benzodiazepines, cooling +/- intubation to facilitate paralysis and cooling

Serotonin toxicity

- MDMA use, dilated pupils, hypertonia, hyperreflexia, clonus
- As above

Meningitis

- Meningism / neck stiffness, petechial rash of DIC, Hx headache / unwell, LP – white cells
- IV antibiotics ceftriaxone 2g +/- vancomycin 30mg/kg, IV fluids, supportive Rx

Heat stroke

- Hot environment, use of drugs will predispose, lots of activity (eg dancing)
- Supportive, cooling – cold IV fluids, ice packs, potentially intubation with paralysis

Status epilepticus

- Hx epilepsy, Hx of aura prior to seizure
- Anti-epileptic drugs: with dose, supportive care

Others will be OK

Question 39 (12 marks)

A 45 year old man (weighing 70kg) is brought into the ED by the ambulance service after he was witnessed to have a generalised seizure. A total of 5mg of intramuscular midazolam was given pre-hospital. It was suspected that he had taken an overdose of his prescription medication.

- a) List four (4) prescription medications under each of the following drug categories, which could cause a seizure as a result of an overdose **(4 marks)**

Drug class	Example of drug which could cause seizure
Analgesics	• tramadol, • lignocaine, • propoxyphene, • salicylates
Antimicrobials	• isoniazid, • chloroquine, • quinine
Psychiatric medications	• bupropion, • citalopram, • lithium, • venlafaxine, • TCA, • antidopaminergic agents
Other medications	• hypoglycaemic agents, • lithium, • essential oils, • hydrocarbons, • methylxanthines, p • ropranolol, • baclofen

- b) List three (3) immediate bedside tests you would do to investigate the cause of his seizure, and for each, state your rationale **(6 marks)**

	Bedside test	Rationale
1	BSL	hypoglycaemia
2	ECG	features of Na-channel blockade, prolonged QT
3	Blood Gas	hyponatraemia, may also have other features related to specific agents

- c) The patient proceeds to have two (2) more seizures in the ED despite intravenous midazolam. List two (2) “second-line” agents (with appropriate dose) which could be used to terminate seizures in this situation **(2 marks)**.

- Levetiracetam 1-3.5g IV over 15-60 min
- Valproate 1-3g IV over 5-60 min
- Pyridoxine (vit B6) : 5g or 70mg/kg empiric
- Phenobarbitone : 5-15mg/kg over 15 mins, then 0.5-3mg/kg/hr
- Propofol : requires airway protection
- **No role for phenytoin
- Pass mark 3+5+1= 9/12

Question 40

A 56-year-old female is brought in to your ED after a generalized tonic-clonic seizure. On your assessment, you note that there is right-sided weakness and history reveals frequent falls and headache in recent months.

She has no significant past medical history and as part of the ED assessment, you have performed a CT brain, which is included in the Props booklet.

The patient is now GCS 15 and complaining of a headache. Her vital signs are as follows:

Temp	37.5C
HR	65
BP	135 / 85
RR	15
O2 Sats	97%

Questions:

1. List 3 pertinent findings on this CT. (3 Marks)

- Large ring enhancing lesion to left frontoparietal hemisphere
- Surrounding vasogenic oedema is evident
- Mild mass effect with a minor degree of midline shift
- Irregular thick margins with hyperattenuation (or heterogenous enhancement of the margin)

2. List 5 differential diagnoses for these radiological findings. (5 Marks)

- Primary malignancy (Glioblastoma Multiforme most likely, others include anaplastic astrocytoma)
- Cerebral metastasis (Lung, Breast,
- Cerebral abscess
- Primary CNS lymphoma
- Cerebral toxoplasmosis
- Cerebral Tuberculosis
- Subacute cerebral infarction
- Tumefactive demyelination

3. List your management priorities in the Emergency Department (5 Marks)

- Analgesia with dose
- Steroid Therapy (Must name drug and dose and route)
Dexamethasone 4-8mg stat then 4mg QID IV
- Consultation with neurosurgery team for admission and further management
- Seizure prophylaxis
Will accept either phenytoin load 15-20mg/kg or leviteracetam 20-30mg/kg
- Social support for patient and family

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4. State 5 important aspects to breaking bad news to this patient. (5 marks)

Any of the below

- Appropriate setting: quiet area is desirable
- Ask if she wants any family or NOK present
- Having other support staff present: Senior RN or Social Worker
- Use of a 'Warning Shot'
- Explain findings on the CT and the likely diagnoses in layman terms
- Explain the next step in her treatment will be guided by the neurosurgical team
- Use of silence for news to sink in
- Offer tissue and water
- Social worker to assist with any social issues
- Answer any questions posed by patient and family

Will accept any combination of the above

Pass Mark is 13/18

Question 41

1.

