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Case Report

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School-Age Child with Flu-Like Symptoms- Now What?

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Case Presentation

On July 1 at 10:00 a.m. in Northern California at a walk-in clinic, an eight-year-old type I diabetic, Adam, a Hispanic male present accompanied by his mother, Lana. Lana states Adam has had a fever over 101 degrees Fahrenheit for the last 4 days and has been complaining of generalized aching, nasal congestion, and a sore throat. She states that Adam is usually a very active child, playing soccer outside, but has been lying in his bed and telling her, "Mom, I don't feel good. My stomach hurts, I feel like I'm going to throw up, my eyes itch, and I hurt all over." Lana says she has been giving him some Tylenol for his fever but it keeps returning. Adam hasn't been eating well, only drinking a little water, complaining of a sore throat, and diarrhea and she is concerned because he seems to be getting worse.

History

Past Medical History

Adam was the second child born in the family at 39 weeks gestation and he has one older sister, Myra. Adam is a Type I diabetic who has had an insulin pump since he was 6 years old. His last A1C was 5. He does not take any other medications. He is allergic to penicillin and a variety of grass pollens, which cause a rash and nasal congestion with sneezing. Adam has not had any surgeries, although he did break his right arm 3 years ago when learning to ride his bicycle. He is up-to-date on vaccinations and tested positive for Covid-19 three weeks ago, reporting he only had mild cold symptoms and a loss of taste. Vision and hearing screenings at school were normal and his last physical was normal six months ago.

Family Medical History

Lana has type II diabetes and hypertension, managed with oral Metformin and Lisinopril daily. Adam's dad has no medical problems, but he does smoke ½ pack of cigarettes a day and refuses to quit. Maternal grandparents have diabetes and hypertension. My paternal grandfather died of a heart attack 2 years ago. My paternal grandmother has no medical problems. Lana adds there is no other family history of heart attack, stroke, respiratory, gastrointestinal, cancer, or other chronic medical conditions. There is no use of alcohol, non-prescribed substances, behavioral disorders, violence, or abuse in the home.

Social History

Lana says that Adam has a pleasant personality, is respectful, makes occasional contact with the provider, and answers questions appropriately. Adam says he loves to play soccer and basketball but hasn't felt like getting out of bed the last few days. He adds that he has lots of friends, enjoys going to school, and is in the 3rd grade, and is looking forward to starting 4th grade in August. Adam resides with his parents, who are married, and his 12-year-old sister, Myra. Lana says they are a close family and they go to church every Sunday.

Environmental History

Adam's family lives in a single-wide trailer, located in a rural area of northern California with his parents and sister, Myra. The family is Hispanic, although English is their primary language. Adam says he has a dog named Bo that stays inside the trailer. Adam says that pollen sometimes causes him to have a runny nose and eye itching. Adam is exposed to secondary smoke from his dad. Lana is a homemaker and Adam's dad is a construction worker. They have one car, smoke alarm detectors in the bedrooms, and receive federal/state assistance for healthcare, dental, and food. Lana denies any alcohol, substance abuse/violence in the home. Adam says he feels safe in his home and denies any depression or thoughts of suicide/harm to himself or others. Lana states Adam's dad does have a gun, but it is locked in a gun case.

Assessment Findings

Vital Signs: Temperature= oral 101.2 degrees Fahrenheit (34.4 degrees Celsius); apical pulse= 125; Respirations= 32; Pulse oximetry= 89%; BP= 100/60; Height= 128 cm (50.4"- 25th percen-

tile); Weight= 21.8 kg (48 lbs.), 10th percentile; Body mass index – 13.3 (underweight).

General: Hispanic skinny male; uncomfortable; slightly lethargic, but answers questions quietly, appropriately, briefly, and with occasional eye contact. Their eyes are bloodshot and slightly sunken appearance. Their body position is side lying in a flexed position on the exam table with both arms crossed across his abdomen, moaning occasionally with movement. Occasional shoulder rises with some mouth breathing with respirations, no nasal flaring. His clothes are clean with hair is neatly combed. No unpleasant body odors are noted.

