

## Disclaimer

### Acute Care & Critical Care Case-Based Reviews

Acute Endocrine & Neurological Disorders

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## Introduction



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## Agenda

- Cases 1-3
- Mini Case Pearls
- A special coupon code & Feedback giveaway
- Live Q&A



## Integrated Case-Reviews

- Case 1 -



## Case 1

- 31-year-old female with a PMH of DM1 and intermittent non-compliance comes in with worsening abdominal pain, nausea with vomiting, and lethargy.
- Her symptoms started yesterday after she ran out of her insulin.
- She appears confused but is redirectable and isn't able to recall her insulin regimen.



## Case 1

- VS:
  - Temp = 98.3, P = 125 bpm, BP = 105/62, RR = 24, O2Sat = 96% (RA)
  - Bedside Accu check reads = HIGH
- Physical Exam:
  - Gen: Awake but retching and appears weak
  - Pulm: Kussmaul breathing without wheezes, rhonchi or rales
  - CV: tachycardic, regular rhythm, no murmurs
  - GI: non-tender, non-distended.
  - Skin: Warm, dry mucous membranes



## Case 1

- What do we need to order or do next?
  - IV, IVF, labs
    - Which labs and why?
- Differential Diagnosis:
  - DKA
  - HHS
  - SBO or volvulus
  - Food poisoning
  - Gastroenteritis
  - Other \_\_\_\_\_ acidosis



## Case 1

- Causes of High, Anion Gap Metabolic Acidosis
  - CAT
    - CO or CN
    - Aminoglycosides
    - Theophylline
  - MUDPILES
    - Methanol → forms? \_\_\_\_\_
    - Uremia
    - DKA
    - Paraldehyde or Paracetamol or phenformin
    - Iron, INH
    - Lactic acidosis
    - Ethanol or ethylene glycol → forms \_\_\_\_\_
    - Salicylates

## Case 1

- Clinical issues to consider proactively:
  - What patterns are we looking for on BMP?
  - What is the corrected Na? → why?
  - What is the baseline K+? → why?
  - Does the baseline glucose matter? → why?
    - What if it is low, normal, or high?
  - Do we need a UA?
  - Do we need to measure ketones, alcohols, lactic acid?



## Case 1.1

- Case Scenario 1.1:
- Labs:
  - WBC = 12.4, H/H = 16.4/49.2, Plt = 156
  - Na = 122, Cl = 91, K = 2.9, CO2 = 12; BUN = 46, Cr = 2.1, Gluc = 843
  - UA = not available (pt unable to urinate)
  - Serum ketones = not available; still in lab
- Interpretation:
  - DKA criteria: Per BMP: Glucose > \_\_\_\_\_, AG > \_\_\_\_\_, CO2 < \_\_\_\_\_
    - AG:  $19 = (122 - (91 + 12))$
    - Presumed severity of DKA --> \_\_\_\_\_
  - Level of dehydration: CBC seems concentrated, pre-renal pattern (BUN:Cr = \_\_\_\_\_), unable to urinate, mental status/mucous membranes
  - Corrected Na = \_\_\_\_\_ (Katz 1973 vs. Hillier 1999 methods)
  - Do we need to check \_\_\_\_\_?



## Case 1.1

- Case Scenario 1.1:
- Initial Plan:
  - No insulin
  - Initiate KCL at \_\_\_\_\_ mEq/hr until K+ > \_\_\_\_\_
    - Then continue KCL at 20-30 mEq in each 1 L with goal to maintain K+ between 4 to 5 mEq/L
  - IV fluids: 0.9% NS at 15-20 ml/kg/hr (~1-1.5 L in first hour) until glucose is \_\_\_\_\_ mg/dl then switch to D5% 0.45% NS at 250 ml/hr



## Case 1

- Evidence Integration:
  - Risk of cerebral edema with IVF replacement.
    - Rapid correction of plasma osmolality raises concern for cerebral edema (while rare, carries high mortality), especially in pediatric pts.
      - A retrospective study in 79 ped pts showed that a decrease in serum osmolality of  $\geq 9$  mOsm/kg has been associated with cerebral edema.

J Pediatr 2007;150(5):467-73.  
Neth J Med 2010;68(1):35-57.  
Neurocrit Care 2005;2(1):55-58.

