

Why Does My Chest Hurt?

by

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Part I – William’s Presentation to the Emergency Room

William, a 35-year-old maritime law enforcement training instructor collapsed to the floor during one of his training sessions and reached for his chest. Emergency responders rushed him to Cape Cod Hospital and described the patient as pale, cool, and diaphoretic. In the ER, William presented with crushing chest pain and a BP of 180/110 mmHg.

Questions

1. What would you ask the patient?
2. What are some “do not miss” diagnoses?
3. What would you want to do next?
4. What labs or imaging will you perform?

Part II – The Emergency Room

Dr. Richards, the emergency room physician, ordered an EKG and some routine blood work. The patient's vitals are below, his blood results are listed in Table 1, and his EKG is shown as Figure 1 (next page). William was treated appropriately and after a stay in the hospital, he was asked to follow up with his PCP.

Vitals:

BP: 145/90 mmHg O₂ sat: 99% Height: 6' 1" BMI: 23.1 kg/m²
Heart rate: 120 bpm Temp: 99.5 °F Weight: 175 lb

Table 1: William's blood results from the emergency room.

Category	Result	Reference
Red blood cells	$4.7 \times 10^6/\text{mm}^3$	Male: $4.3\text{--}5.0 \times 10^6/\text{mm}^3$ Female: $3.5\text{--}5.5 \times 10^6/\text{mm}^3$
White blood cells	4,500 cells/mm ³	4,500–11,000 cells/mm ³
Platelets	180,000/mm ³	150,000–400,000 /mm ³
Hemoglobin	16.5 g/dL	Male: 13.5–17.5 g/dL Female: 12.0–16.0 g/dL
Hematocrit	43%	Male: 41–53% Female: 36–46%
MCV	83 μm^3	80–100 μm^3
MCHC	33% Hb/cell	31–36% Hb/cell
Troponin I, cardiac, serum	0 ng/mL	≤ 0.04 ng/mL
Troponin T, cardiac, serum	0.01 ng/mL	≤ 0.01 ng/mL
Myoglobin, serum	70 ng/mL	<100 ng/mL
CK, total	65 units/L	Male: 55–170 units/L Female: 30–135 units/L
CK-MB	3.0 ng/mL	< 5% total
Total cholesterol	330 mg/dL	Desirable: < 200 mg/dL Borderline high: 200–239 mg/dL High: > 239mg/dL
HDL	30 mg/dL	Male: < 40 mg/dL Female: < 50 mg/dL
LDL	252 mg/dL	Optimal: < 100 mg/dL Near optimal: 100–129 mg/dL Borderline high: 130–159 mg/dL High: 160–189 mg/dL Very high: > 189 mg/dL
Triglycerides	240 mg/dL	Optimal: < 100 mg/dL Normal: < 150 mg/dL Borderline high: 150–199 mg/dL High: 200–499 mg/dL Very high: > 499 mg/dL
ALT	60 units/L	8–20 units/L
AST	48 units/L	8–20 units/L

