
Acute Gastroenteritis in Misurata Teaching Hospital

Anwar T. Elgasseir,*

Abstract:

Objectives: To determine the incidence of hospital admission for acute gastroenteritis (AGE) in children below 5 year and to identify factors, that probably, reduce the hospital admission in these cases.

Patients and Methods: Descriptive study (Longitudinal hospital based study) during the period of one year in Paediatric Department, Misurata teaching hospital. All hospital admissions, of children under the age of five and older than two month, with clinical symptoms of acute gastroenteritis were included in the study. Before entry to study, clinical assessment of degree of dehydration was performed. Dehydration severity was categorized and treated according to the level of dehydration either mild, moderate, or severe dehydration. The main outcome measures are percent body weight gain at rehydration and at resolution of illness.

Results: Based on the results of this study, AGE was estimated at a rate of 11.6% from the total hospital admission (1092) in children below 5 years. 49 patients (38%), 58 patient (46%), and 20 patient (16%) were diagnosed clinically as mild, moderate, and severe dehydration respectively (84% mild-moderate dehydration). In our unit 96 patient (76%) were managed by intravenous fluid. 28 patient (85% from oral rehydration solution [ORS] treatment group) responded to ORS treatment and were discharged without intravenous fluid.

Conclusion: It is very clear from our results that ORS can be very effective if appropriately used to patients with mild and moderate dehydration. ORS administered in the observation room or at home with close follow-up will effectively reduce hospital admission.

Key Words: Acute gastroenteritis; ORS observation room; reduce hospital admission.

Introduction:

Acute gastroenteritis (AGE) is inflammation of the mucous membranes of the gastrointestinal tract, and is characterised by vomiting and/or diarrhoea. The most common causes are viruses, but bacterial and protozoal AGE occurs, particularly in developing countries. Vomiting and diarrhoea can be non-specific symptoms in children, and the diagnosis of viral gastroenteritis should be made after careful exclusion of other causes.

Acute diarrhoea is defined as the abrupt onset of increased fluid content of stool above the normal value of 10 mL/kg/day.¹ In practical terms it is associated with increased frequency and fluid consistency of stools and characterized by the passage of loose or watery stools (≥ 3 loose or watery stools/day) that lasts less than 2 weeks.² Dehydration and electrolyte losses associated with untreated diarrhea cause the primary morbidity of AGE.

Infants with acute diarrhea are more prone to dehydration than are older children, because they have a higher body surface-to-volume ratio, a higher metabolic rate, relatively smaller fluid reserves, and they are dependent on others for fluid.

A United Kingdom study estimated that an average of 10 100 new episodes of infectious intestinal disease in children aged less than 5 years of age are seen in general practice each week.³ In the United States there are 1–2 episodes of acute diarrhoea per child below 5 years of age annually, with 220 000 hospital admissions (approximately 10% of all admissions for children in this age range) and 325–425 deaths per year.^{4,5}

Estimation of incidence of hospital admission for AGE in young children is essential. Such estimates are important in assessing preventive measures, and in evaluating the cost-effectiveness of hospital management of AGE compared to home management. Oral rehydration solution (ORS) seems to be here to stay. Abundant literature supports its advantages over intravenous (IV) therapy in otherwise healthy children.

This study provides information that will assist the health care provider in making an accurate assessment and develop a rational and cost-effective strategy and policy for management of children with AGE.

*) Department of Paediatric, Misurata Teaching Hospital, Misurata-Libya.

Objectives

To determine the incidence of hospital admission for AGE in children below 5 year and to identify factors and provide essential data, that probably, help to reduce the hospital admission due to AGE.

Patients and Methods:

Design: Descriptive study (Longitudinal hospital based study) in the Paediatric Department, Misurata teaching hospital, from March 2007-February 2008.

Study Sample: All hospital admissions, of children under the age of five and older than two months who presented to paediatric department with clinical symptoms of acute gastroenteritis were included in the study. Prospectively collected data on AGE admitted cases include; history, clinical examination (with degree of dehydration), investigations, and treatment (Details of relevant clinical information, investigation, and treatment were recorded on a data collecting form). Data from 150 subjects were expected to be available for analysis (140 subjects are estimated, with precision of ± 5 % using a 95 % confidence interval). The sample size was increased to allow for possible loss.

Participants - inclusion criteria

Eligible children presented with history of acute diarrhea (≥3 watery stools per day for no more than seven days).

