Complex Clinical Case Studies in Primary Care

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Disclosure

• No real or potential conflict of interest to disclose.
• No off-label, experimental or investigational use of drugs or devices will be presented.

Objectives

• At the conclusion of this session the participant will:
  – Analyze the implications of various heart sounds in the context of associated clinical findings.
  – Evaluate history, physical exam and diagnostic findings in clinical case studies of patients across the lifespan with normal variants and abnormal heart sounds.
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M.R. Presents for Annual Labs

- This 66-year-old female presents for “routine labs.”
- She is not seen by the nurse practitioner.
- “Annual labs” included CMP, CBC, lipid panel, TSH.
Results as Follows

- Hgb 12.3 g/dL (123 g/L)
- Hct 34.9% (0.349 proportion)
- Plt 290 k/uL
- RDW 14.3%
- TSH 2.64 mIU/L
- WBC 4.5 k/uL
- Neut 76%
- Lymp 15%
- Mono 7%
- Eos 1%
- Baso 1%

Results as Follows (continued)

- TC 261 mg/dL (6.76 mmol/L)
- HDL 70 mg/dL (1.81 mmol/L)
- LDL 173 mg/dL (4.48 mmol/L)
- TC/HDL 3.7 ratio units
- TG 90 mg/dL (1.02 mmol/L)
- VLDL calc 18 mg/dL (0.47 mmol/L)

Results as follows (continued)

- A/G ratio 2.4
- Albumin 4.1 g/dL (41 g/L)
- Alk phos 80 units/L
- ALT 13 units/L
- AST 19 units/L
- Tbiili 0.5 mg/dL (8.55 µmol/L)
- eGFR 51 mL/min/1.73 m² (0.85 mL/s)
- BUN 16 mg/dL (5.7 mmol/L)
- Cr 1.14 mg/dL (100.78 µmol/L)
- Ca++ 9.2 mg/dL (2.3 mmol/L)
Results as follows (continued)

- CO₂ 22 mmol/L
- Na⁺ 121 mmol/L
- Cl⁻ 84 mmol/L
- K⁺ 3.6 mmol/L
- Glu 95 mg/dL (5.27 mmol/L)

Abnormals

- eGFR 51 mL/min/1.73m² (0.85 mL/s)
- Cr 1.14 mg/dL (100.78 µmol/L)
- Na⁺ 121 mmol/L
- Cl⁻ 84 mmol/L
- TC 261 mg/dL (6.76 mmol/L)
- LDL 173 mg/dL (4.48 mmol/L)
- Neuts 76%

Over the Last 3 Years (Avg of 8 Measures)

- BUN ~40 mg/dL (14.28 mmol/L)
- Cr ~1.85 mg/dL (163.54 µmol/L)
- Na⁺ ~136 mmol/L
- Cl⁻ ~108 mmol/L
- eGFR 35 mL/min/1.73 m² (0.58 mL/s)
- TC 230 mg/dL (5.96 mmol/L)
- LDL 130 mg/dL (3.37 mmol/L)
**M.R. Medical Hx and Vital Signs**

- Anemia
- Benign HTN
- Impaired renal function
- GERD
- Mixed hyperlipidemia
- Hypothyroidism

**VS**
- 64" (162.6 cm); 81 lb (36.82 kg); BMI 13.9 kg/m²
- 97.9°F (36.6°C); P 59 bpm; RR 16 bpm; BP 136/66 mm Hg; SaO₂ 96%

**M.R. Medications**

- Omeprazole 20 mg daily
- Levothyroxine 75 mcg daily
- Amlodipine 5 mg daily
- ASA 81 mg daily
- Lisinopril 10 mg daily
- Lovastatin 20 mg daily

**M.R. – Something Clearly Different!**

- Called the lab to add serum osmolality – result 254 mOsm/L
- While in office for lab draw she looked clinically volume contracted.
M.R. – Something Clearly Different! (continued)

- Na\(^+\) 121 mmol/L
- Serum osmolality 254 mOsm/L
- Clinically dry
- She has hypovolemic, hypotonic, hyponatremia.