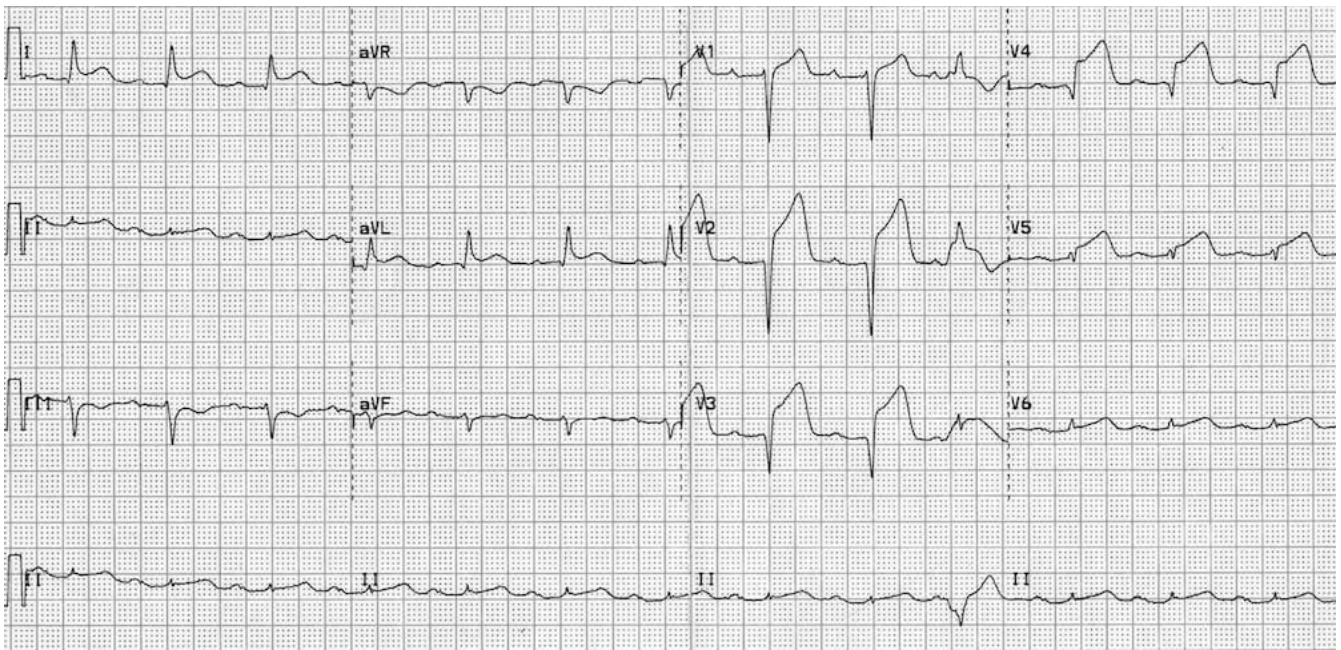


Figure 1. William's EKG. (Adapted from Burns et al. 2021, CC BY-NC-SA 4.0, <<https://litfl.com/anterior-myocardial-infarction-ecg-library/>>)

Questions

1. Summarize William's results.
2. Based on the patient's current presentation, what are your working hypotheses of the factors that contributed to William's condition?

Part III – Primary Care Physician Visit

William was discharged from the hospital and scheduled for a follow-up with his primary care physician (PCP) a few days later. Prior to his appointment, William completed the requested blood work.

Dr. Cohen, William's PCP entered the exam room and asked William how he had been feeling and what brought him in to see her.

"Well, over the last few months I had been experiencing some headaches and dizziness but didn't think much of it," William said. "Recently, I collapsed at work and was rushed to the hospital by ambulance. The medical staff at Cape Cod Hospital informed me that I had a heart attack and said they would send over my labs."

"Ok," said Dr. Cohen. "I see that here and I have the results of your EKG and your blood work. How are you feeling now?"

"I'm doing alright," said William

"Ok, then I'd like to ask you a few questions."

Question

1. What pertinent questions would you like to ask William? What other risk factors need to be addressed at his primary care visit?

“Well as you know, I immigrated to the United States when I was 16 years old with my parents, sister, and maternal grandmother from the Faroe Islands. I have a family history of dyslipidemia in my maternal grandmother, grandfather, and father. One of my uncles who lived on the island died of a heart attack at age 45. All my family was diagnosed with dyslipidemia at a relatively young age, in their thirties or forties.”

“Ok, and remind me what you do for a living,” said Dr. Cohen.

“I work as a Maritime Law Enforcement Training Instructor and live in a neighboring town around the Barnstable County Fire-Rescue Training Academy.

“Has your work changed recently to become more stressful?” asked Dr. Cohen.

“No, not really, work is pretty consistent. I enjoy my profession as a firefighter” explained William.

