Investigation 3.9

3.9A: Abdominal Pain & Dark Urine
3.9B: Urinary Tract

Investigation

3.9A: Abdominal Pain and Dark Urine

Introduction:

Who are you? We are not looking to learn your name. We are conducting investigations in this book to find the causes of various medical **symptoms** in order to better understand medical science, and in the process see if you might consider selecting some particular area of healthcare as your career. But in this investigation you will first need to figure out the name of the healthcare role you are playing. You have frequently played the role of a primary care physician, but not today.

You start this morning, not in a doctor's office, but at the hospital. You came in from the physician's parking lot through a security door with an electronic combination that required you to press 1-8-4-6-#, a security number selected by the medical staff to honor the year of the first public demonstration of **general anesthesia**. General anesthesia constitutes America's greatest contribution to healthcare. Dentist William Thomas Green Morton conducted that demonstration of general anesthesia at the Massachusetts General Hospital in Boston on October 16, 1846. Now we find it difficult to imagine what people were forced to endure prior to 1846. The ability to do general anesthesia and make people **unconscious** for painful procedures came along only relatively recently in long history of medicine. In any case, you plugged-in the right numbers and successfully opened the back door of the hospital.

As you head toward the in-patient section of the hospital you pass by the entrance to the Operating Rooms, but you keep going straight ahead. When you first got interested in medicine you were fascinated by the puzzle of the **medical diagnosis**, but you worried that you might not be able to handle the "blood and gore" of medical care. You later discovered that everyone who considers a **career** in healthcare had that same concern. Will I faint when I really need to take action? In truth, once you get **immersed** into medical training and actually come face-to-face with some **gory** situations, to your surprise, you barely notice. Instead you have so much to think about and remember as you start doing what needs to be done, your mind never even registers that gore. Gore bothers spectators, not healthcare providers. If you feel healthcare calling you, you need not worry for a moment about how you would handle "blood and gore." But in your role today, you will never step foot into the **operating room** or see anything **grotesque**.

You are on your way to see a patient at the request of a **colleague** in **internal medicine**. Today you play the role of a **medical consultant**. Your internist colleague, Dr. Brian Johnson, has admitted a 38 year-old female to the hospital and wants your help in sorting through her problems and suggesting the right treatment. You start your **consultation** by reading Dr. Johnson's History and Physical in the patient's **hospital chart**. (Remember you are still trying to identify the consulting role you play today.)

Chief Complaint:

“My urine has looked red, off and on, for about a week, and for the last two days I have had pains in my stomach and lower back, really severe last night.”

History of Present Illness:

Martha Benson came into my practice about 8 years ago. I have seen her for annual physical examinations and routine care for minor infections, lumps and bumps, weight control, and **immunizations**, but nothing significant except a steady trend toward **hypertension**. I finally put her on a blood pressure medication two years ago but I am not satisfied that I have adequately controlled her blood pressure. Now she has pain, **hematuria**, loss of appetite, and symptoms suggesting significant **kidney** issues. In the office we found 4+ hematuria, no evidence of a **kidney infection**, no history of trauma, and I am concerned. I elected to bring her into the hospital to get to the bottom of this quickly and to deal with her pain.

Review of Systems:

She had both measles and chicken pox as a child. Her parents made sure she got her childhood immunizations and she gets flu shots annually. She has had no surgery ever and came to the hospital only for an uneventful delivery of a healthy daughter 9 years ago. She has had no problems ever with her heart, lungs, kidneys, stomach, or nervous system, but I see in my office notes that I have treated her twice for **urinary tract** infections, both cleared uneventfully.