Haemorrhagic stroke / ICH

Hypoglycaemia

Migraine

Todd's paresis

Intracranial tumour

Intracranial abscess

2.

BSL – exclude hypoglycaemia

CT head – for haemorrhage

ECG – for AF

3.

NIHSS ≤ 4 or ≥ 24

Resolving signs

Evidence of active bleeding or acute trauma

Systolic BP $>180\text{mmHg}$, diastolic $>110\text{mmHg}$

Question 42

12 Marks

A 65 year old man is brought to ED with a stroke. He is usually independent and well. He has treated hypertension and elevated lipids. He has right sided hemiplegia (worse on arm than leg), eyes deviated to the left, and global aphasia. You cannot assess sensation or visual fields due to the aphasia. He is awake.

Symptoms started 2hrs previously.

- 1) List risk factors for stroke (4 marks)

HTN
DM
Lipids
Male
Age
AF
Valvular disease
CCF, IHD

- 2) What is the likely cerebral territory involved? (2 marks)

Left MCA 1 mark
Proximal ie M1 1 mark

- 3) The decision is made to offer thrombolysis. What agent do you use? (2 marks)

tPA 0.9mg/kg to max 90mg. 10% bolus then 90% over 60mins
OR
tenecteplase 0.25mg/kg to max 25mg over 1 minute

Need to choose a drug and dose for two marks

- 4) Following CT imaging he is referred for interventional radiology. What are the indications for IR clot retrieval? (4 marks)

NIHSS ≥ 6
Pre-stroke Rankin score ≤ 1
Acute ischaemic stroke from occlusion of
-internal carotid
-M1
-dominant vertebral
-basilar
-M2 if NIHSS >10 and if ineligible for thrombolysis
thrombolysis able to be given within 4.5 hours after stroke onset
arterial access can occur within 24 hours of stroke onset

Question 43

FEx Net 2022 Collated SAQs

Q1. (2 marks) 1/2

Right peri-sylvian and insular cortex hypodensity consistent with an infarct. (MCA territory)

Basal Ganglia spared

Q2. (2 marks) 1/2

R MCA Thrombo-embolic Infarct

- distal main stem with superior and inferior divisions affected.

Q3. (4 marks) 3/4

Contralateral hemiparesis face & arm > leg

Contralateral hemisensory loss

Contralateral visual field defect (homonymous hemianopia/quadrantanopia)

Dominant lesion – aphasia (expressive and receptive)

Q4. (10 marks) 6/10

Title - Thrombolysis for acute CVA

Target audience -ED Triage and staff / Internal Medicine /ICU / Radiology

Immediate actions for patients with suspected stroke

Inform ED senior / Focused history and examination /Proceed to urgent CT Brain

/Order routine lab tests, ECG, CXR

Instructions / Checklist paperwork for nursing staff and medical team to document process – BP observation important

Detailed Examination including - NIHSS score - Disability assessment – Modified Rankin score

Inclusion criteria - Clinically suspected CVA - Less than 4.5 hours - Age >18

Exclusion criteria

ICH / recent stroke / MI / Trauma /GI bleeding

Pt improving dramatically / Very large CVA on CT or clinically very severe symptoms

Abnormal INR or platelets

Assess Bleeding risk

Discussion with Neurology / ICU / Stroke Team

Consent process - with patient / family – risks of bleeding

Drug specific information tPA (0.9mg/kg, 10% bolus dose, then infusion)– dose / route of

Disposition – ICU / stroke team.

References – stroke guidelines, Australian Stroke Foundation

Addenda – NIHSS score

Signatories – ED director / Stroke team / ICU

Review date

Passmark: 11/18 Adjust to ../10 please

Question 44

A 85-year-old woman is transferred to your emergency department from her residential care facility. The staff reports that she has been complaining of a headache, is more confused than normal and is unsteady on her feet.

