Emergency approach to meningitis in children

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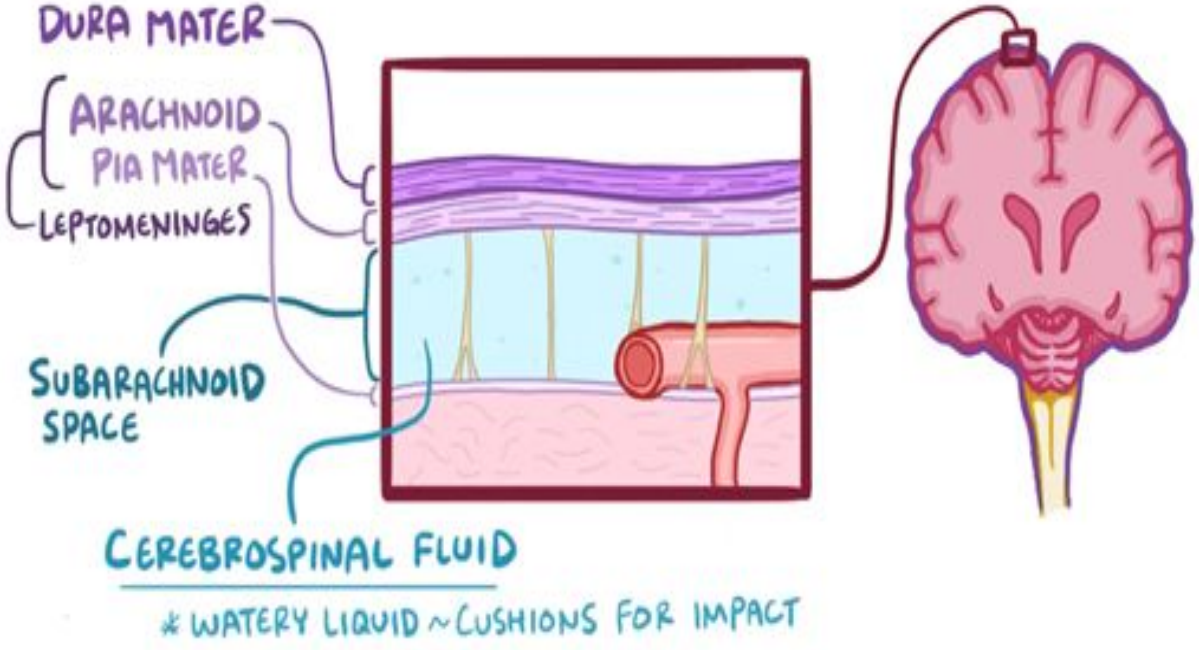
OUTLINE

- Definition
- Prevalence
- Aeitiology
- Presentation
- Emergency assessment
- Investiagtion
- Complications that require emergency care

