Nontraumatic Neuro Emergencies

Emergency Care Conference
2011
June 23, 2011
Nervous System

• Central Nervous System
• Peripheral Nervous System
• Somatic Nervous System
• Autonomic Nervous System
  – Sympathetic
  – Parasympathetic
CNS

• Spinal Cord
• Brain
  – Speech (temporal)
  – Vision (occipital)
  – Personality (frontal)
  – Balance and Coordination (cerebellum)
  – Sensory (parietal)
  – Motor (frontal)
  – Reticular activating system/consciousness (brainstem)
Vascular Supply

- 20% of total blood flow from heart
- Carotid system
- Vertebrobasilar system
- Circle of Willis
- CSF (ventricles)
CNS Malfunction

- Focal Deficits
  - Speech, motor, sensory, visual, personality
- Seizure activity
- Altered Mental Status
Altered Mental Status Causes

• Structural lesions
  – Tumors***
  – Trauma
  – Degenerative diseases
  – Bleeds***
  – Parasites
Altered Mental Status Causes

- Toxic-Metabolic States
  - Hypoxia and global hypoperfusion
  - Diabetic Ketacidosisis
  - Liver or kidney failure
  - Hypoglycemia/lack of nutrients
  - Poisoning
  - Stroke
  - Infectious
  - Seizure
Assessment - General

• Consciousness/alertness
  – AVPU
• Confusion, mood, and thought process
  – Perception and judgment
• Positioning (upright, leaning, gait/falling)
• Speech
  – Aphasia, dysarthria
• Memory/Attention
  – Perseveration
AVPU

- Alert - Fully oriented (person, place, time, and situation)
- Verbal - responds when spoken to, may be slow to respond, may be purposeful or not
- Pain - responds to pain (sternal rub, pinch of thumb web space or trapezius)
- Unresponsive
Altered MS = Abnormal

• Airway
  – Trauma = Cervical spine injury
    • Immobilization
    • Jaw thrust
    • Need for basic airways (OP/NP)
      – OP without gag = intubation
      – Bleeding/vomiting

• Breathing (controlled by brain)
  – Irregular, deep, rapid
Focused History

• Traumatic or Medical
• Medical Chief Complaint
• Details - onset, timing, recurrence, pain, activity, food intake
• PMH - cardiac, DM, Htn, seizures, strokes (bracelets)
• Meds, drugs, alcohol, chemicals
Physical Exam

• Face - Smile, frown, wrinkle forehead
  – Drooping may be due to stroke

• Eyes and Pupils
  – Significantly unequal (think high ICP / head bleed)
  – Dilated (think brain injury or toxic)
  – Constricted (toxic)
  – EOMs
    • Lack of full movement can indicate stroke
    • Nystagmus - jerking of eyes on gaze to side = toxic
Physical Exam

• Cardiovascular (Vital signs)
  – Heart Rate and regularity
    • Intermittently slow - think brain lesion/high ICP
    • Irregular may be atrial fibrillation - risk factor for stroke
    • Cardiac Monitor
    • Pulse Ox
  – Blood Pressure
    • High in strokes/head bleeds
    • Low in shock, sepsis, some toxins, etc.
Neurologic Exam

• Incontinence (think seizure or LOC)
• Motor function of each extremity
  – Lift arms (drift) and legs
  – Hand grasps/wiggle toes/”push on the gas”
• Sensation in hands and feet
• If unconscious - pain response
  (withdrawal or localization for extremity)
More Neuro Exam

- Posturing
  - Decorticate - arms flex to pain
  - Decerebrate - arms and wrists extend
- Glasgow Coma Scale (3-15, exact #)
  - Eyes (1-4 points)
  - Verbal (1-5 points)
  - Motor (1-6 points)
  - Pediatric adaptation
- Reevaluate every 5 minutes
  - Improvement or worsening is prognostic
Initial Stabilization

• As per previous slides (airway etc.)
• Oxygen (keep O2 sat 93-99%)
  – Hypoxic is bad
  – Over Oxygenation may be bad too
• IV and meds (if allowed by your level)
• Reassurance to patient
• Rapid transport (time dependent)
  – Destination choice (CT scanners/stroke centers)
Common Neuro Problems

• Altered mental status
• Seizure
• Stroke/TIA
• Headache
Altered Mental Status - AEIOU-TIPS