She has a past history of dementia, CRF, IHD and AF.

Her medications include digoxin, warfarin, atenolol, isosorbide mononitrate, lorazepam and aspirin.

Her vital signs are

BP 100/60 mmHg
HR 50bpm, irreg,
GCS 13 (V4,M5,E4)

A CT has been performed (**see image in props booklet**).

a) List four relevant (4) findings on the CT (4 marks)

- Bilateral subdural haematomas
- Acute on chronic
- Loss of sulci and right ventricular volume – demonstrates raised ICP
- No midline shift on single slice
- No fracture evident on single slice

b) List four (4) other investigations you would perform and explain why (4 marks)

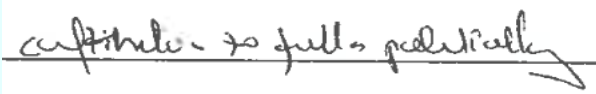
- Bold answers required for full marks

Investigation	Justification
• INR	• On warfarin, may need reversal
• ECG	• Bradycardia - ?slow AF vs block vs digoxin toxicity

• EUC	• Hypo/hypernatraemia effect on mental state • Potassium and renal failure in presence of digoxin
• Digoxin level	• ?toxicity
• CT neck	• C-spine clearance in potential trauma
• CBE	•

- c) There is an advanced care directive that states she is not for CPR or intubation. Neurosurgery have advised non-operative management. List 4 OTHER management issues you will address. (4 marks).

- Reversal of anticoagulation and cessation of warfarin
- Address family expectations and possibility of further deterioration
- Analgesia
- Documentation

- Medication review: 
- Mobility and falls assessment with OT/PT
- Repeat CT at 24 hours
- Adequate communication with GP / care facility prior to discharge

Question 45

- 1. Complete the following table in regards to risk stratification of TIA patients with the ABCD2 score. (7 marks)**

Symptom or Risk Factor	Score Weighting
Age > 60	1
Blood Pressure > 140 / 90	1
Clinical Features 1. Unilateral Weakness 2. Speech impairment without weakness	2 1
Duration of symptoms 3. > 60 minutes 4. 10 – 59 minutes	2 1
Diabetes Mellitus	1

(0.5 marks for each part of answer – symptom & score)

- 2. Name the finding seen on this CT image. (1 mark)**

Left sided dense middle cerebral artery (MCA) sign or hyperdense MCA sign

- 3. List 6 absolute contraindications for thrombolytic therapy for acute stroke. (6 marks)**

1. Uncertainty about time of stroke onset (eg patient awaking from sleep)
2. Coma or severe obtundation with fixed eye deviation and complete hemiplegia
3. Only minor stroke deficit which is rapidly improving
4. Seizures observed or known to have occurred at onset of stroke
5. Hypertension: SBP > 185mmHg or DBP >110mmHg on repeated measures prior to study.
6. Clinical presentation suggestive of subarachnoid haemorrhage even if the CT scan is normal.
7. Presumed septic embolus
8. Patient having received heparin in last 48 hours and has elevated PTT or has a known hereditary or acquired haemorrhagic diathesis (eg PT or APTT greater than normal)
9. INR > 1.5

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- 10. Platelet count < 100 000 uL
- 11. Serum glucose < 2.8mmol/L or >22mmol/L

- 4. In 2016 the Australasian College for Emergency Medicine commissioned an independent literature review by researchers from the University of Canberra Health Research Institute. What was the conclusion of this review? (2 marks)**

Current evidence shows that IV thrombolysis with rTPA, particularly within 3 hours of symptom onset, increases the odds of a better functional outcome, but also increases the risk of sICH and early death by ICH.

Question 46

1.

BPPV

Vestibular labyrinthitis

Meniere's disease

Acoustic neuroma

2.

Ischaemic stroke

Haemorrhagic stroke

CNS malignancy

MS

Posterior circulation migraine

3.

Negative head impulse test

Skew gaze on cover testing

Nystagmus that is persistent, vertical, torsional or changes direction

Ataxic gait – broad based, cerebellar gait

Dysdiadochokinesis

Past pointing

Intention tremor

Question 47

A 60 yr old lady presents with vertigo.

In column 1 list 4 important diagnoses to consider in any patient that presents with persistent vertigo.

In Column 2 list the historical features that would suggest each diagnosis.