M.R. Medications

- Omeprazole 20 mg daily
- Levothyroxine 75 mcg daily
- Amlodipine 5 mg daily
- ASA 81 mg daily
- Lisinopril 10 mg daily
- Lovastatin 20 mg daily

M.R. Disposition

- Where did the hypotonic, hypovolemic hyponatremia come from?
- What are the implications?
M.R. Hyponatremia

- The primary implication of hyponatremia is whether or not the patient is hypotonic.
- If the patient is hypotonic, then the extracellular fluid is more “watery” than the intracellular fluid. The danger is that there will be an intracellular fluid shift.
- If fluid shifts into the cell, cellular edema occurs.

The Isotonic Patient – Low Sodium but Normal Osmolality

- Serum osmolality 270–290 mOsm/L
- As long as the patient is isoosmolar, there is no concern about intracellular fluid shift.
- Most common cause is an extracellular accumulation of an indissolvable solute (lipid).

The Hypertonic Patient – Low Sodium but High Osmolality

- Serum osmolality is >290 mOsm/L.
- Now the concern is extracellular fluid shifts.
- Most common cause is an extracellular accumulation of a solute other than Na+. (Glucose is most common.)
The Hypotonic Patient – Low Sodium and Low Osmolality

- Serum osmolality <270 mOsm/L
- Concern is for intracellular fluid shifts and consequent edema.
- Several causes
  - Hypervolemic
  - Hypovolemic
  - Euvolemic

Types of Hypotonic Hyponatremia

- Hypervolemic: An accumulation of free water dilutes serum sodium
  - Liver, renal, heart failure
- Hypovolemic: Patient loses both water and Na⁺, but Na⁺ loss is greater
  - Diuresis, vomit/diarrhea
- Euvolemic: Usually mild retention of water – hypothyroidism

For more information please see reference at the conclusion of this presentation

Case Study J.S.
A 52-year-old Female

J.S. Initial Visit
• 72-year-old female presents with a CC of fever.
• Fever is intermittent and began 8 weeks ago. Patient reports going to a dentist that was “dirty.”
• Since then she has also had fatigue and malaise, decreased appetite, joint pain b/l “to the knees,” and swollen hands.

J.S. Initial Visit (continued)
• ROS is otherwise negative: No n/v/d/c, ENT sx, lymphadenopathy, rash, cardiopulmonary sx, headache, seizures or syncope, extremes of weight, or urinary sx.
• She has no oral or dental sx.
**J.S. Histories**

- Denies any significant PMH
- Surgical hx significant for hysterectomy and arthroscopy many years ago
- Social hx significant for 4 cups (0.95 L) of coffee daily; quit smoking years ago; 2 beers daily at night, not sexually active
- Meds: Triamcinolone acetonide topically b.i.d. – prescribed 3 years ago; not using

**J.S. Physical Exam**

- 63” (160 cm); 145 lbs (65.9 kg); BMI 25.86 kg/m²
- Temp 98.2°F (36.8°C); P 108 bpm; RR 16 bpm; BP 135/72 mm Hg; SaO₂ RA 97%
- Well developed, well groomed
- HEENT all WNL
  - Ears and mouth were inspected. Tonsils absent.
- No ant/post cervical, submental, submandibular, occipital or pre/post auricular nodes noted

**J.S. Physical Exam (continued)**

- Chest is clear to auscultation.
- Cardiac exam reg rate, tachy, no murmurs or other adventitious sounds
- Exam of the LE was normal: No edema, ulcers, pedal pulses palpable
- Abd normal: No bruits, organomegaly, tenderness
J.S. Physical Exam (continued)

- Musculoskeletal exam was normal: No edema, crepitus, ecchymosis. PROM and AROM all normal, no joint tenderness.
- Skin without rashes or ulceration
- Neuro grossly normal, CN II–XII intact

J.S. Assessment

- Fever
  - UA, CBC with WBC diff, CRP, ESR
  - Pt to start recording temps at home
- Weakness
  - Iron/TIBC and B12
- Joint pain
  - Parvo B19 IgM/IgG, CCP Ab IgG/IgA
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**Note:** Values are approximate and subject to error.
J.S. Labs – What is abnormal? What were we looking for?

