ABNT Acute Neurology Survival Guide

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Neurology SpR Survival Guide

We hope you will find this "survival guide" a useful resource - designed to accompany the ABN Acute Neurology Bootcamp, it is full of information that is good to have at your fingertips when working on the wards or on-call. The guide is divided into topics covering the range of acute neurology with top tips, common presentations, differentials or medications and a resource section for each topic.

It should go without saying that information and resources are provided as an aide memoire and are no substitute for guidance from the treating consultant in clinical practice.

GENERAL RESOURCES

Practical Neurology https://pn.bmj.com/
E-Brain Neurology question bank (accessible with ABN membership) https://learning.ebrain.net/
Calman training day resources online www.qsneuro.uno

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SEIZURES: top tips

1. Treat status epilepticus as a clinical emergency with loading doses of ASM after benzodiazepine
2. Always get an ECG
3. Consider whether symptomatic seizure and need for pabrinex, glucose, electrolyte replacement or aciclovir

STATUS EPILEPTICUS EMERGENCY MANAGEMENT: Please use local guidelines, information below for general principles	
Early status (5-10 minutes)	Use benzodiazepine e.g. lorazepam 4mg IV Repeat after 5 minutes
Established (10-30 minutes)	Load with levetiracetam (40-60mg/kg), phenytoin (20mg/kg) or valproate (40mg/kg) depending on local protocol and patient co-morbidities
Refractory (>30 minutes)	General anaesthesia

COMMONLY USED ANTI-SEIZURE MEDICATIONS		
Drug (Brand name)	*Side Effects/contra-indications*	*Example titration schedule*
Levetiracetam (Keppra)	Mood changes, agitation, lethargy	250mg od, increasing by 250mg every 1-2 weeks to doses 500mg bd. If needed, increase in 250mg steps every 2 weeks, max 1.5g bd
Lamotrigine (Lamictal)	Rash, SJS. On higher doses, double vision, dizziness	25mg od, increasing by 25mg every 2 weeks up to 50mg bd then by 50mg per week to 100mg bd. If needed, increase in 50mg steps every 2 weeks, max 250mg bd
Carbamazepine (Tegretol) Use prolonged release formulation	Rash, SJS (particularly in patients with Han Chinese background). On higher doses, double vision, dizziness	200mg od, increase by 200mg every 2 weeks to 600 or 800mg daily. If needed, increase in 200mg steps every 2 weeks, max 1000mg bd
Sodium Valproate (Epilim)	Weight gain, dizziness, tremor, hair loss Teratogenic – do not use in women of child-bearing age unless on pregnancy prevention programme	200mg od, increasing by 200mg every 2 weeks to 600 or 800mg daily. If needed, increase in 200mg steps every 2 weeks, max 1000mg bd

RESOURCES

Driving advice https://www.gov.uk/guidance/neurological-disorders-assessing-fitness-to-drive
Royal College of Emergency Medicine First Seizure Protocol https://rcem.ac.uk/wp-content/uploads/2021/10/First_Seizure_in_the_ED_Flowchart_Dec2009.pdf
NICE Epilepsy Guidance https://www.nice.org.uk/guidance/ng217
International League Against Epilepsy (classification and guidelines) https://www.ilae.org/
NBM guidance https://pn.bmj.com/content/17/1/66
ESETT Trial (choice of drug for status) https://www.nejm.org/doi/pdf/10.1056/NEJMoa1905795

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HEADACHE: top tips

1. Take a clear history and work out the phenotype
2. Cut down on analgesic use – patients should be advised to take painkillers on 10 days/month or less
3. Offer preventative treatment to patients with 4 or more headache days/month

SECONDARY HEADACHES PRESENTING ACUTELY	
Venous sinus thrombosis	Investigate with CTV, therapeutic LMWH if high suspicion
PRES	Investigate with CTA/MRA, manage blood pressure and seizures
Subarachnoid haemorrhage	CTH within 6 hours is 98.5-99.8% sensitive, consider LP for xanthochromia if <2 weeks from onset
Giant cell arteritis	Do ESR/CRP, high dose prednisolone if likely
Idiopathic intracranial hypertension	Look for papilloedema, blind spot, visual field defect. Consider LP for diagnosis or if vision threatened
Meningitis	Do LP as soon as possible. Treat with a cephalosporin if bacterial meningitis suspected

