POTPOURRI OF PEARLS

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Diagnosis: the essential competency of the clinician

Every individual in the United States will experience at least one diagnostic error during his or her lifetime.

There is a “moral, professional, and public health imperative” to improve the diagnostic process.

—National Academy of Medicine, Improving Diagnosis in Health Care, 2015.
Pitfalls in diagnosis: early closure

- Pattern recognition
- Heuristic: rule based
Example: ?urosepsis

- Agitated, disheveled, 50 year old woman, dropped off in ED at outlying hospital
- Febrile, positive UA
- Sedated for agitation, subsequently intubated for shallow respirations in transit
- Diagnosis #1: Urosepsis
- Lumbar puncture: grossly purulent
- Diagnosis#2: Meningitis
- Blood culture positive for staph aureus (not typical cause of meningitis)
- MRI brain and cervical spine: epidural abscess cervical spine, extending inferiorly
- Diagnosis #3: Staph aureus epidural abscess
  - Incidentally, urine did grow >100K E. coli
Medicine is a team sport

- We are on the same team, yet seldom interact.

- In crisis you are the first representative of our health system, and often see the patient in their home.

- You see the patient before the picture is muddied by any intervention.

- I value your observations.
Telephone game

- Paramedic
- Emergency room physician
- Admitting hospitalist
- Subsequent hospitalist (on service next day)
- Discharging hospitalist
- Primary care physician
What do I look for in paramedic documentation?

■ What was the patient’s original complaint?
  – Associated symptoms?

■ Initial vitals:
  – Blood pressure, heart rate, oxygen saturation.

■ Initial appearance of patient (and possibly of scene/home/street)
  – Exam

■ Interventions in the field.
  – Fluids, nebs, narcan, aspirin, etc.
Syncope
Case #1

- 59 year old woman who used meth day prior to presentation
- After urination lost consciousness, does not know what happened
- Chest pressure and dyspnea after, EMS called
- BP 80/50, HR 113, RR 18, SaO2 92% on 2 L on arrival to outlying hospital
- EKG sinus tach, no ST-T changes
- Blood pressure came up with fluids, sx resolved without specific treatment
- Troponin 0.01 (nl) and repeat 0.85 (mild elevation), tox positive for meth
- On transport to CWH BP 118/64, HR 89, SaO2 94% on 2L O2
- A diagnostic test was performed
CT PULMONARY ANGIOGRAM:

“LOBAR AND SEGMENTAL EMBOLI INVOLVING ALL 5 LOBES BILATERALLY.”
Pulmonary embolism 2016: 1/6 cases of syncope admitted to hospital

- 560 patients admitted with syncope to 11 Italian hospitals
- No PE in 330 patients (59%) by negative d-dimer AND low pretest probability (Wells criteria)
- 97 of remaining 230 pts (42%) had PE
- 17% of total with syncope (97/560) had PE
- PE present in 45 of 355 pts (13%) with alternative explanation for syncope, and in 52 of 205 patients with no alternative explanation (25%).
What is syncope?

- Sudden loss of consciousness and postural tone
- Sudden
- Transient
- Rapid, spontaneous recovery
- Pathophysiology: global reduction of blood flow to the reticular activating system (RAS) in the brain
Syncope is common

- 1/3 of individuals will experience syncope at least once during their lifetime
- 1% of ER visits (32% admitted)
- 3% of hospital admissions
Case #2

- 39 year old woman getting a blood draw
- Feels clammy, then nauseated, palpitations, flushed, passes out
- Few myoclonic jerks
- Recovery of consciousness after less than a minute
- No confusion
Vasovagal syncope (neurocardiogenic syncope, vasodepressor syncope)

- Most common cause of syncope
- Pathophysiology: External stress precipitates biphasic response
  - Initial sympathetic response: Palpitations, anxiety, diaphoresis, piloerectioin
    - Afferent receptors in heart sense vigorous LV contraction, signals brain to activate vagus
  - Secondary parasympathetic response: Bradycardia, nausea, vasodilation (warmth/flushed)
Case #3

- 80 year old man with Parkinsons
- Stands up after sitting in church to sing, collapses
- Brief loss of consciousness
- No confusion
- Brought to hospital
- A diagnostic test was performed
Orthostatic syncope: causes

- Inadequate venous return
  - *Volume depletion (eg gi bleed, dehydration)*
  - *Venous pooling (eg prolonged standing)*

