

## **Case 246: Altered Mental Status**

❖ **Chief complaint**

- 77-year-old female presents with decreased responsiveness.

❖ **Vital signs**

- **HR 107**    BP: 101/56    **RR: 30**    **T: 38.1°C**    **Sat: 87% on RA**    Wt: 60kg

❖ **What does the patient look like?**

- Patient is ill appearing and lethargic with mild respiratory distress

❖ **Primary survey**

- Airway: speaking in full sentences
- Breathing: mild respiratory distress, tachypneic
- Circulation: warm skin, diaphoretic, strong pulses bilaterally

❖ **Action**

- Place patient on the monitor
- Oxygen via NRB
- One or two large-bore peripheral IV lines (draw rainbow top)
- POC glucose (95, must ask)
- Consider 1L NS bolus
- Stat EKG
- Stat portable CXR

❖ **Instructor Prompt:** discuss initial differential diagnosis

❖ **History**

- Source: Home health aide
- HPI: this a 77-year-old female brought in by her home health aide after he found her sleepy and difficult to arouse this morning. The patient is lethargic and a poor historian. The aide reports that the patient had been in her usual state of health until last week when her arthritis started to act up. The aid brought her to the PCP who prescribed oxycodone-acetaminophen. The aide thinks that she may have taken too many of the oxycodone-acetaminophen tablets because she was complaining that her arthritis was still bothering her even though she was taking extra doses of her medications. If specifically asked, the aid will report that she has also been complaining of difficulty hearing and ringing in her ears for the past few days.
- PMHx: CAD, arthritis, HTN, hyperlipidemia
- PSHx: none
- Allergies: none

- Meds: metoprolol, pravastatin, aspirin
- Social: no alcohol, smoking, or drugs
- FHx: not relevant
- PCP: Dr. Heinrich Dreser

#### ❖ Secondary Survey

- **General:** Ill appearing, opens eyes to pain, uses inappropriate words, and localizes to pain (**Instructor prompt:** calculate GCS, which is E2, V3, M5 = 10)
- **HEENT:** dry mucous membranes, pupils 4 mm equal and reactive
- Neck: normal
- **Heart:** tachycardic rate with regular rhythm
- **Lungs:** tachypneic, diffuse crackles bilaterally
- Abdomen: normal
- Extremities: normal
- Back: normal
- **Neuro:** somnolent, moves all extremities spontaneously, no gross deficits, otherwise limited exam
- **Skin:** warm and profusely diaphoretic
- Psychiatric: difficult to assess, no SI (if asked)

#### ❖ Instructor Prompt: Discuss differential and initial plan

#### ❖ Action

- Order Labs
  - BMP, CBC, LFT, PT/INR, salicylate/acetaminophen/ETOH levels, TSH/T4, urinalysis, urine culture, urine drug screen, blood cultures, lactate, ABG, troponin, BNP
- Order Imaging
  - EKG and CXR (if not already ordered)
  - Consider head CT
- Order Meds
  - IVF Bolus (if not already ordered)
  - No response to naloxone if given
- Consider trial of BiPAP as component of delayed sequence intubation

#### ❖ Results

- EKG- **Figure 246.1:** (ask for interpretation)- sinus tachycardia
- CXR- **Figure 246.2:** (ask for interpretation)- diffuse pulmonary edema

#### ❖ Nurse

- Repeat Vitals: **HR 115** BP: 109/60 **RR: 35** T: **38.1°C** Sat: **81% on NRB** (**88% if BiPAP**)

❖ **Action**

- Intubate for respiratory failure
  - Rapid sequence intubation (learner should identify approach, meds and dosages used)
  - Post-intubation care (learner should provide vent settings, sedation including pain control, post-intubation OGT, CXR, foley)
  - Vent Settings: match patient's pre-intubation RR with high TV for goal PCO<sub>2</sub> < 20 mmHg

❖ **Instructor Prompt:** discuss appropriate vent settings here vs after lab results below