ACUTE TREATMENT FOR SEVERE PRIMARY HEADACHES	
Headache phenotype	*Drug*
Migraine	Combination therapy IV paracetamol 1g High dose IV aspirin 900mg Triptan (e.g. s/c sumatriptan 6mg) Anti-emetic (e.g. metoclopramide or prochlorperazine) Greater occipital nerve block
Cluster headache	High flow oxygen (12L/minute) Subcutaneous triptan e.g. sumatriptan 3-6mg Intranasal triptan e.g. sumatriptan 10-20mg
Paroxysmal hemicrania/hemicrania continua	Indometacin e.g. 25mg tds for 3 days then 50mg tds for 3 days then 75mg tds (continue lowest dose that gives therapeutic response), prescribe with PPI cover

RESOURCES

Drug Titration Schedules https://www.headacheacademy.com/treatments-regimes-and-protocols/
British Association for the study of headache resources including headache diaries and patient information leaflets https://www.bash.org.uk/guidelines/#
Ottawa headache rules for SAH https://www.mdcalc.com/ottawa-subarachnoid-hemorrhage-sah-rule-headache-evaluation#next-steps
IIH consensus guidelines https://jnnp.bmj.com/content/89/10/1088
International classification of headache disorders (diagnostic criteria) https://ichd-3.org/

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STROKE: top tips

1. Thrombolysis with alteplase should be considered if stroke onset within 4.5 hours
2. Request CTA with CTH for acute stroke
3. Thrombectomy considered if within 6 hours

THROMBOLYSIS
DOSE: Alteplase 0.9mg/kg 10% as bolus over 1 min, 90% over 1 hour
BENEFITS: 1/3 chance of improvement
RISKS: 1/30 chance of bleeding causing harm

CONTRAINDICATIONS FOR THROMBOLYSIS
BP persistently >185/110
Evidence of active bleeding
Severe sudden onset headache at onset of symptoms
Previous stroke, serious head injury, GI or urinary tract haemorrhage, surgery or significant trauma in last 3 months
Neoplasm with increased bleeding risk
Previous history of spontaneous ICH, pancreatitis, oesophageal varices, active hepatitis, portal HTN, liver cirrhosis
AVM or aortic aneurysm
LP within last 10 days
External cardiac massage or obstetric delivery within last 10 days
On warfarin with INR <1.7, DOAC within last 48 hours
Unfractionated heparin within last 24 hours and APTT abnormal
Treatment dose LMWH with last 48 hours
Known (or strongly suspected) iron deficient anaemia, thrombocytopenia or platelet defect

RESOURCES

NIHSS stroke score https://www.mdcalc.com/nih-stroke-scale-score-nihss
ASPECTS score https://radiopaedia.org/articles/alberta-stroke-programme-early-ct-score-aspects?lang=gb
Safety of thrombolysis in stroke mimics https://bmjopen.bmj.com/content/7/10/e016311
IST-3 trial (evidence for thrombolysis) https://www.thelancet.com/journals/lancet/article/PIIS0140-6736(12)60768-5/fulltext
MR-CLEAN trial (evidence for thrombectomy) https://www.nejm.org/doi/full/10.1056/nejmoa1411587

FUNCTIONAL NEUROLOGICAL DISORDER: top tips

1. Make a positive diagnosis and provide information – the explanation is part of treatment
2. Ask about dissociation
3. MDT approach to treatment, considering physiotherapy and psychological therapy as well as need for social input

POSITIVE SYMPTOMS/SIGNS	
Non-epileptic attacks/dissociative attacks	Dissociative prodrome Resisted eye opening Gradual onset, waxing and waning course Pelvic thrusting, asynchronous movements Long duration > 5 minutes Occasional biting of inside of mouth but very rare to have severe tongue biting
Functional weakness	Hoover's sign Collapsing weakness Motor inconsistency (discrepancy between formal testing and automatic movement) Drift without pronation
Functional gait disorder	Dragging monoplegic gait Non-economic postures Sudden knee buckling
Functional tremor/movement disorders	Distractibility Entrainment Fixed dystonia "Propriospinal myoclonus"
Sensory symptoms	Midline splitting (although also occurs in thalamic lesions) Splitting of vibration Non-anatomical sensory loss Inconsistency
Facial symptoms	Facial muscle spasm rather than true weakness Eyebrow depression in functional ptosis