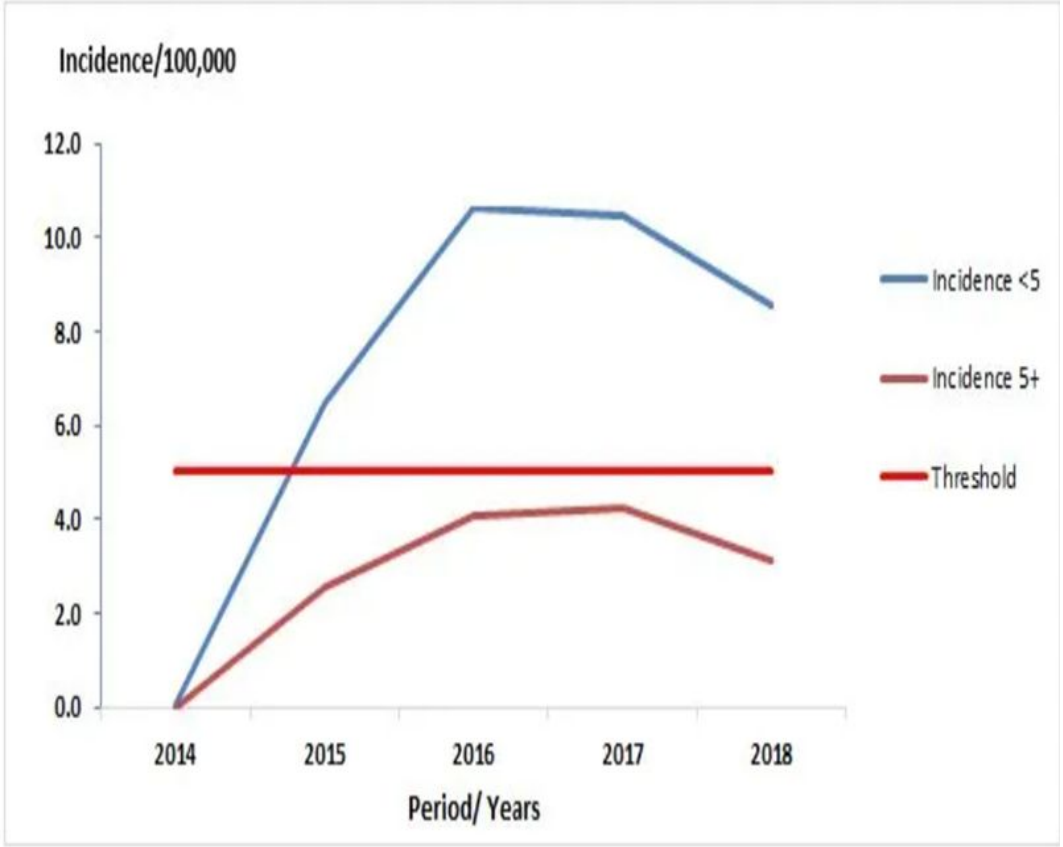
What is Meningitis

- Meningitis is a swelling (inflammation) of the thin membranes that cover the brain and the spinal cord. These membranes are called the meninges.
- Serious/lifethreatening
- Worst in Under 5s, common in Meningitis belt