Participants - exclusion criteria

- Children those with frank protein-energy malnutrition.
- Clinical signs of a coexisting acute systemic illness (e.g. meningitis, sepsis).
- Immunodeficiency.
- Underlying severe chronic diseases.
- Food allergy or other chronic gastrointestinal diseases
- Poor compliance

In our study the following **definitions were adapted:**

Before entry into study, clinical assessment of degree of dehydration was performed. Dehydration severity was categorized using criteria and divided patients into subgroups for mild (3%--5% fluid deficit), moderate (6%--9% fluid deficit), or severe (≥10% fluid deficit, shock, or near shock) dehydration.⁶

Interventions:

Children aged 2 to 60 months, who presented with signs and symptoms of, acute dehydration caused by vomiting and/or diarrhea, presumed to be caused by gastroenteritis, were enrolled

and rehydrated and treated according to the level of dehydration either orally with ORS (WHO standard ORS) or with intravenous fluid or with both. Maintenance therapy was given according to the age and general condition of the child. All participants were weighed pre-treatment and post-treatment and underwent initial and final measurements (if relevant) of their serum electrolytes, blood urea, CBC, and glucose levels, along with urine analysis. Other investigations were requested according to patient condition.

Primary outcome measure(s): Diarrhoea duration defined as the time in hours from the first to the last abnormal (loose or liquid) stools preceding a normal stool output.

The main outcome measure were percent body weight gain at rehydration and at resolution of illness (**weight at resolution of diarrhea – admission weight ÷ weight at resolution of diarrhea**).

It was recommended that for children receiving care in a hospital setting, prompt discharge be considered when the following levels of recovery were reached:

- Sufficient rehydration achieved as indicated by weight gain and/or clinical status.
- IV fluids not required.
- Adequate family teaching had occurred.
- Medical follow up was available via clinic visit.

Results:

Based on the results of this study, AGE estimated at rate of 11.6% from the total hospital admission (1092 patients annually) in children below 5 years. The majority of children of AGE admitted were younger than 2 year (87%). Duration of diarrhea (prior to admission) was ≤ 3 days in 77 patients (61%) where length of stay was also considerably longer than 48 hours in 43% of admitted cases (Table 1).

Table 1: Duration of Hospital Admission in Children with AGE

Duration of Admission (Hours)	No.	%
<24 hr	31	24
24-<48 hr	41	32
48-72 hr	24	19
>72 hr	31	24

Categorization of dehydration based on clinical examination showed; 49 patients (38%), 58 patient (46%), and 20 patient (16%) were diagnosed clinically as mild, moderate, and severe dehydration respectively (84% mild-moderate dehydration) and based on percent body weight gain (PBWG) show 79 patients; 34 patient (27%) their percent of dehydration were 3%-5% and 45 patient (35%) their percent of dehydration were <3%, are admitted to hospital.

Regarding type of dehydration, 101 patients (80%) of cases of AGE were Isonatremic dehydration, where 15% was secondary to hyponatremic dehydration (Figure 1). In isonatremic dehydration 60 patients (72%) were less than 1 year and just 30% of them had

used ORS at home prior to admission. In hyponatremic patient (Figure 2), 79% were less than 1 year and 73% of them had used ORS at home prior to admission. Total patient used ORS at home (prior to admission) were 56 patients (44% from the total cases of AGE). In our unit 96 patients (76%) were managed by intravenous fluid (deficit and maintenance) and ORS used as ongoing loss. ORS used as the initial treatment (as deficit and ongoing loss) in 33 patient (26%). 5 patients (15% from ORS treatment group) failed to respond to ORS treatment and were shifted to intravenous treatment. 28 patient (85% from ORS treatment group) respond to ORS treatment and were discharged without intravenous fluid (Table 2).