## Case 1.2

- Case Scenario 1.2:
- Labs:
  - WBC = 10.1, H/H = 14.4/43.2, Plt = 125
  - Na = 136, Cl = 107, K = 3.9, CO<sub>2</sub> = 21; BUN = 18, Cr = 1.1, Gluc = 197
  - UA = Still shows ketones and glucose
- Current regimen:
  - D5% in 0.45% NS at 200 ml/hr + 20 mEq KCL/L
  - Insulin drip (regular insulin) 0.14 u/kg/hr infusion
- Interpretation:
  - DKA criteria: Per BMP: Glucose < \_\_\_\_\_, AG < \_\_\_\_\_, CO<sub>2</sub> > \_\_\_\_\_
    - AG: 8
    - Presumed severity of DKA --> \_\_\_\_\_
      - But what about urine ketones?
  - Level of dehydration: \_\_\_\_\_

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## Case 1.2

- Case Scenario 1.2:
- Plan:
  - Reduce D5% in 0.45% NS to maintain glucose between \_\_\_\_\_ mg/dL
  - Reduce insulin infusion to 0.02 – 0.05 u/kg/hr
  - Prepare for the transition to subcutaneous injection overlap
  - +/- check beta-hydroxybutyrate to see if < 1 mmol/L
  - Prepare for transition to medicine unit

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## Integrated Case-Reviews

- Case 2 -

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## Case 2

- A 62-year-old male with a PMH of DM2, HTN, HLD, and gout was found by family confused to the extent the patient was almost unresponsive.
- Family called 911.
- On arrival, the patient had a pulse and was breathing but was difficult to arouse.
- Glucose was checked and reported to be 26 mg/dL at which time the patient had a seizure.
- Paramedics were unable to start an IV during the seizure.

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## Case 2

- Initial plan:
  - Proactive clinical issues to consider:
    - Is seizure going to last long enough to meet criteria for SE?
    - Needle stick injury with convulsing patient.
    - Other treatment options since oral and IV are not options
      - IO?
      - IM?
      - Intranasal?
  - Option: \_\_\_\_\_ 1 mg IM injection
    - Pros and cons

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## Case 2

- Case continued
  - Seizure lasted 1 minute
  - IV was then obtained → 1 amp of D50 IVP
  - Patient's mental status starts to improve over the next 2-3 minutes as other vital signs are obtained (P = 92, BP = 132/78) and being prepped for transport
  - The family hands you a list of his medications which include:
    - Atorvastatin, valsartan/HCTZ, metformin and glyburide
    - Family reports his pill box is off and may have taken too much glyburide



## Case 2

- Case continued
  - Arrival to the ED the patient's glucose is 55 and the patient is still feeling weak
  - Options?
    - D50 again or D10W?
      - Pros and cons
    - \_\_\_\_\_ SubQ q6hr
      - SubQ or IV?
    - What if octreotide is still not keeping glucose > 100
      - \_\_\_\_\_



## Mental Break

- Redneck Medicine -



## Integrated Case-Reviews

- Case 3 -



## Case 3

- A 57-year-old male with a PMH of prior CVA 3 yrs ago, HLD, and HTN comes in reporting weakness, numbness, and tingling to the left face, left arm, and leg.
- The family noticed the left side of the face looking different about 50 minutes prior to arrival. They got most concerned when he stood up and tried to walk and fell over to the left up against the wall. They caught him before he fell to the ground.
- They then drove to the local hospital which is a critical access hospital in a rural area.



## Case 3

- On arrival the triage nurse activated a stroke alert.
  - What does that do?
    - ED physician, neurologist, nursing, radiology staff, and pharmacy
    - What if you are in a rural setting?
- Metrics of concern:
  - Last time seen normal?
  - Time of symptom discovery?
  - Door to CT time (initial image) → \_\_\_\_\_ and full interpretation by \_\_\_\_\_ → consider triage to CT image #1
    - Time to vascular imaging (CTA or MRA)
  - Door to lab results → \_\_\_\_\_ → use or consider POC
  - Door to needle time → \_\_\_\_\_
    - Do we mix alteplase ahead of time?
  - Door-in-Door-out time → ideally < \_\_\_\_\_ minutes for \_\_\_\_\_ of patients
  - Door to puncture
  - First image – puncture → within \_\_\_\_\_ of direct presentation for EVT



## Case 3

- What a minute. Did we forget something?
  - Vital signs
  - \_\_\_\_\_
  - What medications are being taken?