Medications: Lisinopril 10 mg once daily
Allergies: none

Examination:

Wt: 135 lbs. Respirations: 18 /min Pulse: 84 /min
Blood Pressure: 148/94 Temperature: 98.2° F.
General: Healthy appearing young female, well developed, well nourished, with abdominal pain.
Head: No abnormal findings. No enlarged lymph nodes. No redness in the ears or throat. Normal range of movement of the neck. No thyroid enlargement.
Heart: No abnormal sounds
Lungs: Clear
Abdomen: Normal bowel sounds. Abdominal tenderness present, mainly in her **flanks**.
Percussion of her lower back produces significant discomfort.
Extremities: No deformities. No swelling. No tenderness.
Neurologic: Grossly intact.

Assessment: Normally healthy and active young woman, mother, uncomfortable and concerned. I consider new onset hematuria along with hypertension at a relatively young age not easily controlled to warrant thorough evaluation and I have asked for a consultation to help sort this out.

Dr. Johnson has asked **you** to figure out Martha's problem. What type of physician will you call yourself when you introduce yourself to your new patient?

[ ] Obstetrician
[ ] Nephrologist
[ ] Urologist
[ ] Gastroenterologist

Before you see the patient make sure you find out what hematuria means:

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And what sort of medication is Lisinopril?

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If you search for a **differential diagnosis** for Martha's symptoms you will generate a very long list that contains problems with many organs other than the **kidneys**. Dr. Johnson has focused on the kidney and has asked for help with the kidney in mind, but as a consultant you know better than to dismiss the possibility of other organ issues. But you agree it makes sense to focus first on the kidney.

Is there anything in the history or not in the history that makes you agree with Dr. Johnson's belief that the kidney demands your primary attention?

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Nephrologists and **urologists** often say they got interested in the kidney because they have ready access to the chemistry of what goes in and what comes out. The blood flows into and through the kidney and urine comes out. The kidneys clean waste products out of the bloodstream and regulate the levels of certain chemicals that we need in our blood. The design of the kidney normally keeps all the red blood cells inside the blood vessels that feed blood into and out of the organ. When blood cells show up in significant numbers in the urine, enough to make the urine red, the patient needs an accurate diagnosis. Martha should not have red blood cells in her urine.

We credit a physician named Mark Ravitch with an often repeated quotation, "The dumbest kidney is smarter than the smartest doctor." Ravitch was drawing attention to the amazing ability of the kidney to separate out the fluid portion of the blood from the red blood cells and then to selectively put back into the bloodstream only the molecules the body needs, allowing the others to become eliminated from the body in urine. Furthermore it appears the kidney does the right thing, sometimes despite the efforts of a well-meaning but mistaken physician. The kidney has a complex function, and its cells carry out complex chemistry and physiology, so when something goes wrong the problem readily deserves a specialist to find the cause. Indeed the kidney does appear to deserve Dr. Ravitch's compliment.

As a consulting physician focused on the kidney you have a differential diagnosis list of kidney-based diseases you especially want to rule out quickly for Dr. Johnson and Martha. The problem could lie outside the kidney, but if that proves the case Dr. Johnson may need a different consultant.

Your Focused Differential Diagnosis List:

Urinary Infection
Pylonephritis
Kidney Stone
Upper Urinary Tract Obstruction
Cystititis
Kidney Cancer
Polycystic Kidney Disease
Leptospirosis

The following chart will provide a little more information about the symptoms of each disease on the differential diagnosis list:

Disease	Nausea/ Vomit	Pain	Pain	Painful Urination	Fever/ Chills	Hematuria	Frequent Urination	Other
Urinary Infection	X	Upper back	side	X	X	X	X	acute
Pyelo-nephritis	X	Upper back	side	X	X		X	Acute or chronic
Kidney Stones	X	Sudden, severe abdominal				X		acute
Upper Urinary Tract Infection	X		side	X	X		X	acute
Cystitis		pelvic		X	X	X	X	Acute or chronic
Kidney Cancer		Low back or none	mass		X	X		Appetite loss
Polycystic Kidney Disease		abdominal	Low Back sides	If kidney stones		X	X	Hyper-tension chronic
Leptso-spirosis	X	Headache, low back,	calf		X			Jaundice, appetite loss

After asking the nurse on duty which room Martha can be found, you walk into her room to find her lying in her hospital bed. After introducing yourself to Martha, you then confirm the medical history from the chart with her before repeating most of the examination that Dr. Johnson did previously. You double-check Dr. Johnson for two reasons. First you might find something that Dr. Johnson missed, and second, you might find something has changed since Dr. Johnson examined the patient. Consulting physicians often find a clue the primary physician lacked simply because they get to the patient later in the process of the illness. In Martha's case you did not find any new information.