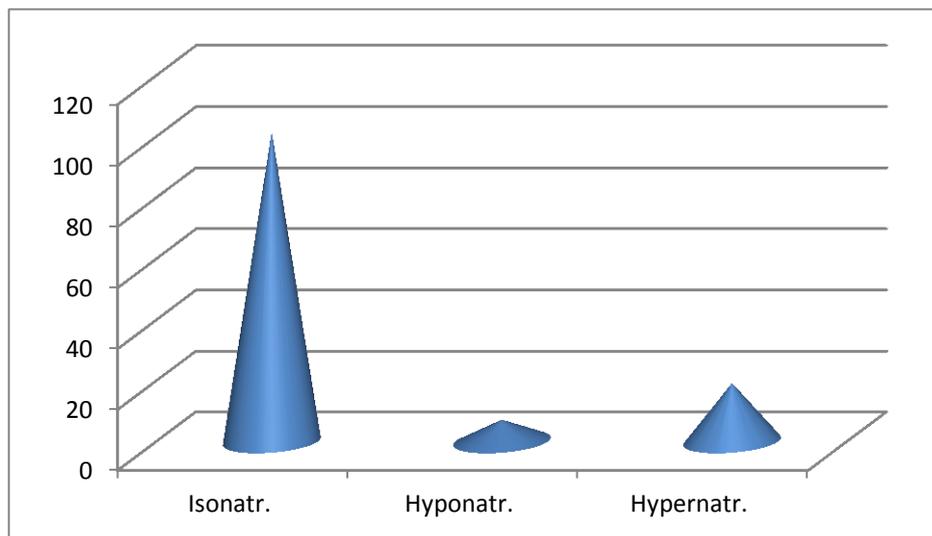


Figure 1: Types of dehydration in Children with AGE.

Table 2: Response to ORS Treatment.

ORS used as the initial treatment in 33 patients (26%)	
Respond to ORS treatment	Failed to respond to ORS treatment
28 patients (85% from ORS treatment group)	5 patients (15% from ORS treatment group)

Discussion:

The annual rate of hospitalisation related to gastroenteritis in children under five is about 11.6% and majority of cases of AGE are among children below two years.

In developed countries, there are 220 000 hospital admissions below 5 years of age annually, and with approximately 10% of all admissions for children in this age range attributed to AGE. Most hospitalizations and

deaths due to diarrhea occur in the first year of life.^{4,5}

In our department, fluid replacement given to dehydrated children are according to degree of dehydration which assessed by clinical examination. If dehydration is correctly assessed, appropriate fluid replacement is the mainstay of management and most infants and children can be rehydrated safely

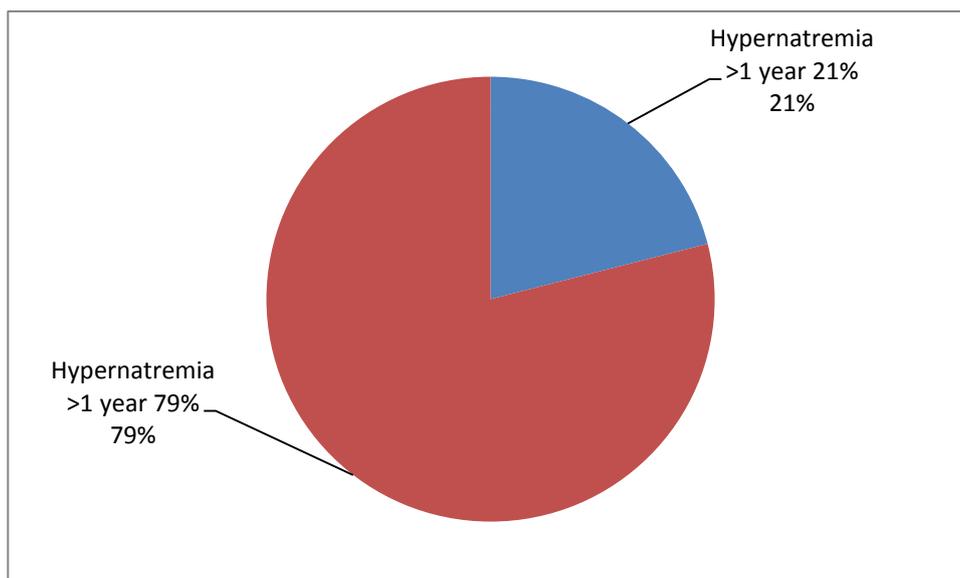


Figure 2: Rate of Hypernatremic Dehydration in Children with AGE.

Based on clinical examination; 49 patients (38%) and 58 patient (46%) were diagnosed clinically as mild and moderate dehydration respectively. These, indicate that, significant number of mild and moderate dehydration (84%), diagnosed on the basis of clinical signs, are admitted in our hospital and could result in substantial cost to the healthcare system especially in our resource-deficient hospital.