❖ **Results**

- **Case 246 Lab Results** (ask for interpretation)
  - Elevated AG at 22 (ask for causes of +AG metabolic acidosis)
  - Hypokalemia (3.0)
  - AKI (Cr 1.5), elevated BUN/Cr >20 suggesting prerenal azotemia (intravascular hypovolemia)
  - ABG: alkalemia with mixed acid-base disorder (resp alkalosis and metabolic acidosis)
    - pH 7.49 = alkalemia
    - PCO<sub>2</sub> 20 mmHg = respiratory alkalosis
    - HCO<sub>3</sub> 16 mEq/L = metabolic acidosis
  - Ketonuria (frequently seen in salicylate OD)
- Other Lab Results: Troponin 0.03 ng/mL, BNP 107 pg/mL, D-dimer will be normal if sent, TSH/T4 normal, **lactic acid 4.5 mmol/L**, acetaminophen level 0 mg/dL, **salicylate level 87 mg/dL** (Reference range: mild tox > 35; severe tox > 90; lethal > 120)
- Repeat CXR- **Figure 246.3:** (ask for interpretation)- appropriate placement of ETT

❖ **Instructor Prompt:** discuss results, diagnosis and management plan; consider discussion of criteria for emergent dialysis

❖ **Action**

- Order Meds
  - Bicarbonate bolus (1-2 mEq/kg) then drip (150 mEq of bicarb in 1 L D5W running at 2x maintenance) with goal pH of 7.45-7.55
  - Potassium repletion
- Consults
  - ICU consult for admission
  - Nephrology consult for emergent dialysis
  - Contact Poison Control Center (who recommend q2hr labs, bicarb drip, and plan for dialysis until salicylate level < 20)

❖ **Diagnosis**

- Primary Diagnosis: Aspirin toxicity

- Secondary Diagnosis: Hypoxic respiratory failure due to non-cardiogenic pulmonary edema, AKI, AMS, anion gap metabolic acidosis, respiratory alkalosis, hypovolemia

#### ❖ **Critical actions**

- Large-bore IV access
- Volume resuscitation
- Recognize acid-base abnormalities and consider differential for anion gap acidosis
- Intubate for respiratory failure
- Bicarbonate drip
- Nephrology consult for emergent dialysis
- ICU admission

#### ❖ **Instructor Guide**

- This is a case of AMS due to acute on chronic aspirin toxicity. The patient is not able to provide a history, so a broad evaluation and workup should be initiated, including evaluation for infection, trauma, and metabolic derangements. The history of a recent prescription for oxycodone-acetaminophen should prompt consideration for an overdose and treatment with naloxone. Note that the patient's presentation is not consistent with an opioid overdose, and accordingly she will not respond to treatment with naloxone. The patient's clinical presentation (fever, tachycardia, tachypnea, and tinnitus) and labs (+AG met acidosis with resp alkalosis) are "classic" for salicylate toxicity. The patient's respiratory status will worsen due to non-cardiogenic pulmonary edema, a complication of salicylate toxicity, and she will require intubation. The vent settings should mirror her pre-intubation RR to prevent worsening of her acid-base status. The patient's labs (BUN/Cr > 20) and vital signs (HR>SBP) show signs of hypovolemia, and the patient should be volume resuscitated even in the setting of respiratory failure from pulmonary edema. The patient requires dialysis as she has renal failure and respiratory failure in the setting of a salicylate level that is borderline severe.

#### ❖ **Case Teaching Points**

- The initial differential for this elderly patient with altered mental status and respiratory distress is broad and should include consideration of infection (UTI, pneumonia, cellulitis/ulcers, meningitis- in this case vitals suggest sepsis), ACS, CHF, toxic ingestions (in this case particularly acetaminophen, opioid, aspirin overdose), metabolic derangements (hypo/hyperglycemia, hypo/hyperthyroid, sequela of possible renal failure, liver failure, respiratory failure) and trauma (due to falls or abuse).

#### **Who was the PCP named after?**

The patient's PCP was named after Heinrich Dreser, the pharmacologist who first synthesized acetylsalicylic acid in 1897. It was previously believed that Felix Hoffmann developed acetylsalicylic acid in 1899 to help treat his father's rheumatism. Acetylsalicylic acid was first marketed in 1899 under the registered trademark of Aspirin.