• Do we see infection?
  – WBC differential
  – Urinalysis
• Do we see inflammation?
  – ESR
  – CRP

J.S. – More Labs

• Joint pain
  – What about rheumatic factors?
    • ANA
    • CCP IgA

J.S. – More Labs (continued)

• The CBC does not suggest infection but...
  – H/H are low.
  – Iron sat
  – Iron
  – MCHC
  – RBC
J.S. – More Labs (continued)

• How do we evaluate anemias?
  – H and H first
  – MCV
  – RDW

• What kind of anemia does J.S. most likely have?

J.S. – Disposition

• Given the collection of her history, physical exam, and laboratory assessment, J.S. has a classic presentation of _________.

• What is the appropriate management of her anemia?
• For more information please see reference at the conclusion of this presentation


Case Study

32-year-old Female

Chief Complaint

• 32-year-old female presents with acute chest pain, some activity intolerance and intermittent low grade fever.
History of Present Illness

• She described the onset as acute. A few days prior she “didn’t feel good” and took some acetaminophen.
• She was not concerned about anything acute – has 4 small children and is “always getting something”

History of Present Illness (continued)

• + easy fatigability
• + decreased appetite with some nausea
• + chest pain; sharp – like a knife in the chest
  – Feels worse when she tries to take a deep breath

Review of Systems

• In addition to the symptoms she has already described
  – + frontal headache on and off over the last few days
  – + occasional palpitations
PMH/PSH

• Denies any significant past medical history
• Never “goes to the doctor”
• One exception is that a couple of weeks ago she had an acute event in which her hands and feet became acutely swollen and painful

PMH/PSH (continued)

• She went to urgent care and was given Rx for prednisone. She took it and her symptoms went away. She felt fine until now.
• Denies any surgical hx

Medications

• She took the prednisone prescription for 10 days and finished a few days ago.
• She takes no other prescription medications on a daily basis.
• She uses OTC acetaminophen rarely.
**Family Hx**
- Family hx not readily available.
- Thinks her mother and sisters are alive but hasn’t talked to anyone in years
- Never knew her father

**Social Hx**
- Pt lives with her boyfriend and their 4 small children.
- Denies tobacco use
- Denies alcohol use
- Denies recreational drug use

**Physical Examination**
32-year-old Female
- 5'6" (167.6 cm); 150 lbs (68.2 kg); BMI 24.1 kg/m²
- Temp 100.0°F (37.8°C); P 117 bpm; RR 20 bpm; BP 94/60 mm Hg; SaO₂ 98% (on room air)
- Appears uncomfortable but not emergent
- Skin without rashes or lesions
Physical Examination (continued)

- CN II–XII grossly normal
- EEN were normal.
- Throat was erythematous without exudate.
- Neck exam was normal.
- Respiratory effort and chest expansion were normal.

Physical Examination (continued)

- Lungs auscultated for fine scattered rales in the bases.
- Cardiac exam was significant for
  - Tachycardia
  - Grade II–VI holosystolic murmur at PMI with radiation to axilla

Physical Examination (continued)

- Abdomen negative
  - + striae
  - + normoactive BS
  - - organomegaly
  - - bruit
Labs/Diagnostics

- Office blood was drawn for
  - CBC, CMP, sed rate, CRP, ANA, RF
- 12-lead ECG
  - Tachycardia
  - Nonspecific T wave abnormalities
- Chest x-ray ordered.