Several studies have shown that admission rates can vary widely between institutions. One study noted up to an 18-fold difference in admission rates for children with gastroenteritis when comparing the admission practices of emergency departments. The authors were unable to explain these differences on the basis of objective analysis of the various populations.⁷ Perrin JM et al. compare variations in rates of hospitalization of children in three urban communities. They noted an unexplainable 2-to 3-fold difference in admission rate for gastroenteritis.⁸ In my opinion, any study that uses an outcome that depends on a multitude of interrelated factors (e.g. admission rate) may be difficult to generalize or compare it to other populations and different hospital setting.

Despite, the majority of cases of AGE admitted to our department were mild to moderate dehydration where ORS is indicated, in our study 99 patients (78%) were managed by IV fluid, included patients who failed to respond to ORS treatment and shifted to IV treatment and patients who exclusively treated by IV fluid.

Our results show the frequent use of IV fluid to admitted cases of AGE, compared to the use of ORS, if we consider the majority of admitted cases were mild to moderate dehydration (84% from the total admitted cases) where ORS was indicated.

As indicated in different literatures that ORS is suitable for use among children throughout the world,⁹ ORS is still not widely accepted by quite numbers of paediatrician and General practitioners in different countries. In the United States, where children with all forms of dehydration are treated with IV fluids rather than ORS,¹⁰⁻¹⁵ and approximately 30% of practicing paediatricians withhold ORS for children with vomiting or moderate dehydration.¹⁶

Use of ORS, seems self-evident, one national survey of physicians in emergency care facilities indicated that many would treat mild dehydration with IV therapy, and half would always or routinely use IV therapy for a moderately dehydrated child aged <2 years.¹⁷

In our study we found WHO standard ORS used as the initial treatment (as deficit and ongoing loss) in just 33 patients (26%) where successful results after treatment of ORS where seen in majority of cases. 28 patient (85% from ORS treatment group) were responded to ORS treatment and discharged without IV fluid, and just 5 patient (15% from ORS treatment group) failed to respond to ORS treatment and were shifted to IV treatment. It is very clear from our

result that, ORS can be very effective if appropriately used to dehydrated children.

Substantial *in vitro* and *in vivo* data support the role of continued nutrition and oral rehydration in improving gastrointestinal function, biochemical, and clinical outcomes.¹⁸⁻¹⁹

Duggan C et al. found that early administration of ORS for acute diarrhea leads to fewer office clinic, and emergency department (ED) visits,²⁰ and to potentially fewer hospitalizations and deaths. Early ORS will probably encourage earlier resumption of feeding, and data indicate that resolution of acidosis might be more rapid with ORS than with IV fluid.²¹

In one systematic review, IV and ORS were compared in children with mild to moderate dehydration. No significant differences were found between IV and oral therapy with regard to duration of diarrhoea, time spent in hospital and weight at discharge from hospital.²² A more recent systematic study by Fonseca BK et al, review of 16 randomised controlled trials (RCTs) (1545 children with AGE) confirmed these findings.²³

Based on our study, length of stay was also considerably longer than 48 hours in 43% of admitted cases. Average length of stay in this study (2.3 days) was substantially shorter than that reported in other studies (3.9 days).²⁴ Higher admission rates in our department with shorter length of stay may reflect a less severe spectrum of illness.

Better management involving more widespread use of oral rehydration solution, can reduce admission, length of stay in hospital and can be cost-effective. Evidence-based clinical care guideline for AGE, in children aged 2 months to 5 years in Cincinnati Children's Hospital Medical Center, recommended that those patients who are treated in the hospital setting and who are eligible for the AGE guideline be placed as short stay patients with a discharge goal of 23 hours or less.²⁵

Our results imply that 127 hospital admissions occur annually attributed to AGE. Based on a standard estimate of \$1244 per admission of AGE cases, seen in other hospital,²⁶ the direct cost of this hospital care is very high compared to our resources. Australian Royal Alexandra Hospital for Children, estimated mean total cost per episode of rotavirus gastroenteritis was \$1744 for children admitted to hospital and \$441 for children not admitted.²⁷

Many non-dehydrated or mildly dehydrated children based on PBWG; 79 patient, (34 patient [27% from the total admitted cases], their percent of dehydration were 3%-5%, and

