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Acute Gastroenteritis PedsCases Podcast

Developed by Melissa Chiu and Dr. Anne Feng for PedsCases.com.
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Introduction

Hi everyone! My name is Melissa and I am a fourth-year medical student at the University of British Columbia. This podcast was developed in support by Dr. Anne Feng, a pediatrician at BC Children's Hospital. Today, we will be talking about acute gastroenteritis, a very common presentation at the emergency department and the clinic.

Objectives

First, let's begin by going over the objectives of this case:
1. Define diarrhea
2. Review the clinical presentation of gastroenteritis
3. Review the common causes of gastroenteritis
4. Develop an approach to the management of acute gastroenteritis

Case

Alright, let's begin the case. You are a third-year medical student doing your pediatric emergency rotation at Children's hospital and you meet Tommy, a 5-year old boy, with his mom. He's slouched over in his mom's arms and he looks really tired. His mom tells you that he has been having 5-6 episodes of diarrhea for the past 2 days and has been throwing up since yesterday morning. He's been slightly feverish and his mom worries that he's been more tired than normal. She also tells you that he has been refusing all his meals and snacks and his lips look really dry.

Before we continue, let's quickly review the definition of diarrhea:

Diarrhea is defined as "the passage of three or more loose or liquid stools per day by the WHO" (1). Note that "passing formed stools at an increased frequency is not

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considered diarrhea", but the frequency must be greater than the norm for it to be considered diarrhea (1).

Diarrhea can be further classified into the following categories:
1. **Acute diarrhea:** this lasts several days/hours;
2. **Acute bloody diarrhea or dysentery;** and
3. **Persistent diarrhea:** this lasts 14+ days (2,3).

History

You remember the tips that your preceptor had given you about history taking for diarrhea. You want to:
1. **Determine the onset and severity**: When did it start? What's its progression been? How many times a day?

2. **Characterize the stools**: Is it watery? Is there any blood or mucous?

3. **Determine the associated symptoms**: Does he have a fever? Any emesis? Is it bilious? Any changes in urine output? Any abdominal pain? Is he more lethargic or listless at home? Any weight loss? Any changes in the intake of fluids or solids?

4. **Determine the child's clinical context**: Is the child immunocompromised? If so, think unusual infections. Any sick contacts? Recent hospitalization? Antibiotic use? Any recent medications? Recent travel? Are his vaccines up to date? Any recent immigration?

After recalling these tips, you return and ask Tommy's mom some more questions. She tells you that Tommy has had 5-6 watery stools with no blood or mucous in the last 2 days. He has been vomiting 3-4 times a day for the past 2 days, and it's non-bilious. His temperature was 38.6 this morning. He's had decreased urine output which is darker than usual. He has not lost any weight and has been growing normally. He has not had any unusual foods recently. There has been one similar episode in the past and she was told he had a stomach bug.

Differential Diagnosis

Before moving onto the physical exam, let's consider our differential diagnosis:
When we see someone with diarrhea, we should split it up into acute diarrhea and chronic diarrhea. Today, we will focus on acute diarrhea:

The most common cause of acute diarrhea is infectious. This includes

1. **Viral causes,** such as acute viral gastroenteritis, which is by far the most common cause for acute diarrhea. This usually presents with low grade fever and diarrhea without any blood or mucous (2–4).   The most common pathogens are: rotavirus, norovirus and enteric adenovirus (2,3).

2. **Bacterial,** which is less common in developed world, but can happen, for example with travel, ingesting raw untreated milk, and prolonged use of antibiotics. The most common bugs are campylobacter jejuni, salmonella, e coli, shigella, yersinia, and cholera (2). Shiga toxin producing e coli is a common cause of hemolytic uremic syndrome, a diagnosis not to be missed, which presents as hemolytic anemia, thrombocytopenia and acute kidney injury. Prolonged use of antibiotics can increase their risk for C-diff. Kids with bacterial gastroenteritis usually have a high fever and blood or white mucous in their stools (4).