## Case 3

- What vessels are candidates for EVT?
  - ICA (Internal Carotid Artery)
  - Proximal segment (M1) of MCA (Middle Cerebral Artery)
  - +/- isolated \_\_\_\_\_ occlusion



## Case 3

- Case Continued:
  - Last normal on arrival = 50 minutes ago
  - Glucose = 121
  - VS: P = 87, BP = 175/93, RR = 18, O2 sat = 97% (RA)
  - CT brain negative for apparent findings
    - Door-to-image #1 = 9 minutes
    - Door-to-vascular image (CTA) = 20 min
    - Last normal now = 70 minutes
  - NHISS = 8
  - No clear CI exists for alteplase ordered
    - Door-to-needle time = 40 min
    - Last normal now = 90 min (1 hr 30 min)



## Case 3

- Case Continued:
  - Alteplase infusing, BP monitored
  - Radiology calls to confirm strong suspicion for M1 MCA occlusion, recommends \_\_\_\_\_ imaging protocol
    - Your rural CT scanner doesn't have that protocol
  - Plan?
    - Stat consult to an interventional neurologist (closest location 2.5 hours drive away) who accepts
    - EMS vs. Air Medical
      - \_\_\_\_\_
      - Door-in-Door-Out 105 mins
      - Last normal = 155 mins (2.5 hrs)



## Case 3

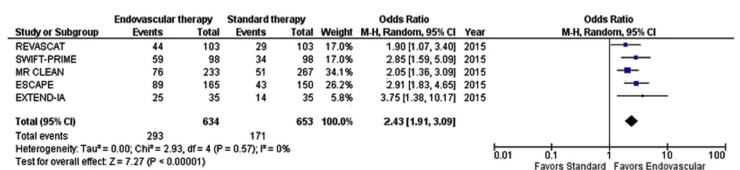
- Case Continued:
  - Plan?
    - Stat consult to an interventional neurologist (closest location 2.5 hours drive away) who accepts
    - EMS vs. Air Medical
      - Air medical.
      - Door-in-Door-Out 105 mins
      - Last normal = 155 mins (2.5 hrs)
    - Arrives at stroke center 45 min later
      - Stroke team activated, interventional neurologist
      - CT perfusion study done in the ER, thrombus confirmed in MCA
      - Taken to neuroendovascular unit
      - EVT is best done < \_\_\_\_\_ (patient last normal = 3 hrs 15 min)



## Case 3

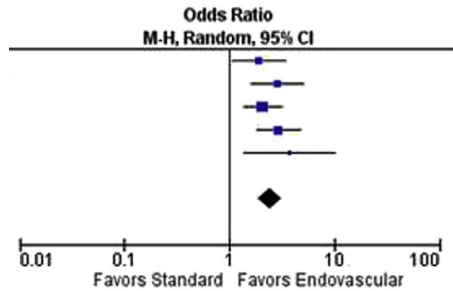
- Evidence Integration:

Meta-analysis 90-day Modified Rankin Score (0-2)



## Case 3

### Evidence Integration:



JACC Cardiovasc Interv 2015;8:1758-65.

## Integrated Case-Reviews

- Quick Case Pearls -



## Quick Case Pearls

### Traumatic Brain Injuries

#### – Types:

- \_\_\_\_\_ hematoma
- \_\_\_\_\_ hematoma
- Intracerebral hematoma
- Traumatic subarachnoid hemorrhage

#### – Pearls:

- Avoid MAPs < \_\_\_\_ (risk of ischemia) and > \_\_\_\_ (risk of ICP)
- Careful with \_\_\_\_\_
- Head positioning (depends on BP)
- Initiate seizure prophylaxis: phenytoin, fosphenytoin, or levetiracetam x \_\_\_\_\_



## Quick Case Pearls

### Seizures

#### – Status epilepticus

- Lasting \_\_\_\_\_ or longer
- \_\_\_\_\_ or more seizures without return to baseline mental status
- \_\_\_\_\_ 40-60 mg/kg up to 4.5 g (max dose)

#### – Toxicology

- \_\_\_\_\_ induced seizures → \_\_\_\_\_ +/- benzo
- \_\_\_\_\_ seizures → \_\_\_\_\_ 0.5 - 1 g/min until seizure stops or up to 5 g. If stops continue remaining infusion of 4-6 hr



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## Live Q&A





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