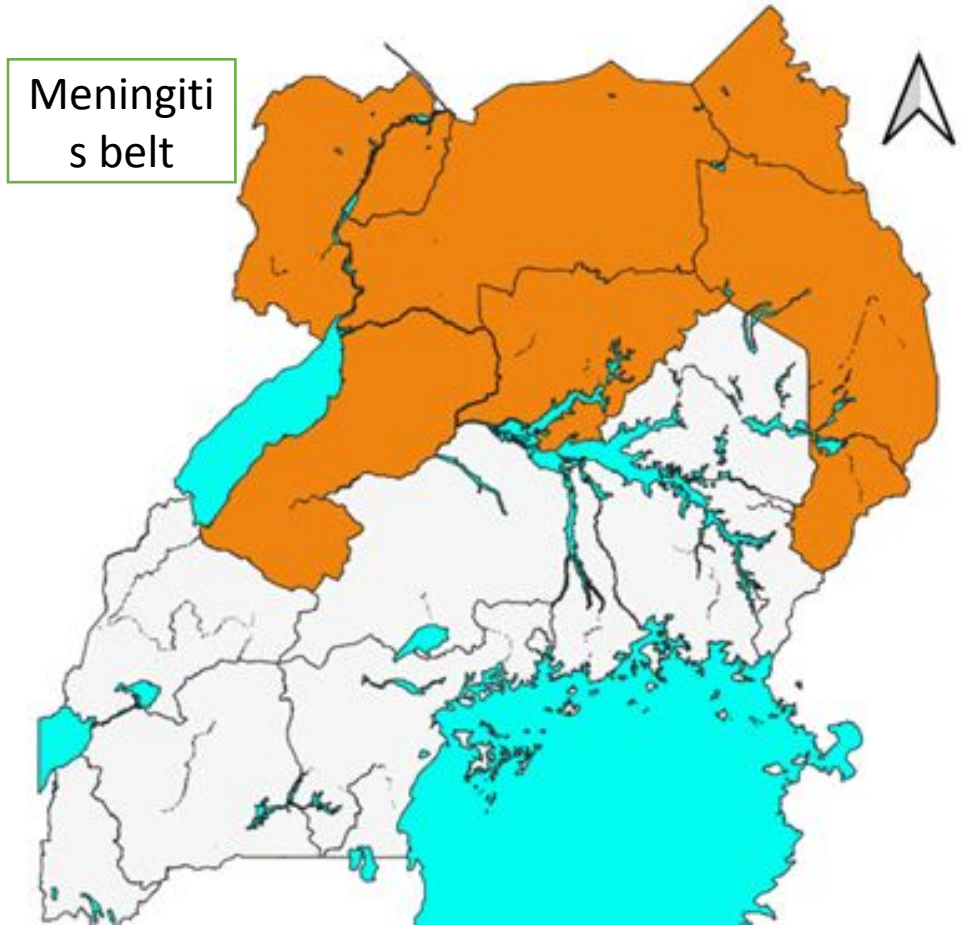


Aetiology Incidence

Bacteria	Viruses	Others organisms	Other causes
Streptococcus Pneumonia	Herpes simplex	Fungi –Cryptococcus neoformans	Autoimmune -Lupus
Haemophilus Influenza	CMV	amoeba	
Neisseria Meningitides	Enteroviruses	Mycobacterium tuberculosis	
Group B Strep –strep agalactiae	Mumps		
Gram neg bacilli –Klebsiella pneumae, E coli			
Staphylococcus --,			

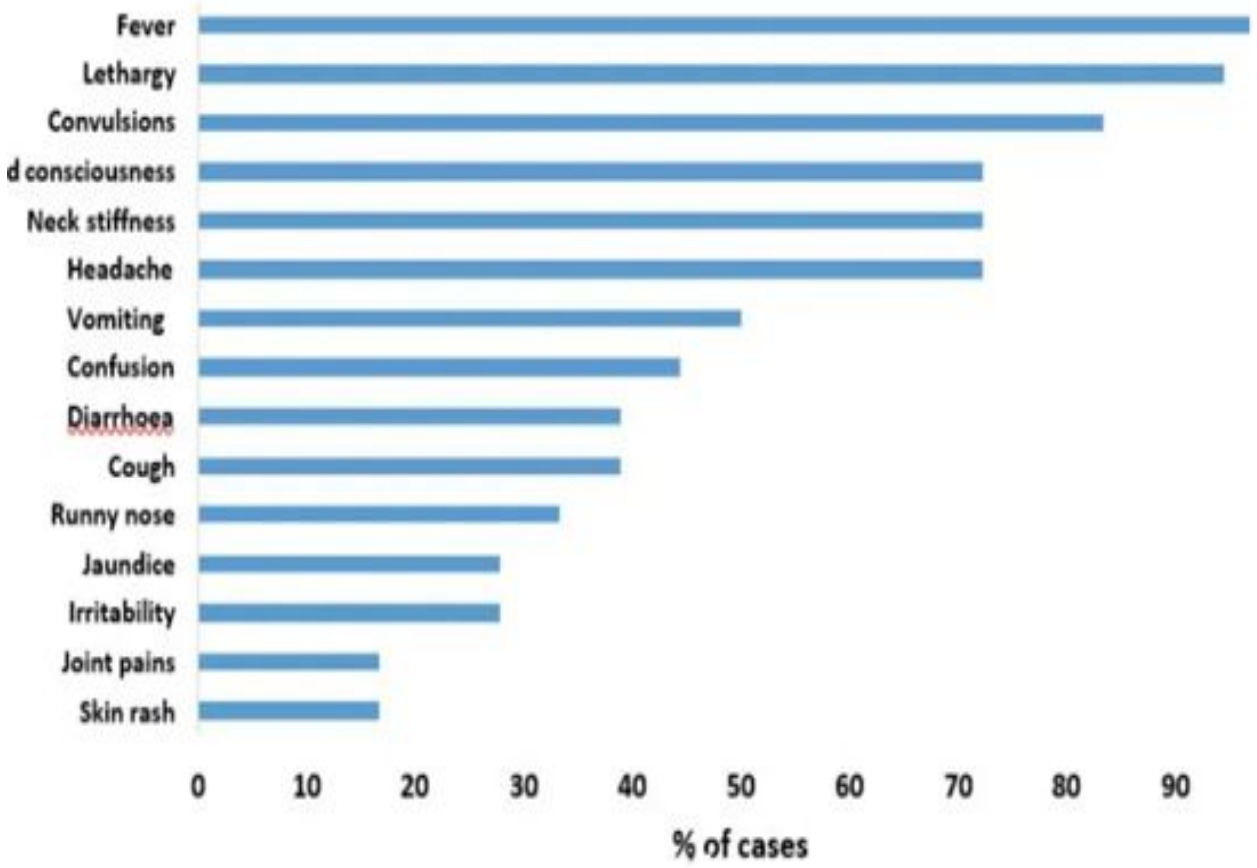


Who is at risk?