- Autonomic nervous system dysfunction:
  - *Medication induced autonomic nervous system dysfunction*
    - EG beta-blockers
  - *Primary autonomic nervous system dysfunction*
    - Eg Parkinson’s
  - *Secondary autonomic nervous system dysfunction*
    - Eg diabetes, renal failure, HIV, collagen vascular disease
Pattern recognition: Three “P’s” of an uncomplicated faint

- Posture: prolonged standing or similar prior episode avoided by lying down
- Provoking: pain, procedure
- Prodrome: sweating, nausea, warmth
Case #4

- 96 year old woman incidentally found to have HR 30’s in clinic
- Asymptomatic
- Blood pressure 140/80
- Past history “vertebrobasilar TIAs” with brief faints, felt improved on Plavix and atorvastatin.
- Prior work-up: normal carotid dopplers
- Current EKG: Mobitz II second degree heart block
- Admitted for pacemaker placement
Cardiovascular causes of syncope

- **Arrhythmia**
  - *Bradyarrhythmia*: Sick Sinus syndrome, AV Block, drug induced, pacemaker malfunction
  - *Tachyrrhythmia*: VT, Torsades, SVT

- **Structural**
  - *Valvular* (aortic stenosis, mitral stenosis)
  - *Obstructive* (hypertrophic cardiomyopathy, myxoma)
  - *Pump failure* (acute MI, tamponade)
  - *Vascular* (pulmonary embolism, primary pulmonary hypertension, dissection)
Neurologic “causes” of syncope (i.e., neurovascular)

- Vertebro-Basilar TIA
- Migraine
Predictors of adverse outcomes in syncope

- Palpitations
- Exertional syncope
- Heart disease (CAD, CHF)
- Evidence of GI bleed (heme +, lab)
- Supine syncope
- Lack of prodrome
- Older age

- Abnormal EKG
- Systolic BP <90 at triage
- HR <50 in ED
- BNP >300
- Chest pain with syncope
- SOB history
Multiple rule based risk scoring systems for syncope (with apps)

- San Francisco Syncope Rule
  - CHF hx, Hct <30%, EKG abnl, SOB hx, SBP <90 at triage

- Rose score
  - BNP >300, HR <50, rectal heme +, hgb <9, chest pain, EKG Q waves, SaO2 <94%

- Boston SR

- OESIL (Ossevatorio Epidemiologico sulla Sincope nel Lazoio)

- EGYSIS (Evaluation of guidelines in syncope study)
  - Many available on apps
Neurologic total loss of consciousness (non-syncope)

- Seizure
- Subarachnoid Hemorrhage
- Increased intracranial pressure (tumor, trauma, ventricular obstruction/hydrocephalus)
  
  - *Lateral tongue biting in this setting is moderately specific for seizure*
CPR
Case #5

- 64 year old obese man heard by sister to collapse at home
- Face down x 7 minutes before EMS arrives
- Asystole
- ROSC after 2 amps epinephrine
- Urine positive for meth, small PE found on CTA
- Initially cooled x 24 hours to 33 degrees, warmed over 16 hours
- No neurologic function off sedation
- Could you have predicted a 0% chance of survival for this man in the field?
Out of hospital cardiac arrest: criteria for no chance of survival

All three must be present:

1. Out of hospital cardiac arrest not witnessed by EMS.
2. Nonshockable initial cardiac rhythm.
3. No return of spontaneous circulation before receipt of third 1 mg dose of epinephrine.
Early identification of patients with OHCA with no chance of survival

- 3 French (Paris) and US (King County) cohorts totaling nearly 7000 patients with out of hospital cardiac arrest
- No patients meeting these three criteria survived, perfect prediction in validation cohort
- 95% confidence intervals upper limit 0.5% survival possible in patients meeting these criteria (1/200)

True/False: Early placement of advanced airway is associated with improved survival in CPR.
Association between tracheal intubation during adult in-hospital cardiac arrest and survival

- 43,314 patients from Get With the Guidelines Registry with in hospital cardiac arrest intubated within first 15 minutes of CPR matched with patients not intubated in same minute
- Lower survival if intubated
  - 16.3% survival intubated vs 19.4% not intubated
- Good functional outcome lower if intubated
  - 10.6% if intubated vs 13.6% if not intubated
- ROSC lower if intubated than if not intubated
  - 57.8% if intubated vs 59.3% if not intubated

Anderson et al, JAMA. 2017;317(5):494-506
How might intubation lead to poor outcome?