3. **Parasitic enteritis,** which may be seen in kids who go camping or travel overseas and drink untreated water (2,3). The most common parasites are protozoans like cryptosporidium, giardia, E. histolytica, and helminths such as strongyloides (2). The symptoms will usually present 12-24 hours after exposure and usually last for 3-7 days (4).

Non-infectious causes include osmotic diarrhea from drinking too much juice and lactose intolerance, and inflammatory causes include Crohn's and UC. These are usually more chronic in presentation. You should also rule out surgical causes such as toxic enterocolitis.

In our case, Tommy has an acute onset of non-bloody and non-mucousy diarrhea with a fever and our most likely diagnosis at this point is acute gastroenteritis.

Physical Exam

Back to our case. Tommy is alert and crying in his mom's arms. He is very irritable. You notice that he doesn't have a lot of tears and his eyes look sunken. As an astute third year medical student, you know that it is important to determine his hydration status given he's been having diarrhea and has been vomiting 3-4 times per day for the last 2 days.   His pulses are strong, HR is 110, RR 22 and BP 100/60, all within normal range. His hands and feet are cold. Cap refill is 3 seconds.

His abdomen is soft and non-distended with no peritoneal signs, so this is less likely a surgical case. His respiratory and cardiovascular exams are normal.

So what does this mean in terms of his hydration status?

In children, hydration status is split into 3 groups: minimal or no dehydration, mild to moderate dehydration and severe dehydration (2,4,5). Let's talk about each one:

1. A child with **minimal or no dehydration** has lost <3% of their body weight. They look well. Their vitals and cap refill are normal. Their urine output may be slightly decreased. Their mucous membranes are moist and when checking for skin turgor, their skin recoils immediately (2,5).

2. A child with **mild to moderate dehydration** has lost 3-9% of their body weight. These kids can still look well. However, some may be more irritable, fatigued or restless. They are usually thirsty and have dry mucous membranes. Vitals are normal to borderline normal. Their eyes are slightly sunken, with a decrease in tears and urine output. Cap refill is prolonged and extremities are cool (2,5).

3. A child with **severe dehydration** has lost more than 9% of their body weight. They look sick, are lethargic, and may even be unconscious. Because of their decreased mental state, they may not be able to drink well. They are tachycardic and breathing deeply. Pulses are weak and thready, urine output is decreased. Eyes are sunken and mouth is parched. Cap refill and skin recoil are both prolonged. They are mottled and may be cyanotic as well (2,5).

What do you think of Tommy given the history and physical exam?
You're right, he is a 5-year-old, previously healthy male who is presenting with acute diarrhea most consistent with viral gastroenteritis. He is hemodynamically stable, but is irritable, thirsty, has decreased urine output and sunken eyes, suggesting that he is moderately dehydrated. He does not have an acute abdomen

So what should we do now? Do we need any further investigations?

Investigations

At this point, we are pretty certain that Tommy has acute gastroenteritis and is moderately dehydrated. In uncomplicated cases of acute gastroenteritis, it is not necessary to order any further investigations (2,4,5). However, if you were concerned about other causes of diarrhea, further investigations relevant to your suspicion may be beneficial. A stool analysis should be ordered if the child is presenting with bloody stools, is spiking a high fever, is young or immunocompromised, or if there is an outbreak in public places (2). If you're suspicious of a parasitic cause, a stool O&P should also be ordered. A sample for C diff should also be taken if the child has any

recent hospitalizations or use of antibiotics (2,5). With severe dehydration, bloodwork for glucose, urea, creatinine, bicarbonate and electrolytes (sodium, potassium, chloride) need to be drawn to rule out electrolyte abnormalities or an acute kidney injury. Children with severe dehydration, who appear unwell, may require additional investigations   to rule out sepsis depending on the clinical context.

Your preceptor agrees with you that no further investigations are needed and asks you to do some reading about the treatment of acute gastroenteritis.

Treatment

Most cases of acute gastroenteritis are self-resolving and don't require any medical treatment (2,4,5). However, dehydration from diarrhea and vomiting can be dangerous, and death from dehydration is common in the developing world (4). The primary goal in the management of dehydration is to replace fluid losses (2,4).