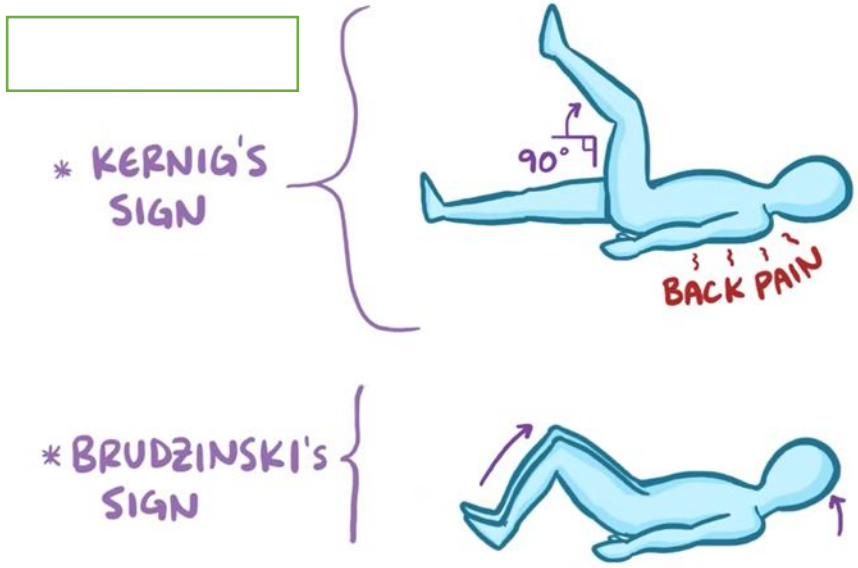


- Meningites Belt
- Under 5 and infants
- Overcrowding –students, refugee camps
- Immune deficiency-HIV, Primary
- Immune suppression-malnutrition, anti cancers
- Cerebral malaria