On admission to the hospital Dr. Johnson had ordered **blood chemistry** studies on Martha that included measuring the levels of **blood urea nitrogen** and **creatinine.** These tests measure the amount of waste products still in the blood that the kidney should have removed. The lab calculated an estimate of Martha's **kidney filtration rate** (estimated GFR) of 64 mL/minute, when a normal value should exceed 90. You see that Martha's kidneys are not working properly and you decide to ask for help from the department of **radiology** to figure out precisely what is happening. You may have heard the expression, "A picture is worth a thousand words."

An X-ray picture of the kidney called an **intravenous pyelogram** (IVP) uses an **iodinated** contrast material **injected** into a **vein** to make the blood and then the urine visible. The X-ray pictures taken over a period of time after the injection tell us what is happening in the kidney and the ureters that take the urine down to the **urinary bladder**. While you would love to have that information, the fact that Martha's kidneys are not working efficiently causes you to reconsider. The contrast material can often injure a kidney so the IVP might possibly make Martha's condition worse. So you decide to ask the radiologist to image Martha's kidneys not with X-rays but with **ultrasound** (sound waves much higher in frequency than our ears can hear).

You have several other patients to see in the hospital, so two hours later you walk to the radiology department to review the ultrasound study with the **radiologist**. The study demonstrates five **kidney cysts**, two in the left kidney and three in the right. Those findings confirm the diagnosis of **Autosomal Dominant** Polycystic Kidney Disease, a condition that we do not know how to cure, but a condition that healthcare providers can work with patients to manage.

Polycystic Kidney Disease does cause blood pressure problems because the kidneys play a key role in **regulation** of blood pressure. Dr. Johnson actually has Martha on the right blood pressure medicine, but he will need to continue to work on controlling her blood pressure.

Polycystic Kidney Disease can also create cysts in other parts of the body, abnormalities in blood vessels in the brain, and even leaking in the valves of the heart, all issues Dr. Johnson will have to watch for in Martha. Urinary tract infections appear more commonly in patients with this disorder.

As a consultant you immediately get in touch with Dr. Johnson to discuss your diagnosis. Dr. Johnson may wish to explain the situation with his patient himself and he may want you to also follow Martha in the future. You ask Dr. Johnson for permission to speak with Martha's daughter's pediatrician about the findings. Why would you make that request?

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Would Martha ever be a candidate for a kidney transplant?

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If you still have curiosity about how the kidney does its "magic," you might look up the role it plays in regulating blood pressure and see if you can understand why Dr. Johnson was using the right blood pressure for Martha by looking up the mechanism of action for the medication Lisinopril.

Polycystic kidney disease will change Martha's life. She did not do anything to cause this disease. No one wants the job of sitting down with Martha to tell her the results of her ultrasound examination. No one wants to tell her that we do not know how to cure her condition. Delivering bad news unfortunately remains a task that falls on healthcare professionals to perform.

One of the important skills in the practice of medicine we call the "bedside manner." While our lessons here have focused on the path to finding the right diagnosis, you can certainly appreciate also that medicine involves difficult conversations, too often. Patients want the professionals who take responsibility for their medical care to care not just about their body, but also to care genuinely for them as individuals with hopes and fears and failings and passions. Fortunately the ability to learn and use science does not **preclude** the ability to also relate to others with compassion and understanding.