• A - Acidosis (sepsis, DKA, Poisoning, etc.) and Alcohol
• E - Epilepsy
• I - Infection
• O - Overdose
• U - Uremia (kidney failure)
• T - Trauma, tumor, toxin
• I - Insulin (hypoglycemia, diabetic ketoacidosis)
• P - Psychosis, poison
• S - Stroke, seizure
Hypoglycemia

- Altered Mental Status
- Focal findings on exam
- Seizures
- Glucometer < 60-70
- Typically caused by diabetic medications
  - Too much Insulin (or too little food)
  - Too much oral medication for diabetes
- One of the few neuro problems which can be fixed in the field
Hypoglycemia - Treatment

• If alert and able to manage airway
  – Given oral glucose, orange juice/sandwich

• If not alert or seizing
  – I-Tech or above - give 1/2 - 1 amp 50% Dextrose
    • Fastest treatment, given only as much as is needed
    • Risk of subcutaneous infiltration - skin necrosis
    • Make sure IV is patent (throw the bag on the floor and watch for blood return)
      • Alternatively, give 500 ml D5W (this will take about 20 minutes to work (will they seize while waiting?)
  – Basic or no IV - Glucagon 1 mg IM (this will also take about 20 minutes to work)
Hypoglycemia - Alcoholic

• Liver disease can cause hypoglycemia from malnutrition
• Probably will respond to Dextrose
• May also need Thiamine
  – Alcoholics are vitamin deficient
  – Preferably given before Dextrose to prevent Wernicke’s syndrome
    • Rare, I’ve never seen it
Hypoglycemia
Sign Off Issues

• If taking Insulin only
  – OK if someone can observe and make sure patient eats and checks blood sugar frequently
  – Must have a good reason to have hypoglycemia (didn’t eat)

• Be careful with patient taking diabetic pills
  – Most of the newer meds (Metformin) are fairly safe
  – Older meds may cause recurrent hypoglycemia
    • Generic names start with “G” and end in “ide”
    • Last a long time
    • You may be back in a few hours, better not to sign them off
Narcotic Overdose

• Altered Mental Status
  – Sleepy, comatose
  – Low RR, likely low O2 sat, low HR, low BP
• Pinpoint pupils
• Needle tracks, syringes, pill bottles, etc.
• I-Techs and above can fix with Narcan
  – Accidental overdoses
    • Peds and geriatrics - go for it.
Narcotic Overdoses

• Recreational Overdoses (addicts)
  – Do you really want to wake them up?
    • Will withdraw immediately (vomit/diarrhea)
    • THEY WILL BE REALLY PISSED OFF!!
      – They feel sick
      – You ruined their night
      – May attack you
      – May try to jump out of the ambulance (this has happened)
  – Strap them down before you wake them up
Narcotic OD

• If you do wake them up...
  – Give small doses of Narcan (0.2-0.4 mg)
    • Repeat as needed to improve airway/breathing
    • Will avoid withdrawal and safety issues
    • DO NOT SLAM IN 2 MG IV DOSE!!
    • May not solve hypoxia if they have already aspirated

• Option of airway management/ventilation
  – Oral or nasal airway/Combitube/Intubation
    • Solves the problem without risk to you
    • Call Medical Control or Medical Director for preferences

• Don’t just give Narcan because you can!!
Narcotic OD Sign Off

• If you did give Narcan…
  – Patient is now awake and likely competent to refuse care and transport
  – They also are probably withdrawing
  – Narcan has a short half-life
• They might go back to comatose when Narcan wears off, before narcotic does
• Might go shoot up more heroin
  – Wind up dead from massive overdose
Overdose

• May medications can cause altered mental status in addition to narcotics when taken as an overdose
  – Psychiatric medications/sedatives
  – Aspirin
  – Benadryl
  – Diabetic medications
  – Stimulant drugs of abuse (amphetamines, cocaine)
  – Seizure meds
Ventilation Issues in Altered Mental Status

• Rate should be 10-12 breaths/min
• Hyperventilation causes blood vessels in brain to constrict reducing blood flow
• Injured brain tissue ability to regulate blood flow is lost
• Hyperventilation worsens outcome
  – If EMT-P, consider Mannitol for high ICP instead
• Single indication is mental deterioration with 1 blown pupil (impending herniation)
Seizure

• Temporary behavioral change from massive electrical discharge of neurons in brain