- Prolonged interruption of chest compressions
- Hyperventilation and hyperoxia area both associated with poor outcome
- Could delay interventions such as defibrillation and epinephrine
- Delay in time to success of intubation may result in inadequate ventilation or oxygenation by other means
- Unrecognized esophageal intubation leading to fatal outcome
Potential benefits of early intubation

- Better control of ventilation and oxygenation
- Protection from aspiration
- Chest compressions more continuous post advanced airway
Early intubation in CPR for out-of-hospital cardiac arrest: what is true?

--Japanese observational study of out of hospital cardiac arrest in 649,359 patients showed advanced airway management associated with decreased chance of good outcome.

--Korean observational study of 32,513 pts found intubation during OHCA associated with good neurologic outcome.

--Meta analysis (2013) of observational out of hospital cardiac arrest studies found intubation compared with basic airway management associated with decreased survival and decreased ROSC.

--Three randomized controlled trials of early intubation for out-of-hospital-cardiac arrest vs basic airway support in process
True/False: There is no downside to oxygen in critically ill patients
Conservative versus conventional oxygen and survival in ICU patients

- 480 patients randomized to goal SaO2 94-98% (conservative) versus goal SaO2 97-100% (conventional)
- 12% mortality in conservative group versus 20% mortality in conventional group
- 4% shock in conservative group vs 11% shock in conventional group
- 2% liver failure in conservative group vs 6% in conventional group
- 5% bacteremia in conservative group vs 10% in conventional group
- PO2 difference between two groups 87 mmHg vs 102 mm Hg.
  - Girardis et al. JAMA 2016 Oct 18; 316:1583
CPR: Thinking outside the box

- CPR is in progress for wide complex non-perfusing bradycardic rhythm in a patient with end stage renal disease
- He is thought to have missed the last two dialysis sessions
- A bowl of cherries is found at the scene, half-eaten
- What drug not in standard ACLS algorithms should be considered?
Calcium
Hypotension after intubation of an asthmatic

- A 20 year old man with severe asthma is intubated for status asthmaticus with impending respiratory arrest
- Nebulized therapies and steroids have been administered
- Initial fall in blood pressure after intubation responds to fluids
- During prolonged inter-facility transport on a vent, blood pressure falls and does not respond to norepinephrine
- What is the likely cause of hypotension and what should be done?
Autopeep from greater volumes delivered than exhaled in patient with airway obstruction.

Disconnect patient from vent and allow to exhale.
Give two endocrine causes of shock with relatively slow heart rates, which can result in mortality if not considered, identified, and treated.
1. Adrenal insufficiency/Adisonian crisis
2. Hypothyroidism/Myxedema
List as many noninfectious causes of fever as you can
Noninfectious causes of fever/hyperthermia

- Serotonin syndrome
- Neuroleptic malignant syndrome
- Hyperthyroidism
- Heat stroke
- Malignant hyperthermia post anesthesia
- Delirium tremens
- Neoplasm
- Vasculitis
- Pancreatitis, hepatitis
- Neurologic injury
Final case

- EMS called for patient found obtunded at home
- Shallow respirations
- Pinpoint pupils
- Home medications include: amlodipine, simvastatin, lomotil.
- What medication might be administered?
Loperamide abuse on the rise

- Loperamide = synthetic opioid available OTC for treatment of diarrhea
- Not detected on urine tox screen
- 1736 loperamide overdoses reported 2010-2015, annual number increased by 91% during study period
- Approximately half suicide attempts, remaining abuse
- 15 deaths, 7 involving loperamide as single agent
- Can cause QT prolongation and torsades
FYI: Fentanyl, new twist on opioid epidemic

- Cheap
  - Heroin costs $65,000 per kilogram
  - Fentanyl costs $3,500 per kilogram

- Prevalence increasing
  - Estimated 41% of 7,100 heroin-related deaths 2012-2014 involved Fentanyl
  - 89% of seized counterfeit OxyContin in Canada contained Fentanyl

- Features: rapid

- Need for more rapid naloxone administration, dose escalation
  - New England Journal of Medicine, Feb 16, 2017
Improving diagnostic ability

- Experience
- Get follow-up – what did they have?
- “Just in time” information: reading on cases
- “Just in case” information: conferences, journals

- Video games?
  - Night Shift