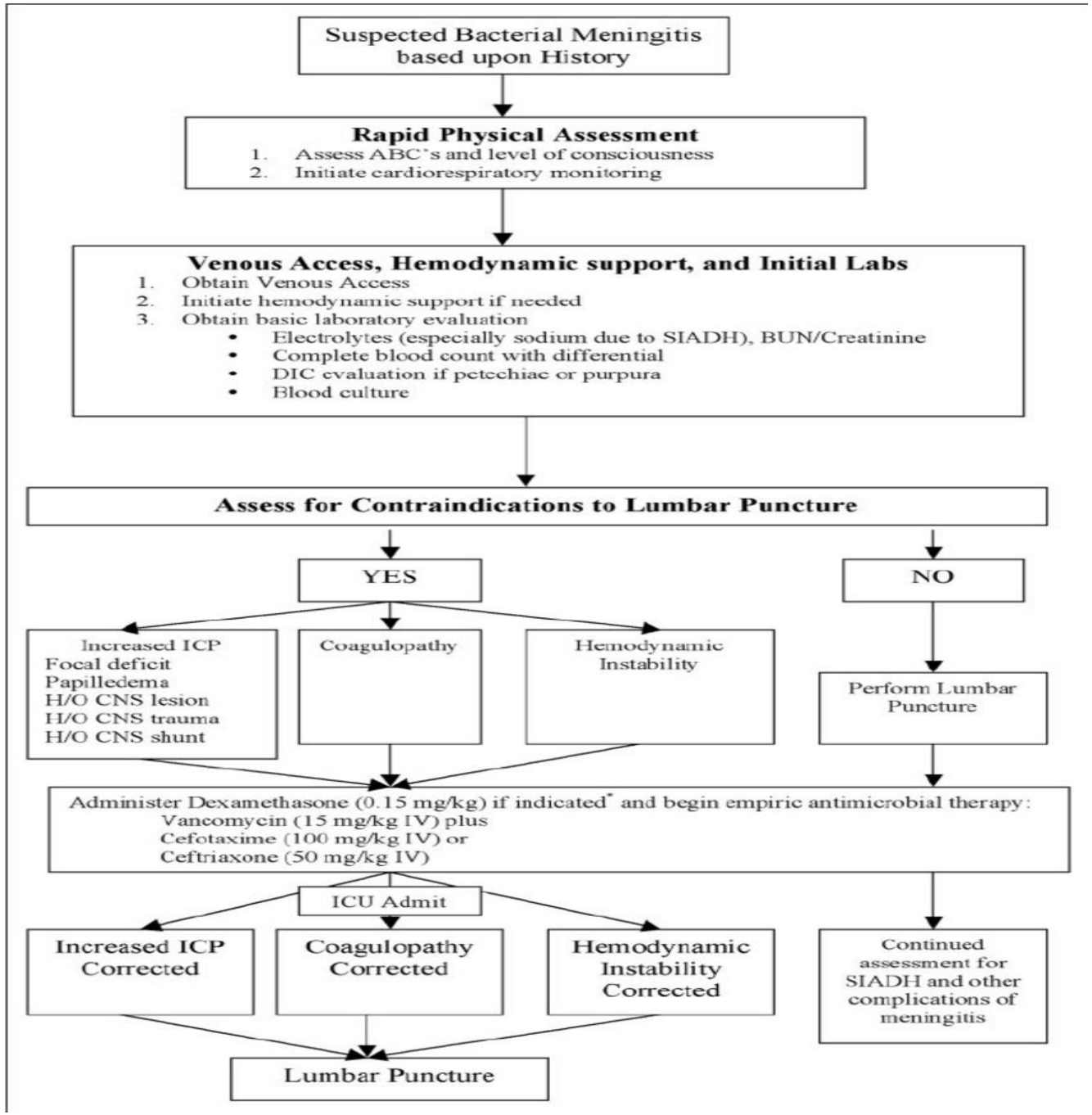
Presentation



Assessment and Investigations



Airway	Ensure patent airway, do not put anything in the mouth
Breathing	Assess breathing, Sp02
Circulation	Shock –thread pulse, tachycardia
Disability	AVPU, neck stiffness, pupil size and reactivity, Kernigs, Brudzinsky, focal neurological deficits
Exposure	Clothes, trauma, poisons -organophosphate


Suspected Bacterial Meningitis based upon History
Rapid Physical Assessment
1. Assess ABC's and level of consciousness
2. Initiate cardiorespiratory monitoring
Venous Access, Hemodynamic support, and Initial Labs
1. Obtain Venous Access
2. Initiate hemodynamic support if needed
3. Obtain basic laboratory evaluation
• Electrolytes (especially sodium due to SIADH), BUN/Creatinine
• Complete blood count with differential
• DIC evaluation if petechiae or purpura
• Blood culture
Assess for Contraindications to Lumbar Puncture
YES
NO
Increased ICP
Focal deficit
Papilledema
H/O CNS lesion
H/O CNS trauma
H/O CNS shunt
Coagulopathy
Hemodynamic Instability
Perform Lumbar Puncture
Administer Dexamethasone (0.15 mg/kg) if indicated* and begin empiric antimicrobial therapy:
Vancomycin (15 mg/kg IV) plus
Cefotaxime (100 mg/kg IV) or
Ceftriaxone (50 mg/kg IV)
ICU Admit
Increased ICP Corrected
Coagulopathy Corrected
Hemodynamic Instability Corrected
Continued assessment for SIADH and other complications of meningitis
Lumbar Puncture