“Has your lifestyle changed at all in the last six months?” asked Dr. Cohen

“No, I still workout by lifting weights three to five times per week. My diet consists mostly of whole foods, salads for lunch, and meat and veggies with dinner to fuel my exercise regimen. I rarely drink alcohol and have never smoked or vaped. I don’t smoke marijuana or use any other drugs,” explained William.

Vitals taken at this primary care visit:

BP: 146/92 mmHg	O ₂ sat: 99%	Height: 6' 1"	Waistline: 33"
Heart rate: 85 bpm	Temp: 98.2 °F	Weight: 175 lb	BMI: 23.1 kg/m ²

Table 2: William’s blood results from the primary care visit.

<i>Category</i>	<i>Result</i>	<i>Reference</i>
Red blood cells	$4.8 \times 10^6/\text{mm}^3$	Male: $4.3\text{--}5.0 \times 10^6/\text{mm}^3$ Female: $3.5\text{--}5.5 \times 10^6/\text{mm}^3$
White blood cells	5,000 cells/mm ³	4,500–11,000 cells/mm ³
Platelets	195,000/mm ³	150,000–400,000 /mm ³
Hemoglobin	17 g/dL	Male: 13.5–17.5 g/dL Female: 12.0–16.0 g/dL
Hematocrit	51%	Male: 41–53% Female: 36–46%
MCV	82 μm^3	80–10 μm^3
MCHC	33% Hb/cell	31–36% Hb/cell
Total cholesterol	330 mg/dL	Desirable: < 200 mg/dL Borderline high: 200–239 mg/dL High: > 239mg/dL
HDL	30 mg/dL	Male: < 40 mg/dL Female: < 50 mg/dL
LDL	252 mg/dL	Optimal: < 100 mg/dL Near optimal: 100–129 mg/dL Borderline high: 130–159 mg/dL High: 160–189 mg/dL Very high: > 189 mg/dL
Triglycerides	240 mg/dL	Optimal: < 100 mg/dL Normal: < 150 mg/dL Borderline high: 150–199 mg/dL High: 200–499 mg/dL Very high: > 499 mg/dL

Questions

2. Given the information provided, what positive and negative factors influence William’s risk for dyslipidemia?

3. Does William have metabolic syndrome? Please review the criteria for metabolic syndrome.

4. What drugs could you prescribe to prevent atherosclerotic cardiovascular disease (coronary artery disease)? Describe each mechanism of action (MOA).

<i>Drug</i>	<i>Mechanism of Action (MOA)</i>

5. Based on William’s presentation, what would be your next step? Of the medications above, which would you prescribe William and why?

6. Given the fact that CAD occurs in patients under 45 at a prevalence of 1.2%, plus William’s lifestyle, diet, and presenting values, what else could have contributed to William’s dyslipidemia?

Part IV – William's Follow-up

William returned to Dr. Cohen's office two months after starting a statin to follow-up with her regarding his new medication regimen. William did not report any side effects from the medication.

"William, because of your young and healthy lifestyle, I decided to do some investigation into other potential factors that may be contributing to your dyslipidemia," Dr. Cohen explained.

"As mentioned, my grandmother, uncle, and father also have dyslipidemia. Could they be affected too?" William asked.

"Exactly. That certainly caught my eye as well. In my research I found a connection between the Faroe Islands and an exposure to a group of chemicals known to cause dyslipidemia."

William responded, "What's the name of this chemical? Is it harmful?"

"The chemicals are known as poly- and perfluoroalkyl substances (PFAS) and they're also found in firefighting foam used at many training sites," Dr. Cohen stated. "Given your young age, heritage, and profession I would like to run some additional bloodwork to assess the levels of these substances."

Questions

1. Describe to your patient the basic characteristic of PFAS and some uses.
2. Based on William's medical history, would you classify his exposure as acute or chronic exposure? Why?
3. Describe daily lifestyle modifications that William should take to limit his exposure to PFAS.

William's blood was sent to a private lab, which determined the presence of four different PFAS in his blood. Based on those findings, Dr. Cohen recommended to William that he have his well water tested by an accredited PFAS laboratory.