### **What are the symptoms of salicylate toxicity?**

Mild toxicity- ototoxicity (tinnitus, vertigo, hearing distortion), tachypnea, and nausea/vomiting

Severe toxicity- CNS depression, dysrhythmias, noncardiogenic pulmonary edema, acute renal failure, hypo/hyperglycemia, hyperthermia, and dehydration

### **What is the pathophysiology of salicylate toxicity?**

1. Mixed acid-base disorder

1st- medullary respiratory center stimulation → increased RR → respiratory alkalosis

2nd- uncoupling of oxidative phosphorylation → increased lactate/ketoacids → metabolic acidosis

2. Inhibits gastric emptying → increased duration of symptoms

3. Diaphoresis, tachypnea, and vomiting →

Volume depletion →

Worsens acid-base and electrolyte disturbances such as hypokalemia →

Urine acidification →

Decreased salicylate excretion

### **How do I treat patients with salicylate toxicity?**

Big picture treatment goals:

Cardiopulmonary stabilization

Correct fluid deficits

Correct acid-base/electrolyte abnormalities

Prevent absorption

Enhance excretion/elimination

Specific treatment goals:

Keep potassium levels >4 mEq/L (facilitates urinary alkalization and salicylate excretion)

Keep serum glucose > 150 mg/dL (hypoglycemia is common)

Sodium bicarbonate for mild alkalemia or salicylate levels > 40 mg/dl

Note: alkalemia is not a contraindication for sodium bicarbonate therapy

### **How much bicarb should I give?**

Initial IV bolus of 1-2 mEq/kg followed by 150 mEq of bicarb in 1 L D5W running at 2x maintenance

Goal of serum pH 7.45-7.55

### **What if I have to intubate?**

Optimize alkalemia with intravenous bicarb before RSI

Post-intubation vent settings should mirror the patient's pre-intubation respiratory status → high minute ventilation with high tidal volumes with an endpoint of achieving a PCO<sub>2</sub> < 20 mmHg

### **ABG or VBG?**

VBGs correlate well with ABGs for pH and PCO<sub>2</sub> but not as well for PO<sub>2</sub>

VBGs are sufficient for detecting mixed acid-base disturbances in an emergent clinical setting such as salicylate poisoning

### **What are the causes of metabolic acidosis with elevated anion gap?**

CAT-MUDPILES

**C**yanide, carbon monoxide

**A**lcoholic ketoacidosis

**T**oluene

**M**ethanol, metformin

**U**remia

**D**iabetic ketoacidosis

**P**henformin, pyroglutamic acid, paraldehyde, propylene glycol, paracetamol

**I**ron, isoniazid

**L**actate

**E**thanol, ethylene glycol

**S**alicylates

### **When should I consider dialysis?**

Indications for emergent hemodialysis include:

Renal failure

Acidemia refractory to treatment

Significant electrolyte imbalances refractory to treatment

Significant hyperthermia

End-organ toxicity (e.g., acute lung injury, hepatic injury, seizures, coma, severe AMS)

Progressive clinical deterioration despite treatment

Serum salicylate concentration above 100 mg/dl

Note: Have a lower threshold to dialyze in patients with renal or hepatic failure

### **What are the dialyzable drugs?**

I STUMBLED

**I**NH/isopropyl alcohol

**S**alicylates

**T**heophylline

**U**remia

**M**ethanol

**B**arbiturates

Lithium  
Ethylene glycol  
Dabigatran, Depakote

❖ **References**

- **Author:** Dr. Jeremy Berberian
- Editors: Dr. Kristen Grabow Moore, Dr. Jenna Fredette, Dr. Rich Bounds
- Expert content by: XXX
- Ultrasound content by: XXX
- **References:**
  - Tintinalli (7th Edition), Chapter 183 (Author: Luke Yip, MD), Medscape emedicine “Salicylate Toxicity” (Author: Muhammad Waseem, MD, MS)
  - CXR Figure 13.2 source:  
[www.radiology.vcu.edu/programs/residents/quiz/pulm\\_cotw/PulmonConf/09-03-04/68yM%2008-03-04%20CXR.jpg](http://www.radiology.vcu.edu/programs/residents/quiz/pulm_cotw/PulmonConf/09-03-04/68yM%2008-03-04%20CXR.jpg)
  - CXR Figure 13.3 source:  
[http://courses.washington.edu/med620/images/mv\\_c3fig1.jpg](http://courses.washington.edu/med620/images/mv_c3fig1.jpg)