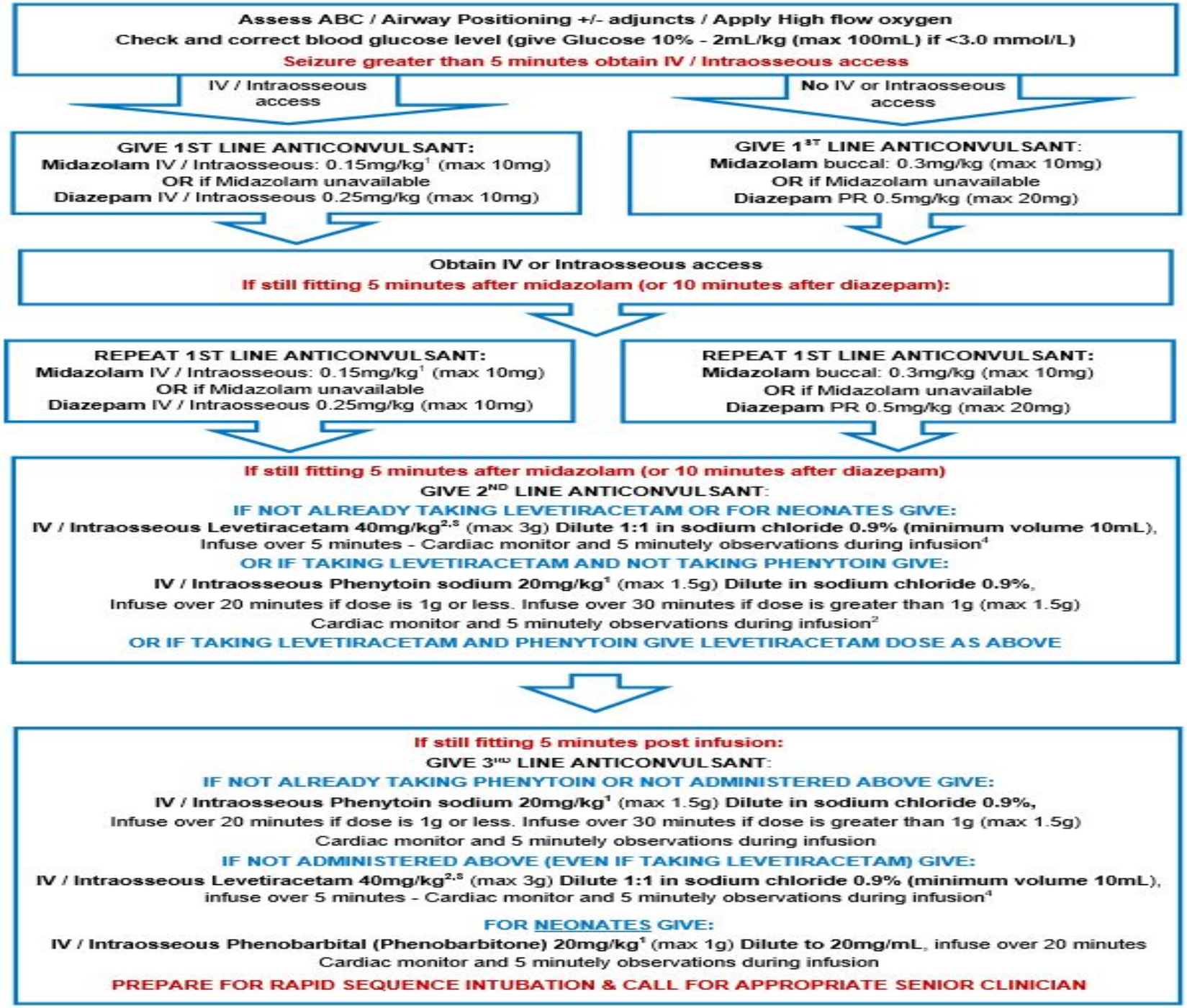
Investigations

- Blood slide for Malaria
- Brain CT Scan/ MRI if focal signs detected
- CSF Culture

	Normal	Bacterial	Viral	Fungal/TB
Pressure (cmH20)	5-20	> 30	Normal or mildly increased	
Appearance	Normal	Turbid	Clear	Fibrin web
Protein (g/L)	0.18-0.45	> 1	< 1	0.1-0.5
Glucose (mmol/L)	2.5-3.5	<2.2	Normal	1.6-2.5
Gram stain	Normal	60-90% Positive	Normal	
Glucose - CSF:Serum Ratio	0.6	< 0.4	> 0.6	< 0.4
WCC	< 3	> 500	< 1000	100-500
Other		90% PMN	Monocytes 10% have >90% PMN 30% have >50% PMN	Monocytes

Emergency management

Airway	Patent, do not put any objects
Breathing	Oxygen therapy,
Circulation	IV access, Correct shock,
Disability	Rectal diazepam 0.5mg/kg Elevate head 30degrees
Exposure	Remove tight clothes
Infection	IV Ceftriaxone –high dose 100mg/kg (antibitiocs by culture results)