In Column 3 list the findings on physical examination that would suggest each diagnosis.

Column 1 : diagnosis	Column 2 : historical features	Column 3 : signs on examination
BPPV	Intermittent vertigo, worse on movement, lasts seconds – minutes, but can have ongoing disequilibrium after acute attacks	Normal neurological examination +ve Hallpike test
Vestibular neuronitis/ labyrinthitis	Subacute onset over hours Persistent symptoms Can last several days Can get hearing loss with labyrinthitis	Normal cranial nerve examination +ve head impulse test
Migranous Vertigo	Past history of migraines, now increased frequency with vestibular episodes. Can occur with or without headache.	Diagnosis of exclusion, normal neurological examination
Cerebellar stroke	Hyperacute onset of vertigo Occipital headache Difficulty walking	Ataxia – gait or truncal Cerebellar signs – past pointing/ disdiadochokinesis

	Loss of coordination	Head impulse test negative Bidirectional or vertical nystagmus +ve test of skew
Brainstem CVA	Sudden onset Can get sudden hearing loss also	Cranial nerve signs Hearing loss -ve head impulse test

Marking guide :

Must include stroke/cva in order to score >6/12

Column 1 : worth 0.5 mark

Column 2 : 0.5 mark per feature

Column 3: : 0.5 marks per sign

Maximum 3 marks per diagnosis.

Question 48

Questions:

1- List 4 peripheral & 4 central causes of vertigo. (8 marks) 7/8

* Peripheral

BPPV

Labyrinthitis

Vestibular neuritis

Meniere's disease

Acoustic neuroma

Cerebellopontine angle tumours

Barotrauma

Ototoxicity

* Central

Posterior circulation CVA

Cerebellar haemorrhage/infarction

Vertebrobasilar insufficiency

Cerebellar tumour

MS

Lateral medullary syndrome

Vertebral artery dissection

2- List 5 features on examination that would be suggestive of central vertigo. (5 marks) 4/5

Vertical nystagmus

Truncal ataxia

Dysdiadochokinesis

Romberg's sign positive

Dysarthria

Limb weakness (focal neurology)

Absence of a positional component (Negative Dix-Hallpike test)

3- List and justify 3 investigations that could be arranged from the ED to distinguish between central and peripheral causes for vertigo. (6 marks) 5/6

CT Brain – Identify abnormalities of posterior fossa (eg bleed, tumour)

MRI – Highly sensitive for posterior circulation CVA

CTA Neck vessels – Identify vertebral artery dissection

Passmark = 16/19 (adjust to /10)

(8.4/10)

Question 49

A 56 year old female presents to your Emergency Department with acute onset dizziness. She has no significant past medical history and does not take any regular medications and has no allergies.

Your assessment is consistent with vertigo.

1. list your differential diagnoses. (8 marks)

Central Vertigo

- Cerebellar infarction or haemorrhage
- Vertebrobasilar insufficiency
- Wallenberg Syndrome (lateral medullary infarction of brainstem)
- Vertebral artery dissection
- Multiple sclerosis
- Space occupying lesions

Peripheral Vertigo

- Benign paroxysmal positional vertigo (BPPV)
- Meniere Disease
- Vestibular neuronitis
- Labyrinthitis
- Perilymph fistula
- Vestibular ganglionitis
- Ototoxicity
- Eighth nerve lesion
- Post traumatic vertigo
- Post cochlear implantation vertigo

2. Fill out the following table with regards to differentiating between central and peripheral vertigo.

(6 marks)

0.5 Marks for each box

Symptoms	Peripheral Vertigo	Central Vertigo
Onset	Sudden	Sudden or slow
Severity	Intense spinning	Ill defined, less intense
Pattern	Paroxysmal, intermittent	Constant
Nystagmus	Horizontal	Vertical or Direction Changing
Aggravation by positioning	Yes	Variable or typically not
Fatigue of Symptoms / Signs	Yes	No

3. What are the components of the HINTS exam and its clinical significance of the findings? (6 marks)

Component of exam	Clinical significance of examination finding
Head impulse test	Normal test (no saccade / correction on head provocation) strongly suggests central cause. Abnormal test (with corrective saccade) consistent with peripheral vertigo as it suggests dysfunction to the peripheral nerve.
Nystagmus	Horizontal nystagmus suggest peripheral cause. Vertical nystagmus or those that changes direction suggests central cause.