RESOURCES

Patient friendly resources for all FND www.neurosymptoms.org
Patient friendly resources for non-epileptic attacks Home | Non Epileptic Attack Disorder : Non Epileptic Attack Disorder
Bayesian account of 'hysteria' https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3501967/
Codes Trial website with information about non-epileptic attacks https://www.codestrial.org/
Approach to patients with "non-epileptic seizures"- evidence for features of non-epileptic seizures https://pmj.bmj.com/content/postgradmedj/81/958/498.full.pdf

DIZZINESS/BALANCE: top tips

1. Perform HINTS plus (head impulse, nystagmus, test of skew, hearing test) in acute vertigo
2. Consider scan with acute hearing loss, headache, cranial nerve or limb signs, intact head impulse test
3. Use Dix-Hallpike to diagnose BPPV then treat using Epley or Semont

HINTS plus testing	
Test	*Interpretation*
Head **I**mpulse	Abnormal in peripheral vertigo (catch-up saccade when head turned to side of abnormality) No catch-up saccades in central vertigo* or normal subjects
Nystagmus	Unidirectional in peripheral vertigo Direction-changing in central vertigo
Test of **S**kew	Skew deviation in central vertigo No deviation if peripheral vertigo or normal subjects
Plus: bedside hearing test	Hearing loss can be seen in cochlear/brainstem ischaemia Hearing loss not seen in vestibular neuritis

* Only caveat is AICA infarcts where head thrust is positive but also have cerebellar signs

DIFFERENTIAL DIAGNOSIS AND TREATMENT OF ACUTE VERTIGO	
Diagnosis	*Treatment*
PERIPHERAL	
BPPV	Epley manoeuvre Semont manoeuvre
Vestibular neuritis	Anti-emetics e.g. cinnarizine, prochlorperazine for < 3 days Encourage mobility May need vestibular rehabilitation if not improved
CENTRAL	
Stroke	As per acute stroke protocol
Vestibular migraine	Anti-emetics Prophylactic agents if frequent episodes, as per classical migraine, taking into account comorbidities and side effect profile

RESOURCES

Comprehensive neutootology website with patient information https://dizziness-and-balance.com/
HINTS exam https://pubmed.ncbi.nlm.nih.gov/19762709/
Example of HINTS exam https://www.youtube.com/watch?v=1q-VTKPweuk

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NEUROMUSCULAR: top tips

1. Measure respiratory function with forced vital capacity
2. CSF in GBS may be normal for 3-5 days after onset and NCS normal up to a week after onset
3. Remember need for prophylactic LMWH when using IVIG (increased risk of venous thromboembolism)

GBS, variants and differentials	
GBS and variants	*Clues*
GBS (AIDP)	Most common. Nadir within 4 weeks
AMAN/AMSAN	Anti-GM1 IgG antibodies
Miller Fisher Syndrome	Anti-GQ1b IgG antibodies, ataxia, ophthalmoplegia
Bickerstaff's brainstem encephalitis	Anti-GQ1b IgG antibodies, encephalopathy, ataxia, ophthalmoplegia
Pharyngeal-cervical-brachial weakness	Oropharyngeal weakness, dysphagia, preserved leg reflexes
Differential diagnosis	
Toxins	Arsenic, n-hexane, nitrous oxide, botulism (descending paralysis)
Infectious	Lyme, HIV
Inflammatory	Vasculitis, sarcoid
Metabolic	Acute intermittent porphyria, thiamine deficiency

INITIAL TREATMENT OF ACUTE NEUROMUSCULAR FAILURE	
GBS	Supportive ITU care IVIG 2g/kg 5 days PLEX No evidence for steroids
Myasthenic Crisis	Supportive ITU care IVIG 1-2g/kg over 2-5 days PLEX Steroids (beware transient worsening of weakness)
Cholinergic crisis	Supportive ITU care Weaning anticholinesterase

RESOURCES

ABN myasthenia protocol Myasthenia gravis: Association of British Neurologists' management guidelines | Practical Neurology (bmj.com)
Drugs to avoid in myasthenia Drugs to Avoid | myaware
IVIG commissioning https://www.england.nhs.uk/wp-content/uploads/2019/03/PSS9-Immunoglobulin-Commissioning-Guidance-CQUIN-1920.pdf

OBSTETRICS: top tips

1. Avoid gadolinium contrast in pregnancy – iodine contrast can be used if benefits outweigh risks
2. Women of child bearing age using valproate need to be on a pregnancy prevention programme
3. Steroids are safe in pregnancy