Next Day...

- Pt returns to the office early the next day complaining of acute shortness of breath.
- She never got the chest x-ray – was going to do it today
- She now feels like she can't breathe and chest pain is worse.
Physical Examination

• Changes from the day before
  – Pt is generally clearly distressed.
  – Pulse is 138 bpm.
  – BP is 86/60 mm Hg.
  – SaO₂ is 89% on room air.
  – Lungs auscultate for rales.

Physical Examination
(continued)

• Cardiac auscultation
  – Overt S₃ heart sound
  – Systolic mitral murmur appreciably louder than the preceding day
Implications

• Viral myocarditis is a potentially fatal complication of a variety of viral infections.
• Her "swollen hands and feet" were attributed to Parvovirus B19.

Implications (continued)

• A variety of viral infections can cause myocarditis.
• When it occurs in young healthy people symptoms can progress very quickly.
Implications (continued)

- There are no good markers.
- No prevention for DCM
- Attributed to several viruses
  - Parvo B19
  - Coxsackie
  - Adenoviruses
  - Enteroviruses

Implications (continued)

- No good treatments either
- Primarily treat CHF
- **Consider nonviral causes**

For more information please see reference at the conclusion of this presentation

Case Study
14-year-old Female

Chief Complaint
• A 14-year-old female presents with her mother for a basketball preparticipation physical.
• She denies any complaints – feels well and is excited for her first year of basketball

History of Present Illness
• Patient’s mother is primarily Spanish speaking and there is some challenge with translation.
• The patient has been always been athletic. This is her first year for school sports.
History of Present Illness
(continued)
• She has never had a sports preparticipation physical.
• She denies any significant medical history.
• Upon specific questioning she admits to having “passed” out several years ago when she was little.

History of Present Illness
(continued)
• Otherwise she specifically denies any of questions customarily raised during sports PPE.
  – No cardiopulmonary sx
  – No family hx of premature cardiac disease or death
  – Has never been advised she has a heart murmur

Review of Systems
• Negative response to all questions
• She was queried specifically regarding history of
  – Heart and lung sx
  – Asthma
  – Heart murmur
  – Head injuries
Review of Systems (continued)

• Anemia
• Neurological disease
• Musculoskeletal disease
• Mononucleosis

PMH/PSH

• Denies any significant past medical history except the isolated incident of "passing out"
• Denies any surgical history

Medications

• She takes no prescription or OTC medications on a daily basis.
• She has only ever been given medicine for fever by her mother when she was little.
Family Hx

- Mother A and W; no medical hx
- Father believed A and W. He is in Mexico working.
- One little sister with no medical history or conditions

Social Hx

- Pt lives with her mom and little sister in a rented trailer in a rural area.
- She is athletic and likes school – is in 8th grade
- Denies ETOH, tobacco, or recreational drug use
- Denies being sexually active
- Refuses offer to private H and P

Physical Examination

14-year-old Female

- 5’4” (162.6 cm); 119 lbs (54.1 kg); BMI 20.3 kg/m²
- Temp 97.5°F (36.4°C); P 68 bpm; RR 14 bpm; BP 100/68 mm Hg
- Well groomed
- Affect very pleasant and animated
- Skin color normal, warm/dry
Physical Examination (continued)

- CN II–XII grossly normal
- HEENT WNL
- Neck without nodes, bruit, thyromegaly
- Lung sounds are clear.

Physical Examination (continued)

- Cardiac exam reveals a grade III/VI holosystolic murmur.
  - Non-radiating
  - Harsh and rumbling in character
  - It did not change with position change.
  - PMI was normal.

Physical Examination (continued)

- Peripheral pulses are normal.
- Examination of the extremities is normal.
- Patient is Tanner stage 4.
- Musculoskeletal exam is without evidence of weakness.
Physical Examination (continued)

- The abdomen is normal – inspection, palpation, percussion and auscultation.
  - No bruit
  - No organomegaly
  - No pulsations

Implications

- The murmur is the only abnormal finding but it was significant.
- When advised that she had a heart murmur the patient said she had never been told that before.