• Generalized
  – Initially localized then involves entire cortex
  – Tonic-clonic
  – Absence

• Partial - localized
  – Simple
  – Complex partial
  – May spread to become generalized
Seizure Causes

- Hypoxia
- Hypoglycemia
- Fever (in children)
- Tumors
- Head trauma
- Eclampsia (in pregnancy)
- Strokes
- Epilepsy (low seizure threshold)
Tonic Clonic Seizure

• Grand mal seizure
  – Loss of consciousness
  – Initially increased muscle tone (tonic)
  – Then rhythmic jerking of muscles (clonic)
    • Involves diaphragm, breathing affected/hypoxia
  – Salivation
  – Incontinence
  – May have an aura (preceding hallucination)
  – Postictal phase (decreased consciousness, headache, confusion, agitation, combativeness
Absence Seizure

• Petit mal seizure
  – Brief loss of consciousness (seconds)
  – Eyelid fluttering
  – May briefly lose muscle tone
  – Patient may be unaware of event
Pseudoseizures

- Psychological disorder
- May not be under patient’s control
  - May be suggestible
  - May show avoidance behavior
  - May talk during the episode
- No postictal phase
- No EEG changes
- May be difficult to distinguish from true seizure
Simple Partial Seizure

- Focal motor/sensory activity
  - 1 side only
- No loss of consciousness
- May spread in brain
  - Become generalized with tonic-clonic activity
Complex Partial Seizures

• Originate in temporal lobe
  – Typically start with an aura
• Last a few minutes
• Involves loss of consciousness
• Acts confused, change in personality
• May have repetitive movements
• No tonic-clonic activity
Seizure Assessment - History

- Get history from bystanders
- Previous seizure history
  - Length, type, aura, mouth trauma, incontinence
- Recent head trauma
- Alcohol/drug use
- Fever, headache, stiff neck
- PMH - Diabetes, heart disease, stroke
- Current meds (especially seizure meds)
Seizure Assessment - Pertinent Findings

- Head trauma
- Injury to lips or tongue
- Blood glucose level (hypoglycemia)
- Pulse oximetry (hypoxia)
- Signs of alcohol or drug use
- Cardiac monitor
Seizure Mimics

- Syncope
  - Orthostatic hypotension
- Migraine headache
- Heart rhythm problems
- Hypoglycemia
- Intoxication (alcohol or other drugs)
- Hyperventilation
- Meningitis
- Stroke
Seizure vs. Syncope

- Any position
- May have aura or no warning
- Jerking during LOC
- Postictal confusion

- Typically standing
- Preceding dizziness
- Usually no jerking (or just a couple of times)
- Regains consciousness almost immediately when lying down
Seizure Management

• Reassure family/bystanders/patient
• Manage airway and breathing
  – Do not force objects between teeth
    • May cause aspiration or laryngospasm
  – High flow Oxygen
  – BVM assistance
• Prevent injury
  – Scene safety
  – Do not restrain patient (except C-spine as needed)
• IV NS or LR if I-Tech or above
  – If hypoglycemic, treat this
Seizure Management

• Maintain body temperature
• Left side recovery position after tonic-clonic phase ends
• Suction as needed
• Cardiac monitor, pulse ox, and capnography (if available)
• EMT-P should consider Anticonvulsant medication if seizure lasts > 5 minutes
  – Lorazepam, Diazepam, Midazolam
Status Epilepticus

- Seizure longer than 30 minutes
- 2 or more generalized seizures without regaining consciousness
- May have prolonged apnea/hypoxia
  - Acidosis, high temperature/blood pressure/intracranial pressure, dehydration
- Fractures
- Heart failure/arrhythmia
Syncope

• Fainting from lack of blood flow to brain
  – Wake up quickly once on floor

• Causes
  – Cardiovascular - rhythm/BP/valve problems
  – Noncardiac - low blood glucose, TIA, anxiety/hyperventilation
Syncope Management

- Scene safety/reassurance
- Maintain airway/breathing
  - High flow Oxygen
- Monitor circulation
  - HR, BP, heart rhythm, pulse ox
- Monitor mental status
- IV NS or LR if I-Tech of above
- Check for and treat hypoglycemia
Stroke

• Injured brain from lack of blood flow
  – “Brain attack”
• 2 types
  – Ischemic (85%)
  – Hemorrhagic (15%)
• 3rd most common cause of death
• Common cause of disability
Stroke Risk Factors