FETAL RISKS WITH SODIUM VALPROATE	
Birth defects	10%
Developmental problems	30-40%

MEDICATIONS WHICH CAN BE USED IN PREGNANCY IF BENEFITS OUTWEIGH RISKS	
Migraine	Paracetamol, cyclizine, domperidone, ondansetron, stemetil, sumatriptan, NSAIDS (before 30 weeks), GON block, low dose beta blockers, low dose amitriptyline
Epilepsy	Levetiracetam, lamotrigine (no increase in malformation rate at doses <325mg/day)
MS	Natalizumab (Tysabri)
MG	Pyridostigmine (may need increased frequency), azathioprine (check TPMT), ciclosporin, tacrolimus
Other	Prednisolone
AVOID	Topiramate, candesartan, valproate, mycophenolate mofetil, methotrexate

RESOURCES

Evidence on steroids in pregnancy https://pubmed.ncbi.nlm.nih.gov/21482652/
Risks of gadolinium contrast https://jamanetwork.com/journals/jama/fullarticle/2547756
Migraine in pregnancy https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6295770/
Consensus guidelines on MS in pregnancy https://pn.bmj.com/content/19/2/106
Myasthenia in pregnancy best practice guidelines https://jnnp.bmj.com/content/85/5/538
Management of epilepsy in pregnancy https://pn.bmj.com/content/practneurol/22/2/98.full.pdf
Safety of anti-epileptic drugs during pregnancy https://www.gov.uk/government/publications/public-assesment-report-of-antiepileptic-drugs-review-of-safety-of-use-during-pregnancy/antiepileptic-drugs-review-of-safety-of-use-during-pregnancy#key-conclusions
Valproate risk acknowledgement form
https://assets.publishing.service.gov.uk/media/5cac898eed915d5d7318b646/Risk-acknowledgment.pdf

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ITU: top tips

1. In neuromuscular respiratory failure, FVC <1L, or a drop by more than 50% requires ITU involvement
2. If treating for Wernicke's encephalopathy, consider the need for glucose before IV thiamine
3. Use multi-modal prognostication following cardiac arrest

CAUSES OF COMA WITHOUT FOCAL SIGNS	
Toxic	Alcohol, carbon monoxide, lead, cyanide, thallium, sedative drugs
Metabolic	Uraemia, hyperammonaemia, neuroleptic malignant syndrome, anoxic-ischaemic encephalopathy, hypercarbnia, hypo/hyper-natraemia, hypo/hyper-calcaemia, hypermagnesaemia, hypoglycaemia, hypothermia, hyperpyrexia, Wernicke's
Epileptic	Convulsive/non-convulsive status epilepticus
Endocrine	Hypopituitarism, hypothyroidism, hyperthyroidism, hypoadrenalism, Hashimoto's encephalopathy
Inborn errors of metabolism	Aminoacidurias, organic acidurias
Psychogenic	Catatonia
Other	Porphyria, Reye's syndrome, mitochondrial disorders, hypothalamic lesions

GCS Scale			
	Eye opening	*Motor response*	*Verbal response*
1	None	None	None
2	To pain	Extension	Incomprehensible sounds
3	To speech	Flexion	Inappropriate words
4	Spontaneous	Withdrawal	Confused speech
5		Localises pain	Oriented
6		Obeys commands	

