Pediatric oral rehydration... everybody's business

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Vomiting and diarrhea represent two of the most common reasons for children to present to emergency departments. Gastroenteritis was the number one diagnosis at the Alberta Children's Hospital Emergency Department last year, with 3,433 registered visits. The children arrive in varying states of hydration requiring a multifaceted approach to assessment and treatment. Family members and care providers often arrive with high expectations of advanced treatment (especially intravenous therapy) when oral rehydration with teaching and close follow-up is often the best care for the child.

Table One:
Classifying degrees of dehydration

Assessment	Mild	Moderate	Severe
H.R.	Normal	Increased	Rapid, Weak
R.R.	Normal	Increased	Increased, Grunty
B.P.	Normal	Normal/ Decreased	Hypotensive (late sign)
Cap. Refill	Normal	2 - 3 seconds	> 3 seconds
Mental Status	Alert, restless	Irritable	Lethargy, Stupor
Skin turgor	Normal	Doughy	Tenting
Mucous Memb.	Slightly Sticky	Dry	Parched
Tears	Present	Decreased	None
Eyes	Normal	Darkened, Soft	Sunken
Fontanelle	Normal	Sunken	Concave
U/O	Decreased	Oliguria	Anuria

The evaluation of the child with symptoms of acute gastroenteritis begins with the assessment of dehydration. According to the Canadian Paediatric ED Triage and Acuity Scale (PaedCTAS) guidelines, vomiting and diarrhea in children may be assessed as low as CTAS #5 for vomiting and diarrhea with no dehydration, to CTAS #2 for abdominal pain with vomiting and diarrhea and abnormal vital signs. Risk of dehydration is related to age. Young infants are more prone to dehydration due to increased body surface to mass ratio, increased metabolism, increased insensible losses and comparatively smaller circulatory volume. Acute vomiting and diarrhea in a child greater than two years old is CTAS #4 whereas acute vomiting and diarrhea in a child less than two years old is CTAS #3.

Clinical criteria for the assessment of dehydration have been examined in various studies. Signs and symptoms such as increased heart rate, decreased urine output, lethargy, absence of tears, sunken eyes, and dry mucous membranes can help the nurse to evaluate the degree of dehydration (mild, moderate, severe). These conventionally used clinical criteria for evaluating dehydration have been codified by the American Academy of Pediatrics and by the World Health Organization. However, there are major inconsistencies between sources, the criteria have not been validated, and their usefulness has been called into question. One research study that looked at the validity and reliability of various clinical findings found that the following four findings were independently associated with dehydration: general ill appearance, prolonged capillary refill (>2 sec), dry mucous membranes and reduced tears. The combination of all four signs suggests severe dehydration.

In the assessment and reassessment of dehydration, the nurse must look for a combination of signs and symptoms. Table One is one example of a tool used to classify the degree of dehydration.

The majority of children with mild and moderate dehydration do not need laboratory studies. These studies are not accurate in determining the degree of dehydration and should only be used as an adjunctive tool with a comprehensive clinical evaluation in assessing moderate or severe dehydration. Electrolytes, BUN, creatinine, and glucose, including a chemstrip, should be obtained in any child with severe or moderate dehydration requiring intravenous (IV) rehydration. A chemstrip is always necessary for any seriously ill or injured child.

Oral rehydration solution (ORS) is the preferred treatment for children with mild to moderate dehydration with or without vomiting. Most of the children who have vomiting can be treated with ORS. Studies have demonstrated that small amounts of ORS can be tolerated by most children. To deliver 60 to 90 mL of ORS every hour, start with 15 mL every 10 to 15 minutes. If the child cannot tolerate 15 mL, then try 10 mL every 10 minutes or 5 mL every five minutes. If more than 60 to 90 mL per hour is required, ORS therapy can be initiated with 5 mL every one to two minutes. Although this technique is labour intensive, it can be done by a parent/caregiver and will deliver 100 to 150 mL/hour. The child and parent/caregiver can choose whether to take the solution with a spoon, small medicine cup, or syringe, whichever method works the best for them. With a positive attitude, good teaching and encouragement from the emergency department nurse, these parents can be successful and will have the tools to treat the next episode of diarrhea and/or vomiting. The ORS should be an electrolyte solution designed for rehydration. Some children do not like the salty taste of unflavoured electrolyte solution. Therefore, parents and clinicians have been adding juices to flavour the electrolyte solution. A recent study demonstrated that the electrolyte to juice ratio should be 4:1 in order to maintain an appropriate electrolyte balance. Frozen electrolyte ice pops are another option. Sport drinks are not recommended as they do not contain the appropriate proportions of electrolytes.