HEENT: Normocephalic, intact, clean scalp; no lesions; thick, dark brown soft hair. No head lice or bald areas; frontal and maxillary sinus areas are tender with palpation bilaterally; eyes symmetrical and slightly bloodshot, pruritis, and small amount of yellowish discharge; PERRLA, conjunctiva pink, sclera white, red reflex present bilaterally with no extraocular movements. Pupils measure 4 mm diameter; iris color is brown; denies headaches, no blurred vision; last eye exam was 9 months ago. Nose is midline and centered on face; nasal septum straight; yellowish, think discharge noted in both nares, partially obstructing both nares; ears bilaterally symmetrical and equal alignment noted, no ear discharge or piercings, last hearing screen test at school was normal and Adam responds appropriately to questions. Taste has not completely returned to normal post Covid-19; Tympanic membrane is pink/gray with the light reflex present. Neck is symmetrical, lymphedema noted bilaterally; no neck resistance with motion but moans stating "he hurts all over;" oral cavity intact, 3 lower molars have fillings; no broken teeth or malodorous breath; no other signs of dental carries, gag reflex present, and uvula mobile and midline. Tonsils midline +3; able to swallow without difficulty. Erythematous tongue, dry, mucous membranes; and complains of sore throat with swallowing.

Integumentary: Skin is tan and appropriate for ethnicity; intact, and dry. No unusual pigmentation; warm to touch centrally with cool hands, arms, and feet. Some erythema observed on hands, no lesions, scars, tattoos nor open wounds. Insulin pump dressing intact on lower abdomen with no redness, edema, or increased heat to touch.

Respiratory: Anterior-posterior to transverse ratio is 1:2; regular, slightly rapid respirations with occasional mouth breathing and shoulder accessory muscle use during inspiration: no grunting, strider, retractions, nor nasal flaring noted. Bilateral, anterior and posterior breath sounds are clear.

Cardiovascular: Pulses are rapid, palpable, slightly decreased strength but equal bilaterally; no cyanosis; no edema nor clubbing; capillary refill 3 seconds; PMI at the apex in the left midclavicular line; cardiac auscultation reveals a regular, rapid heart rate and rhythm; S1 and S2 noted; no thrills, rubs, gallops, nor murmurs auscultated.

Abdomen: Symmetrical, flat, non-distended, soft, intact, generalized abdominal tenderness with palpation in all four quadrants, no lesions; active bowel sounds in all four quadrants. Insulin pump located on lower left quadrant of the abdomen- dressing clean and intact, no swelling, bleeding, erythema, or tenderness around the pump site.

Neurological: Lethargic, oriented X3; no focal deficits; no tremors noted; speech intact; makes occasional eye contact; follows directions. Denies headache and no history of seizures. Cranial nerves 1-12 are intact with a normal response.

Musculoskeletal: Steady, balanced gait when standing; spine is midline with erect posture; no lordosis; no scoliosis; the full range of motion; no edema, some erythema bilateral hands, tenderness noted with a range of motion in joints.

Initial Management Plan/Interventions

Due to Adam's presentation, history, and assessment, the licensed provider decides to send Adam to the hospital for admission, rehydration, and additional diagnostic testing. The licensed provider orders the following laboratory and diagnostic tests: chest x-ray; electrocardiogram, echocardiogram, serum labs: CBC, BNP, CRP, LDH, Hemoglobin A1C, troponin, and ferritin; and oral swabs screening for Group A Streptococcus and influenza.

Adam needs an IV started for rehydration and medications ordered for his fever and pain. The licensed provider orders Normal Saline 500 mL bolus, then 100 mL/hr. Acetaminophen PO every 4 hours for temperature >101.0 degrees Fahrenheit and 400 mg Ibuprofen PO as needed for pain >6 on a 0-10 pain scale. Supplemental oxygen is ordered via a non-re-breather mask to maintain oxygen saturation >94% per respiratory therapy.

What are You Thinking While Waiting on Diagnostic Testing?

The California summer heat is a peak time for pollens possibly contributing to Adam's nasal congestion or is it his allergies? Lana reported Adam had Covid-19 three weeks ago, so are his clinical presentation symptoms just prolonged? Should Adam be placed in isolation precautions? Adam has diabetes which increases his risk for a variety of illnesses quicker. Does Adam have Kawasaki Disease because of the oral erythema and neck lymphedema, although he is 8 years old? Adam is not drinking or eating much, so one is concerned about rapid dehydration and risk for metabolic acidosis or diabetic ketoacidosis. Adam likes to be around friends, so was he exposed to another illness from a friend recently? What is causing this prolonged fever without relief from Acetaminophen? Is Adam suffering from some post-Covid complications, such as upper respiratory infection, respiratory synchronous virus, Multisystem Inflammatory Syndrome in Children (MIS-C), or cardiac complications? Is the causative agent bacterial or viral? Did Adam eat something that made his stomach hurt and caused diarrhea? Am I missing something or what else do I need to know?