Assess ABC / Airway Positioning +/- adjuncts / Apply High flow oxygen
Check and correct blood glucose level (give Glucose 10% - 2mL/kg (max 100mL) if <3.0 mmol/L)
Seizure greater than 5 minutes obtain IV / Intraosseous access
IV / Intraosseous access
No IV or Intraosseous access
GIVE 1ST LINE ANTICONVULSANT:
Midazolam IV / Intraosseous: 0.15mg/kg[1] (max 10mg)
OR if Midazolam unavailable
Diazepam IV / Intraosseous 0.25mg/kg (max 10mg)
GIVE 1ST LINE ANTICONVULSANT:
Midazolam buccal: 0.3mg/kg (max 10mg)
OR if Midazolam unavailable
Diazepam PR 0.5mg/kg (max 20mg)
Obtain IV or Intraosseous access
If still fitting 5 minutes after midazolam (or 10 minutes after diazepam):
REPEAT 1ST LINE ANTICONVULSANT:
Midazolam IV / Intraosseous: 0.15mg/kg[1] (max 10mg)
OR if Midazolam unavailable
Diazepam IV / Intraosseous 0.25mg/kg (max 10mg)
REPEAT 1ST LINE ANTICONVULSANT:
Midazolam buccal: 0.3mg/kg (max 10mg)
OR if Midazolam unavailable
Diazepam PR 0.5mg/kg (max 20mg)
If still fitting 5 minutes after midazolam (or 10 minutes after diazepam)
GIVE 2ND LINE ANTICONVULSANT:
IF NOT ALREADY TAKING LEVETIRACETAM OR FOR NEONATES GIVE:
IV / Intraosseous Levetiracetam 40mg/kg[2,5] (max 3g) Dilute 1:1 in sodium chloride 0.9% (minimum volume 10mL),
Infuse over 5 minutes - Cardiac monitor and 5 minutely observations during infusion[4]
OR IF TAKING LEVETIRACETAM AND NOT TAKING PHENYTOIN GIVE:
IV / Intraosseous Phenytoin sodium 20mg/kg[1] (max 1.5g) Dilute in sodium chloride 0.9%,
Infuse over 20 minutes if dose is 1g or less. Infuse over 30 minutes if dose is greater than 1g (max 1.5g)
Cardiac monitor and 5 minutely observations during infusion[2]
OR IF TAKING LEVETIRACETAM AND PHENYTOIN GIVE LEVETIRACETAM DOSE AS ABOVE
If still fitting 5 minutes post infusion:
GIVE 3RD LINE ANTICONVULSANT:
IF NOT ALREADY TAKING PHENYTOIN OR NOT ADMINISTERED ABOVE GIVE:
IV / Intraosseous Phenytoin sodium 20mg/kg[1] (max 1.5g) Dilute in sodium chloride 0.9%,
Infuse over 20 minutes if dose is 1g or less. Infuse over 30 minutes if dose is greater than 1g (max 1.5g)
Cardiac monitor and 5 minutely observations during infusion
IF NOT ADMINISTERED ABOVE (EVEN IF TAKING LEVETIRACETAM) GIVE:
IV / Intraosseous Levetiracetam 40mg/kg[2,5] (max 3g) Dilute 1:1 in sodium chloride 0.9% (minimum volume 10mL),
infuse over 5 minutes - Cardiac monitor and 5 minutely observations during infusion[4]
FOR NEONATES GIVE:
IV / Intraosseous Phenobarbital (Phenobarbitone) 20mg/kg[1] (max 1g) Dilute to 20mg/mL, infuse over 20 minutes
Cardiac monitor and 5 minutely observations during infusion
PREPARE FOR RAPID SEQUENCE INTUBATION & CALL FOR APPROPRIATE SENIOR CLINICIAN

Management of common complications

Clinical s/s of Increased ICP

Infants

- Tense and/or bulging fontanel
- Separated cranial sutures
- Irritable
- High-pitched cry
- Increased occipital circumference
- Distended scalp veins
- Changes in feeding
- Crying when disturbed
- Setting-sun sign

Children

- Headache
- Nausea
- Vomiting
- Diplopia, blurred vision
- Seizures

Box 28-1, Chapter 28 Wong

- Management
- ABCs
- Elevate head of bed
- Hyperosmolar therapy: mannitol, hypertonic saline
- hyperventilation

Take home