## Case 246 Lab Results

<b>Complete blood count:</b> WBC 11.2 x 10 <sup>3</sup> /uL Hb 13.1 g/dL Hct 39.5% Plt 250 x 10 <sup>3</sup> /uL	<b>Coagulation panel:</b> PT 13.1 sec PTT 26 sec INR 1.0
<b>Basic metabolic panel:</b> Na 146 mEq/L K 3.0 mEq/L Cl 108 mEq/L CO <sub>2</sub> 16 mEq/L BUN 35 mEq/dL Cr 1.5 mg/dL Gluc 100 mg/dL	<b>Urinalysis:</b> SG 1.020 pH 6.0 Prot Neg Gluc Neg Ketones + Bili Neg Blood Neg LE Neg Nitrite Neg Color Yellow
<b>Liver function panel:</b> AST 21 U/L ALT 14 U/L Alk Phos 68 U/L T bili 0.6 mg/dL D bili 0.2 mg/dL Albumin 4.5 g/dL	<b>Arterial Blood Gas:</b> pH 7.49 PO <sub>2</sub> 65 mmHg pCO <sub>2</sub> 20 mmHg HCO <sub>3</sub> 16 mmol/L

**Figure 246.1: EKG**

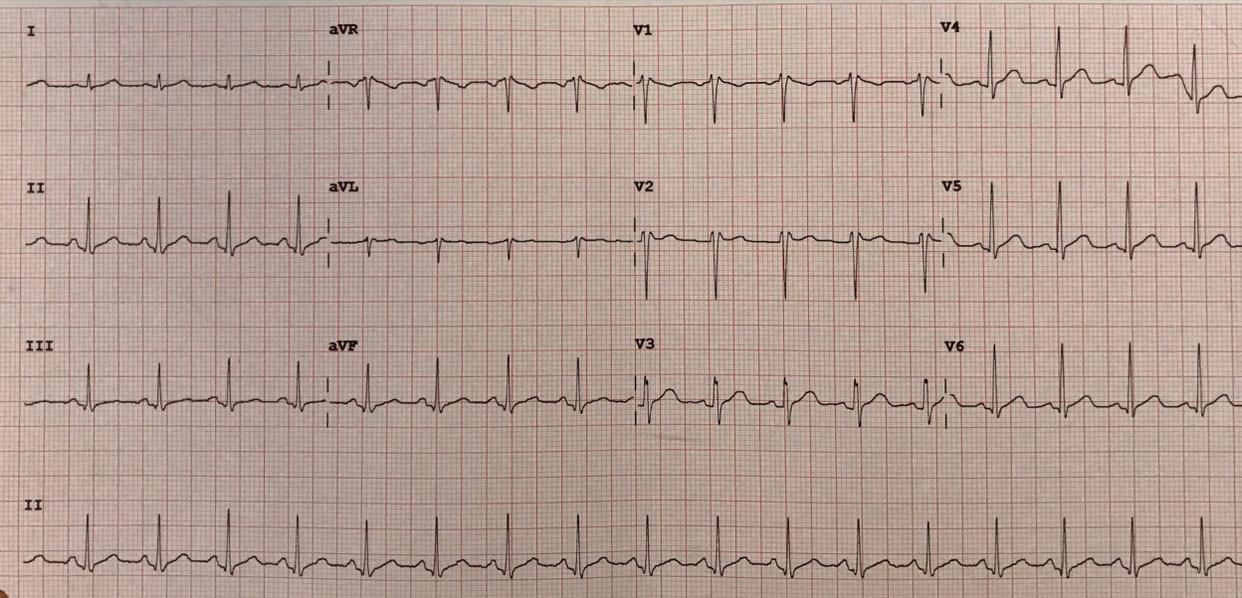
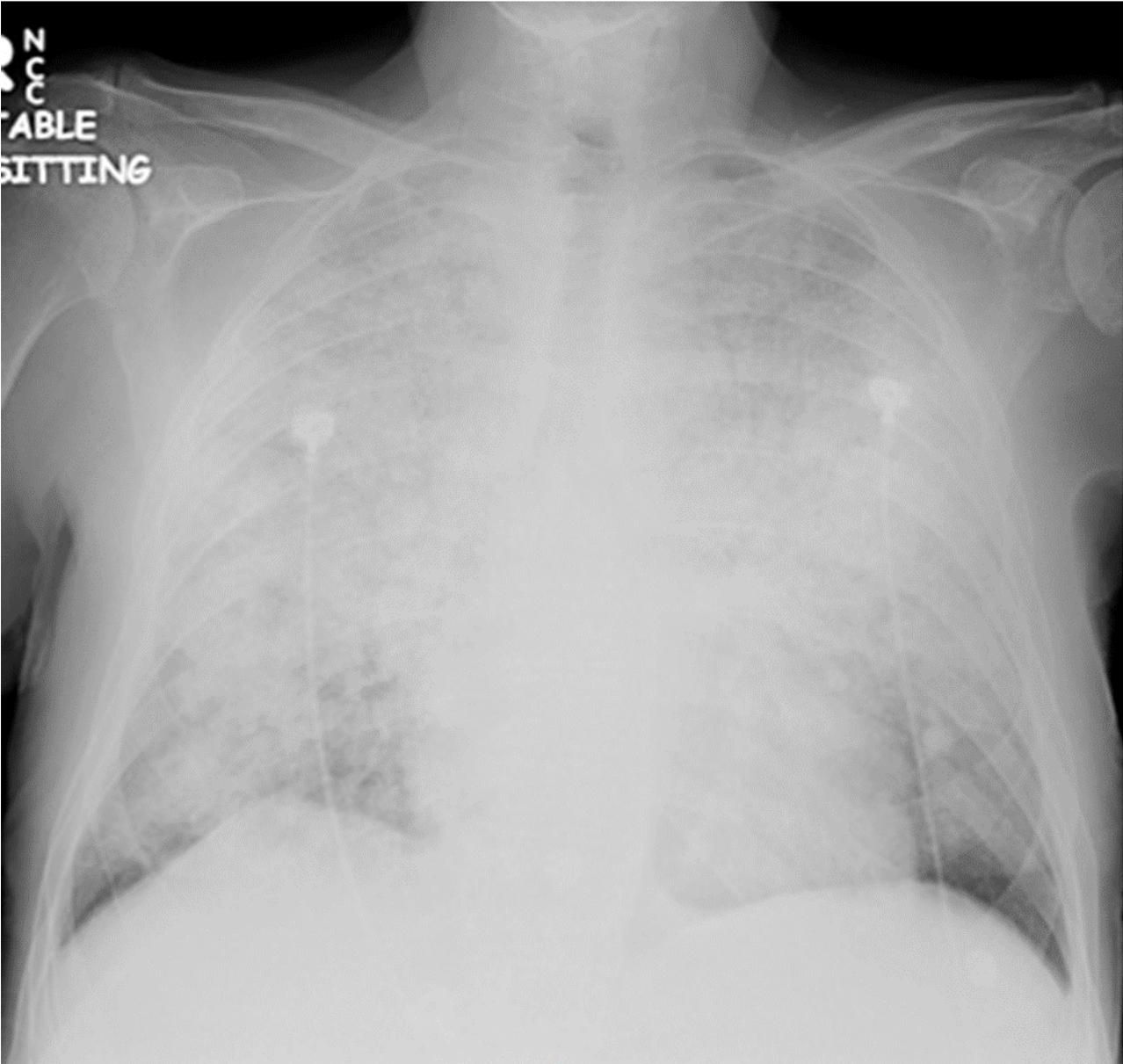


Figure 246.2: CXR



**Figure 246.3: CXR (Repeat)**