Test of Skew (Skew Deviation)	Abnormal skew test with quick vertical gaze corrections (ocular tilt) suggests likely central cause.
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References

Tintinalli's Emergency Medicine 7th Edition, Section 14, Vertigo and Dizziness, page 1144

Edlow J, Diagnosing patients with acute onset persistent dizziness, Annals of Emergency Medicine, 2017.10.012

Question 50 (25 marks)

An 18 year old male is brought to your small rural ED by his parents. He had a VP shunt inserted for hydrocephalus at age 10, with the last revision 3 years ago. He has had increasing headache and vomiting for the last two days and is now confused.

Vital signs are:

T 37.3 degrees (per axilla)
 P 114 regular
 BP 140/70
 GCS 14

i. List 5 potential causes for this presentation (5 marks)

- Shunt blockage, Shunt infection
- Hypoglycaemia
- Hypo / hypernatraemia
- Encephalitis / meningitis
- DKA
- SAH/ICH
- Toxidrome

ii. List the initial laboratory investigations you would perform including your rationale (10 marks)

Investigation	Rationale

- BSL / glucose
- Na
- VBG
- Lactate
- Urea / creat
- LP / shunt reservoir aspiration
- Above with sensible rationale

iii. A CT brain shows marked hydrocephalus. The patient becomes drowsy and has a tonic clonic seizure. Outline your initial five treatment steps (5 marks)

- Oxygen
- IV benzodiazepine – including correct dose / kg
- IV phenytoin / levetiracetam – including correct dose / kg
- IV osmotic agent - hypertonic saline / mannitol
- Consider IV antibiotic/IV antiviral – appropriate choice and dose
- Safe correction of any electrolyte / glucose abnormality

iv. Despite your treatment, his seizures persist for the next 30 minutes. What five further steps would you take (5 marks)

- Intubation – appropriate CO₂ control
- IV phenobarbitone
- IV osmotic agent if not given prior
- Shunt reservoir aspiration
- Discussion with neurosurgeon
- Discussion with retrieval service

Question 51

1.

Blocked shunt – hydrocephalus

Fractured shunt – hydrocephalus

Meningo-encephalitis

Wound infection

2.

Investigation	Abnormality
CT head	Hydrocephalus
Shunt series x-ray	Fractured shunt
LP / shunt tap	Raised WCC – meningo-encephalitis

Question 52

A 24 year old man with a history of hydrocephalus presents with headache, malaise and fever. He has a ventriculoperitoneal shunt.

Aside from the peritoneal cavity, list 2 other potential sites for the drainage limb of a ventricular shunt (2 marks)

1. Pleural cavity, right atrium, ureter, gall bladder (2 marks)

Apart from infection, list 3 causes of shunt obstruction (3 marks)

1. Prox: tissue debris, choroid plexus, clot, infection, catheter tip migration, localized immune response to tubing
Distal: Kinking/disconnection of tube, pseudocyst formation, infection

What is the most commonly cultured micro-organism in CSF shunt infections? (1 mark)

Staph epidermidis

What is the role of lumbar puncture in a patient with a ventriculoperitoneal shunt? (1 mark)

No role, May be negative in presence of shunt infection.

His CT image is attached. What is the diagnosis (2 marks)

1. Slit ventricle syndrome (2 marks). often presents with waxing and waning symptoms. The CT is often helpful in distinguishing it from other causes of malfunction. Overdrainage and the slit ventricle syndrome are seen in approximately 5% of patients with shunts. Because of overdrainage, the tissues actually occlude the orifices of the proximal shunt apparatus. As intracranial pressure increases, the same occluding tissue is disengaged, which allows drainage to resume. This phenomenon is cyclical and is responsible for the episodic or waxing and waning aspect of the presenting complaint. Patients present with episodes of elevated intracranial pressure caused by a transient obstruction of the ventricular catheter from a collapsed ventricle. Decreased cerebral compliance may prevent the ventricles from fully expanding as intracranial pressure and volume increase, which further contributes to ventricular collapse. The rate of this complication is lower for currently used shunt systems with antisiphon devices and programmable shunt valves

Author: M Taliana, Maitland Hospital

Source: Ch 169 Tintinalli

SAQ 20 image