45 patient [35% from the total admitted cases], their percent of dehydration were <3%), were admitted to hospital, and received unnecessary IV fluids and investigations. These patients can be treated as outpatient with close follow-up or rehydration in observation room with ORS given by the mother, without investigation or IV fluid. This policy reduces hospital admission to AGE cases and result in substantial savings to our healthcare system. Furthermore a recent systematic review, support our results and suggested that supplementary laboratory tests, including serum electrolytes, to assess patients with acute diarrhea usually are unnecessary and often unhelpful and non-specific.²⁸

Atherly-John YC, in a randomized trial of ORS versus IV rehydration for dehydrated children in a paediatric emergency department, demonstrated shorter stays in emergency department (as observation), improved parental satisfaction with oral rehydration.²⁹

In my experience, with regard to therapy of dehydration with ORS in observation room, when indicated, are clinically sound, but at the same time not widely practiced by many hospitals. Most of our staff physicians treat dehydrated children with intravenous fluid replacement to provide full replacement of fluid and electrolyte deficits and to meet maintenance needs. Furthermore the patient is hydrated over few hours, generally while the intestine is put to "rest" by allowing nothing to eat or drink. The reasons for this practice are probably due to the demands of the public for expected forms of therapy, which are technologically advanced and produce quick results. Most of us have used this approach (IV fluid replacement) and found it to be highly successful and satisfactory. The question we need to answer, why should we change our practice?

The experience with oral rehydration solutions is compelling. Over 85% of dehydrated children in our study can be successfully rehydrated with intensive use of glucose-electrolyte solutions (WHO standard ORS) without the need to place an IV fluid. The argument made in favour of this therapy, it is less expensive and has fewer complications. This type of therapy can be administered in the patient's home if the child is only mildly dehydrated or can be given in the observational room for children with mild and moderate dehydration. Although the oral rehydration solutions commonly used in this country are the

standard WHO formulas, they appear to be adequate for treatment.

Conclusion and Recommendations:

AGE is a major cause of hospital admissions in young children, and large savings to the healthcare system are possible if it can be prevented. The goal of the clinical assessment is to provide a starting point for treatment and to conservatively determine which patients can safely be sent home for therapy, which ones should remain for observation during therapy, and which ones should immediately receive more intensive therapy. Children need to be assessed carefully for signs of dehydration. Children without dehydration can be managed safely with ORS at home and should be offered their normal fluids and ORS to the ongoing loss. Children with severe rehydration require hospital admission and we recommend those with lesser degrees of dehydration to be observed in the paediatric observation room, ORS Room, (ORS Observation Room) for 4-6 hours where treatment are given by mothers, and early review to ensure rehydration is occurring appropriately, to confirm that their

oral intake is adequate and to determine the need for IV fluids and/or admission if ORS refusal, or inadequate ORS intake e.g. worsening diarrhea or dehydration despite adequate volumes. Child once rehydrated, he could complete his treatment at home with close follow-up appointment. ORS administered in the observation room are probably safe, efficacious, and cost-effective alternatives to the hospital admission and is standard treatment for uncomplicated, acute mild to moderate dehydration in young children.

We could presumably save a significant amount of health care resources by using this approach, and I believe that, the working physicians working in our hospital may consider adopting this system. There is a need for clinical trials to compare the relative risks and benefits of home-based and hospital-based management of children with mild dehydration. In my opinion, guidelines with simple management tools for assessing patients and accurately monitoring cases of AGE, at the national level are required.

References:

1. Guandalini S. Acute diarrhoea. Paediatric gastrointestinal disease 2004; 4: 166–79.
2. World Health Organization. The treatment of diarrhoea: a manual for physicians and other senior health workers. Geneva, Switzerland: World Health Organization, 1995.
3. Djuretic T, Ramsey M, Gay N, et al. An estimate of the proportion of diarrhoeal disease episodes seen by general practitioners attributable to rotavirus in children under 5 years of age in England and Wales. *Acta Paediatr* 1999; 88: 38–41.
4. Glass R, Lew J, Gangarosa RE, et al. Estimates of morbidity and mortality rates for diarrheal diseases in American children. *J Pediatr* 1991; 118: 27-33.
5. Herikstad H, Yang S, Van Gilder TJ, et al. A population-based estimate of the burden of diarrhoeal illness in the United States. *Epidemiol Infect* 2002; 129: 9–17.
6. Practice parameter: the management of acute gastroenteritis in young children. American Academy of Pediatrics, Provisional Committee on Quality Improvement, Subcommittee on Acute Gastroenteritis. *Pediatrics* 1996; 97: 424-435.
7. Connell FA, Day RW, LoGerfo JP, et al. Hospitalization of Medicaid children: analysis of small area variations in admission rates. *Am J Public Health*.1981; 71 :606 –613.
8. Perrin JM, Homer CJ, Berwick DM, et al. Variations in rates of hospitalization of children in three urban communities. *N Engl J Med*.1989; 320 :1183 –1187.
9. Santosham M. Oral rehydration therapy: reverse transfer of technology. *Arch Pediatr Adolesc Med* 2002; 156: 1177-9.
10. Anidi I, Bazargan M, James FW. Knowledge and management of diarrhea among underserved minority parents/caregivers. *Ambul Pediatr* 2002; 2: 201-6.
11. Hirschhorn N, Greenough WB. Progress in oral rehydration therapy. *Sci Am* 1991; 264: 50-6.
12. Merrick N, Davidson B, Fox S. Treatment of acute gastroenteritis: too much and too little care. *Clin Pediatr* 1996; 35: 429-35.
13. Ozuah PO, Avner JR, Stein RE. Oral rehydration, emergency physicians, and practice parameters: a national survey. *Pediatrics* 2002; 109: 259-61.
14. Perlstein PH, Lichtenstein P, Cohen MB, et al. Implementing an evidence-based acute gastroenteritis guideline at a children's hospital. *Jt Comm J Qual Improv* 2002; 28: 20-30.

15. Use and misuse of oral therapy for diarrhea: comparison of US practices with American Academy of Pediatrics recommendations. *Pediatrics* 1991; 87: 28-33.
16. Reis EC, Goepf JG, Katz S, et al. Barriers to use of oral rehydration therapy. *Pediatrics* 1994; 93: 708-11.
17. Stein RE. Oral rehydration, emergency physicians, and practice parameters: a national survey. *Pediatrics* 2002; 109: 259-61.
18. Duggan C, Nurko S. "Feeding the gut": the scientific basis for continued enteral nutrition during acute diarrhea. *J Pediatr* 1997; 131: 801-8.
19. Sandhu BK; European Society of Paediatric Gastroenterology, Hepatology, and Nutrition Working Group on Acute Diarrhoea. Rationale for early feeding in childhood gastroenteritis. *J Pediatr Gastroenterol Nutr* 2001; 33: 13-6.
20. Duggan C, Lasche J, McCarty M, et al. Oral rehydration solution for acute diarrhea prevents subsequent unscheduled follow-up visits. *Pediatrics* 1999; 50: 104-129.
21. Nager AL, Wang VJ. Comparison of nasogastric and intravenous methods of rehydration in pediatric patients with acute dehydration. *Pediatrics* 2002; 109: 566-72.
22. Gavin N, Merrick N, Davidson B. Efficacy of glucose-based oral rehydration therapy. *Pediatrics* 1996; 98: 45-51.
23. Fonseca BK, Holdgate A, Craig JC. Enteral vs intravenous rehydration therapy for children with gastroenteritis: a meta-analysis of randomized controlled trials. *Arch Pediatr Adolesc Med* 2004; 158: 483-490.
24. Jin S, Kilgore PE, Holman RC, et al. Trends in hospitalizations for diarrhea in United States children from 1979 through 1992: estimates of the morbidity associated with rotavirus. *Pediatr Infect Dis J* 1996; 15: 397-404.
25. Cincinnati Children's Hospital Medical Center. Evidence-based clinical care guideline for acute gastroenteritis (AGE) in children aged 2 months through 5 years. Cincinnati (OH): Cincinnati Children's Hospital Medical Center; May 2006.
26. Australian casemix report: on hospital activity, 1995-96. Canberra: Department of Health and Family Services, 1997.
27. Liddle JL, Burgess MA, Gilbert GL, et al. Rotavirus gastroenteritis: impact on young children, their families and the health care system. *Med J Aust.* 1997; 167: 304-7.
28. Steiner MJ, DeWalt DA, Byerley JS. Is this child dehydrated? *JAMA* 2004; 291: 2746-2754.
29. Atherly-John YC, Cunningham SJ, Crain EF. A randomized trial of oral vs intravenous rehydration in a pediatric emergency department. *Arch Pediatr Adolesc Med* 2002; 156: 1240-3.