An evidence and consensus based guideline for acute diarrhoea management

K Armon, T Stephenson, R MacFaul, P Eccleston, U Werneke

Abstract

Objective—To develop an evidence and consensus based guideline for the management of the child who presents to hospital with diarrhoea (with or without vomiting), a common problem representing 16% of all paediatric medical attenders at an accident and emergency department. Clinical assessment, investigations (biochemistry and stool culture in particular), admission, and treatment are addressed. The guideline aims to aid junior doctors in recognising children who need admission for observation and treatment and those who may safely go home.

Evidence—A systematic review of the literature was performed. Selected articles were appraised, graded, and synthesised qualitatively. Statements on recommendation were generated.

Consensus—An anonymous, postal Delphi consensus process was used. A panel of 39 selected medical and nursing staff were asked to grade their agreement with the generated statements. They were then sent the papers, appraisals, and literature review. On the second and third rounds they were asked to re-grade their agreement in the light of other panelists’ responses. Consensus was predefined as 83% of panelists agreeing with the statement.

Recommendations—Clinical signs useful in assessment of level of dehydration were agreed. Admission to a paediatric facility is advised for children who show signs of dehydration. For those with mild to moderate dehydration, estimated deficit is replaced over four hours with oral rehydration solution (glucose based, 200–250 mOsm/l) given “little and often”. A nasogastric tube should be used if fluid is refused and normal feeds started following rehydration. Children at high risk of dehydration should be observed to ensure that maintenance fluid is tolerated. Management of more severe dehydration is detailed. Antidiarrhoeal medication is not indicated.

Validation—The guideline has been successfully implemented and evaluated in a paediatric accident and emergency department.

Scope of the guideline

The guideline deals with children who have diarrhoea, with or without vomiting, rather than with a defined diagnosis, as the guideline should assist clinicians in diagnosis prior to management of a particular condition. Children presenting with vomiting alone or with chronic diarrhoea (more than seven days duration) are not considered. We present a summary version of the full guideline (which can be obtained from the corresponding author, or the Archives of Disease in Childhood website, www.archdischild.com) to which reference should be made for clarification or further information. The authors assume that health care professionals will use general medical knowledge and clinical judgement in applying the recommendations in this document to the management of individual patients. These recommendations may not be appropriate for use in all circumstances.
Method of development
Recommendations made are based on statements derived from a systematic review of published literature and refined by a three-round Delphi consensus development process. The literature search used the following databases: Medline (1966 to June 1998), Embase (1980 to June 1998), and Cochrane (to June 1998). The following mesh headings and text words were used: diarrhoea; diarrhea infantile; diarrhea to 14 years; gastroenteritis; differential diagnosis; diagnosis; incidence; prevalence; aetiology; electrolytes; dehydration; patient admission; fluid therapy; intravenous treatment; rehydration solution; administration; oral; enteral nutrition; faeces; lactose intolerance; enteral; differential diagnosis. General search terms for the type of study required were also used (for example, for diagnostic procedures, the search “sensitivity and specificity or predictive value of tests or diagnostic errors or screening or diagnosis or sensitivity or specificity” was used).

Explicit inclusion criteria were set: articles that addressed the clinical questions identified, a scientific review of the literature, and a review or clinical guideline written by a national body. Articles were excluded if opinion based. Included articles were appraised using a standard proforma, and recommendations were graded using a standard grading scheme (see Appendix). The derived statements, together with the original papers referred to and appraisals were sent to a Delphi panel consisting of 39 medical and nursing staff who regularly manage children with diarrhoea, with or without vomiting. The final guideline based on the literature review and predefined consensus agreement (agreement by at least 83% of panelists) is in the form of an algorithm (flow diagram or decision tree) shown in fig 1. Each box is numbered, and key decision points are allocated a letter, with recommendations explained in the text. Throughout, the word “admit” is defined as follows: any admission to a paediatric facility with paediatric trained staff for observation, further investigation, and management regardless of the expected length of stay.

The guideline
A: Differential diagnosis of child presenting with diarrhoea

Statement—There are no published data on the relative probabilities of possible diagnoses in the child presenting to hospital with diarrhoea.

A table of differential diagnoses (table 1) is shown derived from published texts (Vb, D) and consensus opinion, not intended to be comprehensive, but rather to act as an aide memoir to the clinician. (Based on Level Vb evidence and Delphi consensus, Grade D recommendation.)

It is essential that the clinician recognise any life threatening causes of diarrhoea, such as intussusception (Vb, D), surgical abdomen (Vb, D), and haemolytic uraemic syndrome (III, C). Features suggestive of these conditions are identified, and although these features may occur in acute gastroenteritis the likelihood of a different aetiology is increased and should be actively sought.