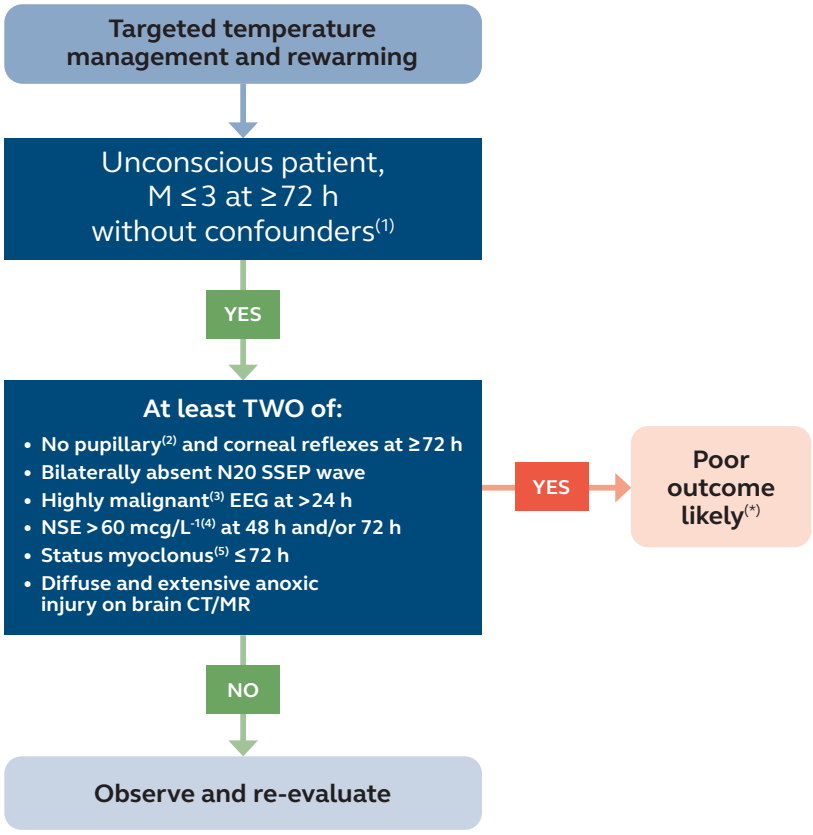
RESOURCES

Neuromuscular disease and respiratory failure https://pn.bmj.com/content/8/4/229
Post-cardiac arrest guidelines https://www.resus.org.uk/library/2021-resuscitation-guidelines/post-resuscitation-care-guidelines

Resuscitation Council UK

GUIDELINES 2021

Neuroprognostication of the comatose adult patient after resuscitation from cardiac arrest



[1] Major confounders may include analgo-sedation, neuromuscular blockade, hypothermia, severe hypotension, hypoglycaemia, sepsis, and metabolic and respiratory derangements

[2] Use an automated pupillometer, when available, to assess pupillary light reflex

[3] Suppressed background ± periodic discharges or burst-suppression, according to American Clinical Neurophysiology Society

[4] Increasing NSE values between 24–48 h or 24/48 and 72 h further support a likely poor outcome

[5] Defined as a continuous and generalised myoclonus persisting for 30 min or more

[*] Caution in case of discordant signs indicating a potentially good outcome

COMMON ON-CALL QUERIES

- Parkinson's patient is NBM: try to administer regular levodopa via NG (may need conversion as below), if this is not possible consider rotigotine patch http://www.parkinsonscalculator.com/calculator1-withNG.html or http://pdmedcalc.co.uk/calculator.php

- How long to treat with acyclovir for confirmed HSV encephalitis? Repeat LP at 14 days and continue until HSV PCR negative https://www.journalofinfection.com/article/S0163-4453(11)00563-9/fulltext

- Patient needs LP but is on an antiplatelet/anticoagulant: low dose aspirin ok to continue but other medications may need to be held https://pn.bmj.com/content/practneurol/early/2018/08/28/practneurol-2017-001820.full.pdf

ACRONYMS

ABNT: Association of British Neurologists Trainees
APTT: Activated partial thromboplastin time
ASM: Anti-seizure medication
AVM: Arteriovenous malformation
BP: Blood pressure
CSF: Cerebrospinal fluid
CRP: C-reactive protein
CTA: Computerised tomography angiogram
CTH: Computerised tomography head
CTV: Computerised tomography venogram
DOAC: Direct oral anticoagulant
ECG: Electrocardiogram
ESR: Erythrocyte sedimentation rate
FVC: Force vital capacity
GBS: Guillain-Barré syndrome
GI: Gastro-intestinal
GON: Greater occipital nerve
HIV: Human immunodeficiency virus
HSV: Herpes simplex virus
HTN: Hypertension
ICH: Intracranial haemorrhage
INR: International normalized ratio
ITU: Intensive treatment unit
IV: Intravenous
IVIG: Intravenous immunoglobulin
LMWH: Low molecular weight heparin
LP: Lumbar puncture
MDT: Multi-disciplinary team
MRA: Magnetic resonance angiogram
NBM: Nil by mouth
PCR: Polymerase chain reaction
PLEX: Plasma Exchange
PPI: Proton pump inhibitor
PRES: Posterior reversible encephalopathy syndrome
S/C: Subcutaneous
SJS: Stevens-Johnson Syndrome
TPMT: Thiopurine S-methyltransferase