Implications (continued)

- Mom is listening to the conversation and starts crying.
- Mom talks with the patient in Spanish. The patient then tells me that Mom is upset because the patient had a sister who died from a heart murmur when she was a teenager.
Implications (continued)

- At this point the interview is paused and we all go back to the room with the phone to call the language line.
- It becomes apparent that the patient had a half-sister (same father) who had a heart murmur and died when she was a teen. The mother has no more details.

Implications (continued)

- The mother then says that she was told that her daughter (current patient) had a heart murmur when she was a baby but that it was innocent.

Implications (continued)

- The mother and daughter are both most upset that the sports PPE form will not be signed.
- They are uninsured and are undocumented residents so they do not have any access to health care.
What to do?

– Advise the mother that for her daughter's health, she could not be cleared for basketball until after seen by pediatric cardiology.
– The MA worked with them to find a practice that would accept payments.

What do you think happened?

– She missed the entire season of basketball.
– The murmur was benign.
– Pediatric cardiology cleared her for sports in the future.

For more information please see reference at the conclusion of this presentation

Case Study #4

41-year-old Female

Chief Complaint

• A 41-year-old female presents with a chief complaint of chest pain and getting out of breath too easily.
• She power walks/jogs each day and actually had to stop because she was so out of breath.

History of Present Illness

• The patient reports that she is generally in good health. She has just noticed that in the last few weeks or so she gets tired easily.
• She was finally prompted to seek care when she had to stop her job for SOB.
History of Present Illness (continued)

• She admits to a kind of “dull” chest discomfort that is hard to describe. She is aware of it. It comes and goes but it doesn’t really stop her from doing anything.
• It is not sharp or easy to localize.

History of Present Illness (continued)

• She specifically denies
  - Radiation of the discomfort
  - Pain or discomfort to neck, arm, jaw
  - No associated sx, e.g., diaphoresis, n/v
  - Association with rest or activity

Review of Systems

• Otherwise noncontributory
• She was queried specifically regarding history of
  - Constitutional sx
  - Other cardiopulmonary sx
  - Hemoptysis
  - Bleeding (skin, GI, GYN)
PMH/PSH

- Dyslipidemia
- Hypertension
- Gastric bypass procedure 2 years ago
  - Her two previous medical problems resolved entirely with wt loss.

Medications

- Vitamin B12 500 mcg SL daily
- Vitamin D and calcium combination supplement daily
- MVI daily

Family Hx

- Mother age 70 years
  - Obesity
  - Dyslipidemia
  - T2DM
  - HTN
- Father died age 52 years of MI
Family Hx (continued)

- Brother age 48 years
  - Obesity
  - HTN
  - T2DM

Social Hx

- Pt lives with her husband. She has no children.
- Works as a telephone tech support person
- Denies tobacco or recreational drug use
- Rare ETOH <6 × year
- Monogamous with husband

Physical Examination 41-year-old Female

- 5’3” (160 cm); 164 lbs (74.5 kg); BMI 29.1 kg/m²
- Temp 97.5°F (36.4°C); P 60 bpm; RR 16 bpm; BP 134/82 mm Hg
- Well groomed
- In NAD
- Skin color normal, warm/dry
Physical Examination (continued)

- CN II–XII grossly normal
- HEENT WNL
- Neck without nodes, bruit, thyromegaly but + minimal JVD
- Lung sounds are clear.