- Atherosclerosis (hardening of arteries)
  - Coronary artery disease or other vascular disease
  - Hypertension
  - Smoking
  - Diabetes
  - High cholesterol (lipids)
- Oral contraceptives
- Sickle cell anemia
- Atrial fibrillation
Stroke

• Must determine last time patient normal
  – If patient woke up with it = last evening
• Treatment is time-dependent
  – 3 to 4.5 hours (from start of symptoms) to give IV t-PA ischemic stroke
    • If given after this risk of bleeding (and death) increases
  – Out to 24 hours for cath lab intervention (UW or Froedtert only for now)
Ischemic Strokes

• Occlusive - cerebral artery blocked
  – Ischemia - Decreased blood flow
    • May cause symptoms that resolve
    • Tissue compromised but not dead (yet)
  – Infarction (death of tissue)
    • Permanent
    • Takes only 5/10 minutes of no flow
    • May cause swelling that worsens ischemia for surrounding tissue
    • Severe swelling causes brain herniation
      – Tissue pushed through foramen magnum at base of skull
Ischemic Stroke

• Embolic stroke
  – Clot (or other material) carried from diseased blood vessels (neck) or heart
    • Atrial fibrillation (clot forms in left atrium)
    • Valve disease (clot forms on heart valve)
    • Congenital heart disease (clot from leg goes through hole in heart to arterial side)
  – Air, fat, or tumor pieces also cause this
  – Sudden onset, no warning
Ischemic Stroke

• Thrombotic stroke
  – Plaque narrows artery
    • Intermittent drops in BP may cause transient symptoms (TIAs)
  – Plaque ruptures and clot forms
    • Blood flow blocked
Ischemic Stroke Symptoms

• Depends on area of brain affected
• Loss of motor/sensory on 1 side
  – Neglect of one side
• Facial droop
• Speech problem
  – Forming words or pronouncing words
  – Understanding words
• Altered mental status
• Vision changes
• Trouble walking/dizziness
Hemorrhagic Stroke

- Deficits plus headache
  - Sometimes pupillary inequality
- Intracerebral (bleeding into brain tissue)
  - Hypertensive blood vessel rupture
- Subarachnoid (bleeding into CSF)
  - Aneurysm rupture or AV malformation
  - Blood in CSF causes increase in pressure in brain
- Subdural Hematoma (between brain and skull) - usually traumatic (sometimes minimal)
Prehospital Stroke Scoring

- **Cincinnati Stroke Scale (72% accuracy)**
  - Facial droop - Smile and show teeth
    - Abnormal = asymmetric movement or drooping
  - Arm drift - Patient closes eyes and lifts arms holding them out for 10 seconds
    - Abnormal = asymmetric movement or one arm drifts down
  - Speech - “You can’t teach an old dog new tricks”
    - Abnormal = Slurring, wrong words, or no speech
Transient Ischemic Attacks (TIAs)

- Temporary interruption of blood flow
  - Usually sudden
- Transient symptoms that resolve
  - Initially indistinguishable from a stroke
  - May last minutes or hours
  - No residual symptoms or deficits
  - Usually no findings on imaging
- Warning of impending stroke
  - 1/3 will eventually stroke
TIA Causes

- Carotid artery disease
- Small emboli (A Fib or valve disease)
- Hypotension
  - decreased cardiac output
  - Too much antihypertensive medication
- Spasm of blood vessel
Stroke History Points

- Time of onset
- Previous symptoms
- Initial complaint and progression
- Mental status changes
- Possible precipitating factors
- Palpitations
- Stroke risk factors
Prehospital Stroke Management

• ABCs (especially airway/suction)
  – Avoid hyperventilation
  – Oxygen (keep O2 sat in mid to upper 90s)

• Get history and stroke assessment
  – Cincinnati Stroke Scale

• Supine, recovery, or semi-upright position (depends on airway/breathing)

• Blood glucose level
  – Treat hypoglycemia
Prehospital Stroke Management

• IV NS or LR TKO (if I-Tech or above)
  – No additional Dextrose (worsens outcome)
• Cardiac monitor and pulse oximetry
  – Capnography, if you have it
• Protect paralyzed extremities
• Reassure patient (even if no speech)
  – May be able to hear and understand
• Rapid transport to stroke facility