Laboratory Results/Differentials

Adam's diagnostic test results are back. His inflammatory markers labs such as neutrophils, C-reactive protein (CRP), and ferritin b-type natriuretic peptide (BNP) are elevated or abnormal. His red blood cell count, hemoglobin, hematocrit, and troponin are within the normal range. Platelets (<150,000), albumin, lymphocytes (<1,000), and sodium are low. The EKG shows sinus tachycardia and the echocardiogram is normal. Children with MIS-C often have a lymphocyte count <1,000, platelets <150,000, hyponatremia, and neutrophilia. LDH, D-dimer, IL-6, IL2R, R, lymphocytes count, and albumin level, are additional laboratory orders that should be collected. Influenza and rapid strep swab were negative. The electrocardiogram shows normal sinus tachycardia. The chest x-ray is normal ruling out pneumonia and no sign of pneumothorax. Some providers may elect to perform a lumbar puncture to rule out meningitis or other infection.

The Rest of the Story

Adam is diagnosed with Multisystem Inflammatory Syndrome in Children (MIS-C), a rare, but serious condition in children directly correlating with SARS-CoV2 within the past 4 weeks. It also presents with joint pain and inflammatory responses. MIS-C clinical presentations are individualized. Kawasaki Disease is more common in children under the age of five and is not related to recent Covid-19 positivity or exposure.

Children can become dehydrated rapidly. Children with type I diabetes are at increased risk when ill. Children presenting with tachycardia, tachypnea, respiratory distress, confusion/mental status changes, neurologic changes, renal or hepatic injury, markedly elevated inflammatory laboratory markers, abnormal EKG, troponin, or BNP should be considered for hospitalized for close observation (Henderson et al, 2022) [4]. Based on Adam's presentation, hospitalization allows a better place to monitor any changes in his condition.

Implications for Treatment/Practice Guidelines (Rheumatology & Arthritis, 2022)

Treatment is primarily supportive and based on clinical presentation. Fever significantly increases the fluid needs of children, increasing the risk of dehydration or hypovolemic shock. Therefore, prompt fluid resuscitation is vital, especially with poor oral intake and diarrhea. Fluid resuscitation, oxygen, varied medications (acetaminophen, steroids, glucocorticoids, low dose aspirin for thrombotic history, or possibly Janus kinase (JAK) inhibitors, if not contraindicated).

Cardiac Management: Abnormal laboratory markers should be monitored regularly until within normal range. Hospitalized children should be placed in the intensive care unit or telemetry for continuous cardiac electrical activity monitoring. Stable children may be monitored at home via Holter monitors as needed. EKGs should be performed every 48 hours or at the follow-up to evaluate for any heart electrical conduction changes. Electrocardiograms should be done on admission and every 7-14 days up to 4-6 weeks post-symptom presentation. Cardiac magnetic resonance imaging may be indicated for children with severe left ventricular dysfunction 2-6 months post initial clinical symptom presentation. Cardiac computed tomography may also provide additional detailed diagnostic imaging if needed.

Infection Management: The American College of Rheumatology & Arthritis (2022) recommends a step process starting with Tier 1: administering 2gm/kg (maximum 100 mg) of Intravenous Immunoglobulin (IVIG) for hospitalized children and low-moderate dose glucocorticosteroids (1-2 mg/kg/day) [1]. Children with cardiac refractory dysfunction may require high-dose glucocorticosteroids (such as Methylprednisolone 2-30 mg/kg/day), close monitoring for fluid overload, and the need for diuretics, or vasopressors. Dexamethasone (0.15 to 0.3 mg/kg/day, max 6mg, for up to 10 days is frequently used in initial treatment, especially in hospitalized children. Anti-rheumatoid medications, such as Anakinra (2-10 mg/kg/day) administered subcutaneously or intravenously every 6-12 hours recommended adjuvant with IVIG by the American Academy of Pediatrics to optimize patient recovery (2022) [1]. Alternative medications are available for pre-existing medication contraindications. Secondary medications, such as Tocilizumab (8mg/kg IV with a max 800mg) and Baricitinib may be considered, especially within 24 hours of increased oxygen demands, although are based on availability, age, and comorbidities. Children on these medications should be monitored closely for adverse reactions, elevated triglyceride levels, thrombus, or thrombocytosis. Currently, limited research does not support the administration of JAK inhibitors and IL-6 in children. During treatment, serial laboratory testing and tapering of medications may be needed for 2-3 weeks or until values return to normal. Atraumatic care is recommended for pediatric patients to reduce pain with serial laboratory collection or the use of local anesthetics, like EMLA cream (lidocaine/prilocaine) at least one hour before collection.