Children who require rehydration should be fed an age-appropriate diet as soon as they have been rehydrated. Children who have diarrhea and are not dehydrated should continue to be fed an age-appropriate diet. Breast feeding should be continued throughout the rehydration. It has been found that the intestine heals more quickly with the proper nutrients found in a well-balanced diet. Controlled clinical trials showed that certain foods, including complex carbohydrates (rice, potatoes, bread, and cereals), lean meat, yogurt, fruits and vegetables are better tolerated. Fatty foods or food high in simple sugars should be avoided (including tea, juices and soft drinks). The classic BRAT diet (Bananas, Rice, Applesauce, and Toast) can be tolerated, but is low in energy density, protein and fat.

The IV route should only be used to treat severe dehydration or any moderately dehydrated child who has persistent vomiting or who does not tolerate a committed attempt at oral rehydration. It may also be indicated for certain clinical conditions such as extreme fatigue, ileus or gastrointestinal distention. An IV bolus of warmed normal saline, 20 ml/kg, followed by two to four hours of maintenance fluids, and a re-attempt of ORS should be done. Few studies have been published on the outcome of children treated with this modality. In these studies, all patients demonstrated clinical improvement, and most of them tolerated oral therapy once the rapid rehydration was completed. It seems that rapid IV rehydration may "break" the vomiting cycle more quickly than oral rehydration, but more studies are needed to investigate the safety and effectiveness of this treatment versus oral rehydration.

When approaching rehydration in children, consider the number of IV attempts needed, the pain involved and the psychological impact of IV initiation versus oral rehydration. By establishing a routine of oral rehydration, we can teach parents/caregivers that a "quick fix" is not always the best answer. Nurses need to take this opportunity to teach by example. An order is not required to start oral rehydration therapy and, many times, the child can be well on the road to recovery prior to the physician assessing the patient. If we, as emergency department nurses, dedicate ourselves to teach and role model proper oral rehydration methods to parents/caregivers, many more children can be treated at home and help ease the overcrowding in our emergency departments today.

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Table Two: Oral rehydration schedules

Note: wait for 15 to 30 minutes after the child vomits before starting the PO challenge

100 to 150 mL an hour schedule (use this schedule if the child is still vomiting)	1. The first 10 minutes – 5 mL (1 teaspoon) every one to two minutes 2. The next 20 minutes – 10 mL every five minutes 3. The next 30 minutes - 20 mL every 10 to 15 minutes
60 to 90 mL per hour schedule	15 mL every 10 to 15 minutes

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Outlook

Trauma corner

Head injury: The importance of trending and reporting assessments

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An all-too-familiar scenario presents to the emergency department (ED) at 0200 involving alcohol and trauma. This time, it is a 48-year-old male who sustained an unwitnessed fall down eight stairs. He was found by family members who promptly called EMS. At the scene, EMS found the patient lying with a pool of blood around his head. Their initial neurological assessment revealed a Glasgow Coma Score (GCS) of three with unequal and sluggish pupils (Rt pupil = 2, Lt pupil = 6). EMS performed a Rapid Sequence Intubation using Rocuronium and Fetanyl. Due to the patient's focal neurological findings, a 20-gram dose of Mannitol 20% solution was administered.

Emergency department care

On arrival to the ED, this patient's GCS remained at three. Initial physical assessment findings included bilateral hemotympanium. He was promptly taken for a CT of the head which showed a right subdural hematoma, a right basal skull fracture and a left depressed skull fracture. On return to the ED, sedation was wearing off and the patient was found to be spontaneously moving all extremities. Basic trauma care of an orogastric tube, urinary catheter and chest x-ray were completed. Plain extremity films revealed a fractured left radius. The plan of care included a return to the radiology department for CT scans of the neck, chest, abdomen and pelvis.

Assessment findings while awaiting a return to CT scan showed a trend of hypertension and bradycardia, which are classic findings in Cushing's response.

The patient's blood pressure increased from 122/76 to 146/86 and on to 154/90 over an hour. His corresponding low heart rate of 46/minute was cause for concern.

The patient was rushed back to radiology for a repeat CT of the head, which revealed a left epidural hematoma. Initial lab results included a hemoglobin of only 115 g/L (normal range