Physical Examination (continued)

- Cardiac exam reveals
  - A grade II/VI systolic murmur at 4ICS LSB
  - Very loud S2

Physical Examination (continued)

- Peripheral pulses are normal.
- Examination of the extremities reveals
  1+ pitting edema from mid-calf down. There is no hyperpigmentation.
Physical Examination (continued)

• The abdomen is basically normal. Organ palpation is limited due to large amount of excess skin.
  – Large well-healed scar is apparent.
  – No bruit
  – No organomegaly
  – No pulsations

Office Diagnostics

• Routine labs are drawn.
• 12-lead ECG
  – Right atrial abnormality
  – Right bundle branch block
  – Right axis deviation
Office Spirometry

- Essentially WNL
- No obstructive dysfunction
- Total lung capacity (TLC) 72% predicted

Laboratory Results

- CMP was WNL.
- CBC
  - Significant for Hgb 17.8 g/dL (178 g/L) and HCT of 53% (0.53 proportion)
  - WBC differential was normal.

Implications

- What would you do?
  - She was referred to cardiology.
  - Workup revealed PPH
  - More detailed history revealed a long hx of anorexiant use prior to her gastric bypass.
  - That "loud S2" was a classic wide-split S2.
Case Study M.J.

M.J. a 52-year-old Male

M.J.

- This 52-year-old male presents for annual physical exam and to discuss new onset sx.
- He is a healthy active adult whose medical hx is significant only for testicular cancer 14 years ago; anxiety, and hypertriglyceridemia.
M.J. (continued)

- He has been well without complaint until approximately 3–4 weeks ago.
- M.J. was out running with his wife when he needed to stop due to a sense of air hunger.
- He describes this as “the worst run of his life.”

M.J. (continued)

- This is atypical. He plays soccer and typically does not have any problem running.
- Since this run he has become more aware and since then describes several episodes of “needing to fill lungs with oxygen.”

M.J. (continued)

- This has occurred while climbing stairs at work.
- The sensation has also awakened him at night.
- M.J. denies chest pain, palpitations, cough, mucus production, wheeze, or chest tightness.
M.J. (continued)

- He denies any new medications or allergies.
- He had a normal cardiac evaluation 4 months ago.

M.J. ROS

- + fatigue, + difficulty sleeping
- + reduced exercise tolerance
- + shortness of breath
- + arthralgias, worse in AM
- + intermittent numbness left arm (of years duration and unchanged)

M.J. Physical Exam

- 5'8 ½" (174 cm);
- 174 lbs (79 kg);
- Temp 98.3°F (36.8°C);
- P 60 bpm;
- RR 16 bpm;
- BP 102/67 mm Hg;
- SaO₂ 98%
- A complete head to toe examination (absent genitalia) is WNL; chest and heart auscultation WNL, no bruits of major arteries, pulses intact
M.J. Plan of Care

• In office spirometry reveals mild restrictive dysfunction.
  – Attributed to general anesthesia this AM for colonoscopy
  – 12-lead ECG unchanged from last graph 2 years ago, pr interval 0.22 sec; cardiac eval in the last six months shows no CAD

M.J. Plan of Care

Laboratory Assessment Ordered

• CBC
• Lipid panel
• CMP
• TSH
• Urinalysis
• PSA
• Free and total testosterone
• Sed rate
• Allergy panel
• CT of the chest and spine
• BNP
M.J. Assessment

- The last 2 recorded Hgb's, 2 and 3 years ago respectively, were 15–16 g/dL (150–160 g/L)
- Pt is diagnosed with IDA.
- Colonoscopy of the AM was WNL.
- He is returned to GI for an EGD.
- He has no evidence of internal bleeding, no bruising, no coagulopathy.

M.J. Disposition?

- M.J. is put on iron replacement therapy.
- What else can we do to evaluate cause?
M.J. Disposition Relevant Labs

- Hgb/HCT
- MCV/MCH
- RDW
- Serum iron
- Iron saturation (transferrin sat)
- Ferritin
- Transferrin
- Folate
- Haptoglobin
- Erythropoietin
- Reticulocyte count

What is M.J.’s diagnosis?

For more information please see reference at the conclusion of this presentation

References


References (continued)

References
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