Antithrombotic Management: Low-dose aspirin (3-5 mg/kg/day; max 81 mg/day) should be used in MIS-C patients with a coronary artery aneurysm (CAA) z-score of 2.5-10.0 and continued until platelet counts are normal. Coronary arteries should also be checked for normalcy at ≥4 weeks after diagnosis before discontinuing the low-dose aspirin. Aspirin should not be used in MIS-C patients with active bleeding, increased bleeding risk, and/or platelets < 80,000/μL (M). Children >12 years may need central venous catheterization and higher anticoagulant management based on risks, history, and symptomology. Children with a CAA z score of z-score ≥10.0 or a cardiac ejection fraction <35% should be treated with low-dose aspirin and enoxaparin for at least 2 weeks, then changed to vitamin K or oral anticoagulant until the CAA z-score is <10 and/or ejection fraction is >35%. Children with a history of thrombosis should remain on low-dose aspirin and anticoagulant management for 3 months and receive follow-up thrombosis imaging 4-6 weeks post symptom onset unless bleeding or other contraindications occur.

Vaccination

Covid-19 vaccination is recommended by the American Academy of Pediatrics (2022) based on the following criteria: The child has fully recovered from illness with normal heart function at least 90 days post MIS-C diagnosis and residing in a community with a high SARS-CoV2 positivity or risk exposure rate. The Centers for Disease Control (2022) provides a map to identify risk areas in each state [1, 2].

Follow-Up

Children diagnosed with MIS-C should follow up with a pediatric cardiologist 1-2 weeks post-discharge to monitor for heart injury or dysfunction. Parents should observe their child for changes in mental status, respiratory distress, activity intolerance, or behavior changes. The child should also continue to follow up as needed with a pediatric rheumatologist.

Lessons Learned

The nursing process is vital in determining the best plan for patient care and optimizing patient outcomes. Multisystem Inflammatory Syndrome in Children (MIS-C) reported cases have continued to increase post the Covid-19 pandemic. The definition of MIS-C varies between the Centers for Disease Control and Prevention, the World Health Organization, and the Royal College of Paediatrics and Child Health (Henderson et al., 2020) [3]. The Centers for Disease Control and Prevention (CDC, 2021) defines MIS-C as involving children <21 years of age who have had or are suspected of having the SARS-CoV-2 virus within four (4) weeks of the onset of the following symptoms: fever >38 degrees Celsius for > 24 hours, inflammatory supported laboratory results, >2 organ involvement, severe illness requiring hospitalization, and no other suspected diagnosis. MIS-C identification is important as it can affect the brain, heart, lungs, kidneys, liver, skin, eyes, and gastrointestinal organs. Adam fortunately appeared to have minimal system organ impact [3].

At the end of June 2022, every state in the United States reported >1 case of MIS-C (CDC, 2022) [2]. There have been 8,639 cases reported meeting the definition of MIS-C including 70 deaths (CDC, 2021) [3]. As healthcare providers, it is vital to stay informed and aware of new health risks, screening, maintain up-to-date knowledge, and explore evidence-based practice to optimize healthcare outcomes. MIS-C risk factors include: previous positive test or exposure to SARS-CoV2 within the past 4 weeks, male, school-age, immunocompromised, history of asthma or type 1 diabetes, obesity, congenital heart disease, African, Afro-Caribbean or Hispanic ethnicity Children are considered a vulnerable population because they lack the antibodies to ward off illness.

Healthcare providers are experts in screening, assessment, application of evidence-based practice interventions, and ongoing evaluation to improve healthcare outcomes. Many diseases may have similar clinical presentations, such as MIS-C and Kawasaki disease.

Recognizing

MIS-C clinical presentations, such as prolonged fever (>3 days) and at least one other clinical symptom including: diarrhea, stomach pain, vomiting, bloodshot eyes, skin rash, dizziness or lightheadedness may help direct diagnostics to differentiate diagnosis and provide appropriate evidence-based practice interventions (CDC, 2021). Providing education on proper hand hygiene, administering vaccinations to prevent illness before it occurs, and providing guidance of when to seek healthcare treatment is an important healthcare provider role [3].

Although rare, MIS-C can be a serious illness impacting pediatric patients. Prevention, prompt screening, thorough assessment, appropriate diagnostics, recognition, application of evidence-based practice interventions and ongoing evaluation can improve pediatric patient outcomes. Additional research is still needed to support clinical treatment guidelines. A team approach of licensed specialists is encouraged for optimal outcomes, including but not limited to pediatricians, rheumatologists, cardiologists, neurologists, internal medicine or gastroenterologists, hepatologists, and nephrologists (Henderson et al., 2022) [5]. Pediatric nurses are vital in establishing relationships with children and families, spending the most time at the bedside, communicating with other healthcare team members, carrying out the plan of care, and evaluating outcomes because children hold our future [1-5].

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