Recommendation on differential diagnosis
The following clinical features should alert the clinician to look for causes other than acute viral gastroenteritis for a child’s diarrhoea with or without vomiting:

- Abdominal pain with tenderness, with or without guarding (Vb, D)
- Pallor, jaundice, oligo/anuria, bloody diarrhoea (III, C)
- Systemically unwell, out of proportion to the level of dehydration (Vb, D)
- Shock (Vb, D)

Features are based on evidence levels shown and Delphi consensus agreement.

B: Estimation of severity of dehydration

The management of gastroenteritis consists of correction of dehydration (rehydration) and maintenance of hydration. An accurate estimate of the level of dehydration is required to achieve this end.

Statement—The severity of dehydration is most accurately assessed in terms of weight loss as a percentage of total body weight (prior to the dehydrating episode). This is the “gold standard” against which other “tests” are measured (I, A).

In a prospective cohort study of children between 3 and 18 months of age in Egypt, Duggan and colleagues (III) found that “prolonged skinfold”, dry oral mucosa, sunken eyes, and “altered neurological status” were the best clinical signs correlating with dehydration as determined by post-rehydration weight gain. In a similarly designed study, with children under 4 years old, Mackenzie and colleagues (III) found “decreased skin turgor”, decreased peripheral perfusion, and deep (acidotic) breathing to be the best clinical indicators of dehydration. A urea of >6.5 mmol/l on serum blood sample and pH<7.35 on blood gas were positive investigations associated with dehydration. However the sensitivity and specificity of all these signs were low.

In both studies mild to moderate dehydration on clinical assessment was found to represent weight loss of 3–5%. Those with severe signs (circulatory collapse) had weight loss of 9–10%. These studies correlate well with the WHO guidance on dehydration assessment (Vb, D).

Recommendation
See table 2 for estimating level of dehydration if weight loss not available. (Level III and Delphi consensus, Grade C recommendation.)

C: Blood tests

Statement—There is no direct evidence indicating when serum electrolytes should be measured in a child with diarrhoea.

The indication from cohorts of children in the UK with gastroenteritis is that derangement of electrolytes is rare (Vb, D) with 1% of admissions having hypernatraemia and no reports of hypokalaemia or hyponatraemia. Even when there is derangement of electrolytes in the
serum, this is a result of relative losses of salts and water. There will still be a total body depletion of sodium in hypernatraemic patients. Oral rehydration solution (ORS) with appropriate amounts of solutes and given in the correct quantity can correct electrolyte abnormalities. It is thus unnecessary to measure electrolytes in those children.
who will be rehydrated with ORS. All children having intravenous rehydration should have urea and electrolytes (U&E) measured, as hypernatraemia will alter the rate at which intravenous rehydration fluids are given and further measurements of U&E should be made as rehydration progresses. In addition the American Academy of Pediatrics (AAP) suggest in their practice parameter (Va, D) that electrolyte levels should be measured in moderately...
dehydrated children whose histories or physical findings are inconsistent with straightforward diarrhoeal episodes, and where a “doughy” feel to the skin may indicate hypernatraemia.

**Recommendation on blood tests**

The child who presents with diarrhoea, with or without vomiting, should have blood taken for urea/creatinine, electrolytes, and bicarbonate in the following circumstances:

- Severe dehydration with circulatory compromise
- Moderate dehydration where a “doughy” feel to the skin might indicate hypernatraemia
- Moderately dehydrated children whose histories or physical findings are inconsistent with straightforward diarrhoeal episodes.

(Based on Level V a evidence and Delphi consensus, Grade D recommendation.)

**D: MANAGEMENT OF REHYDRATION**

Following the evidence of several randomised controlled trials in the USA, Europe, and
Table 1  Broad differential diagnosis of the child presenting with acute diarrhoea (with or without vomiting). The latter diagnoses are more likely to present chronically.

<table>
<thead>
<tr>
<th>Category</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>Infections</td>
<td>Enteral: viral (commonest cause), bacterial, parasitic</td>
</tr>
<tr>
<td>Surgical</td>
<td>Non-enteral infections (urinary tract infection, pneumonia, otitis media)—vomiting predominates</td>
</tr>
<tr>
<td>Systemic illness</td>
<td>Endocrinopathy (diabetes, hyperthyroidism, congenital adrenal hyperplasia, Addison’s disease, hypoparathyroidism), immunodeficiency</td>
</tr>
<tr>
<td>Antibiotic associated</td>
<td>While taking antibiotics and rarely pseudomembranous colitis</td>
</tr>
<tr>
<td>Miscellaneous</td>
<td>Constipation with overflow, toxins, haemolytic-uraemic syndrome, toddler diarrhoea, child abuse</td>
</tr>
<tr>
<td>Dietary disturbance</td>
<td>Cystic fibrosis, coeliac disease</td>
</tr>
<tr>
<td>Malabsorption</td>
<td>Ulcerative colitis/Crohn’s disease, Hirschsprung’s enteroocolitis</td>
</tr>
<tr>
<td>Inflammatory</td>
<td>Irritable bowel syndrome</td>
</tr>
</tbody>
</table>