The way you manage dehydration depends on the level of dehydration of the child. Remember, they are split into 3 categories. Let's talk about the management for each category:

1. For cases of **minimal dehydration**, where the child is well, the child can be given oral rehydration solutions (ORS) with at least 45 mEq of Na/L with regular small feedings (2,5). When discharging the child, you should advise the parents to give 1.5x maintenance fluids equivalent of ORS. Of course, this should be calculated and a specific number should be given to the parents. Pedialyte and enfalyte are some over-the-counter options which the parents could purchase.
2. For cases of **mild or moderate dehydration,** where the child is no longer vomiting and is hemodynamically stable, the child should be given 50-100 mL of ORS per kg BW over 2-4 hours to replace lost fluids and ongoing losses should be replaced with additional ORS (2). Ondansetron has also been shown to decrease rates of admission and need for IV hydration in children between 6 months and 12 years of age and can be given in the ER (5,6).
3. In cases of **severe dehydration,** which usually presents with unstable hemodynamics and is very important to recognize, an IV or an intraosseous line should be started immediately for rapid fluid resuscitation with 20 ml/kg of normal saline (2,4). It's important to remember not to use hypotonic solutions as there is an increased risk of hyponatremia (7). During resuscitation, labs including serum electrolytes, bicarb, BUN, creatinine, and glucose levels should be checked regularly. Depending on the degree of dehydration and response to initial fluid boluses, these children may require hospital admission.

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Remember to regularly re-evaluate the hydration status throughout the child's stay. If you notice that they have a poor response to the initial treatment, you should consider alternate diagnoses such as septic shock, endocrine disorders like DKA, and neurological issues.

After your reading, you return to discuss the case with your preceptor. You believe Tommy has moderate dehydration and you suggest that he be started on ORS to replace his fluid losses. Since he is still vomiting, you also give him a dose of ondansetron. Other antiemetics are not recommended as there is limited evidence to support their use (5).

Tommy's mom is still really worried and asks you if he needs any other medications and whether he needs to be admitted into hospital. You remember that anti-diarrheal medications like loperamide aren't recommended and that antibiotics are only given if there is an identified, treatable bacterial or parasitic cause (2,5). You don't think Tommy requires any other medications and since he doesn't have intractable emesis, severe dehydration and is tolerating the ORS well, you don't think he needs to be admitted either. You review this with your preceptor, who agrees and feels that Tommy can go home once he starts tolerating some food.

You monitor Tommy for a few more hours and notice that he is looking better. He is tolerating ORS and you see him happily sucking on a popsicle and eating crackers. You are happy to discharge him home and you give his mom some instructions for when to return to the hospital. You also set up a follow-up appointment to see Tommy in your preceptor's clinic in a week. Tommy waves goodbye to you as he happily runs out of the ED.

Take-Home Points

That concludes our case on acute gastroenteritis. Let's review some key points:
1. Diarrhea is defined as having 3 or more watery stools per day. Acute diarrhea lasts several days/hours. Persistent diarrhea lasts 14 or more days.
2. The 3 main causes of gastroenteritis are viral, bacterial and parasitic., with viral gastroenteritis being the most common. Recent camping trips or travelling raise the suspicion for parasitic causes and bloody stools suggest a bacterial etiology.
3. Dehydration is categorized into minimal or no dehydration, mild or moderate and severe dehydration. The child is well looking if mildly dehydrated. Moderate dehydration presents with sunken eyes and decreased skin turgor. Severe dehydration is important to recognize and presents with unstable hemodynamics. Should the child be in severe dehydration, bloodwork for glucose, urea,

Creatinine, electrolytes, and bicarbonate should be done and an IV for isotonic resuscitation needs to be started quickly.
4. For the majority of cases, which are viral gastroenteritis with mild to moderate dehydration, the main goal of management is rehydration with ORS. In most cases, medications and antibiotics are usually not recommended.

And that's a wrap on acute gastroenteritis. Thank you to Dr. Feng for supervising the creation of this podcast. Stay tuned for more podcasts on PedsCases!

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