NB. The following features may be indicative of diagnoses other than acute viral gastroenteritis: abdominal pain with tenderness/guarding and/or bilious vomiting (surgical); pallor, jaundice, oliguria, bloody stool (haemolytic-uraemic syndrome); systemically unwell, out of proportion to the level of dehydration (other infections, surgical, congenital adrenal hyperplasia, etc); shock.

developing countries, it is acknowledged that ORS is quicker in the correction of dehydration and acidosis and safer than intravenous therapy. The overall failure rate of oral rehydration therapy (ORT, defined as the persistence or recurrence of signs of dehydration and other clinical indications requiring the need for intravenous rehydration) was 3.6% (95% confidence interval 1.4 to 5.8). Moreover the use of ORT appears to reduce the risk of seizure during correction of hypernatraemic dehydration to 0.08% (95% confidence interval 0.02 to 0.24). However the regimen was thought to be too labour intensive for the UK by the Delphi panelists and did not achieve consensus. (Definition of “whenever practically possible” - this implies that the child’s carer is willing and able to carry this out under supervision.)

Where the child’s carer is not willing and able to carry this out, or when it is required overnight, rehydrate by continuous nasogastric tube infusion (preferred) or intravenous infusion. (Level V and Delphi consensus, Grade D recommendation.)

Regularly assess success of rehydration (for example, two hourly). If no improvement in clinical signs of dehydration or worsening signs, consider nasogastric tube or intravenous infusion. (Level V and Delphi consensus, Grade D recommendation.)

Recommendation in mild–moderate dehydration

- Children who have mild–moderate dehydration secondary to acute gastroenteritis should have their deficit estimated (3–8%) and replaced with ORS (30–80 ml/kg) given “little and often” over 3–4 hours, whenever this is practically possible. (Level I and Delphi consensus, Grade A recommendation.) (An attempt was made to define “little and often” further. The literature discusses the correct administration of ORS and recommends that it be given in 5 ml aliquots every 1–2 minutes. Only if this is well tolerated with no vomiting may the size of the aliquots be increased, with decreasing frequency. However this regimen was thought to be too labour intensive for the UK by the Delphi panelists and did not achieve consensus.)

Recommendation on the composition of ORS

- ORS used for rehydration of children with acute gastroenteritis in the UK should contain: 60 mmol/l sodium, 20 mmol/l potassium, ≥25 mmol/l chloride, and 74–111 mmol/l glucose. (Commercial solutions conforming to this include Diorylate and Diocalm Junior.) (Level I and Delphi consensus, Grade A recommendation.)

F: COMPOSITION OF ORS

In the 1970s the WHO adopted a glucose–electrolyte solution that contained 90 mmol/l of sodium for the treatment of diarrhoea. Since then there have been many controlled trials looking at the ideal concentration of electrolytes and carbohydrate in ORS. A recent multicentre trial in four developing countries found that reduced osmolarity ORS (224 mmol/l) had advantages over standard ORS (311 mmol/l) in the treatment of non-cholera diarrhoea. In developed countries diarrhoea tends to be isotonic (mainly rotavirus induced) and the European Society of Paediatric Gastroenterology and Nutrition (ESP-GAN) published guidelines on the ideal composition of ORS for children of Europe. Since this publication, studies from Finland and a multicentre trial have confirmed that reduced osmolarity ORS is preferable in European children. See Table 8 for the composition of ORS recommended and those commercially available.

A recent meta-analysis of 13 clinical trials examining the effect of rice based ORS on total stool output and duration of diarrhoea showed that there appeared to be some benefit in those with cholera, but in those with non-cholera diarrhoea no benefit was shown.

Recommendation on the composition of ORS

- ORS used for rehydration of children with acute gastroenteritis in the UK should contain: 60 mmol/l sodium, 20 mmol/l potassium, ≥25 mmol/l chloride, and 74–111 mmol/l glucose. (Commercial solutions conforming to this include Diorylate and Diocalm Junior.) (Level I and Delphi consensus, Grade A recommendation.)

F: MAINTENANCE OF HYDRATION/PREVENTION OF DEHYDRATION

The child who was not dehydrated and the child who is no longer dehydrated following rehydration should be allowed free fluids, and be encouraged to drink more than usual.
Table 1. Assessment of severity of dehydration (if in doubt err by overestimating % dehydration)∗∗

<table>
<thead>
<tr>
<th>No dehydration (less than 5% weight loss)</th>
<th>Mild-moderate dehydration (3–8% weight loss)</th>
<th>Severe dehydration (&gt;8% weight loss)</th>
</tr>
</thead>
<tbody>
<tr>
<td>No signs</td>
<td>Dry mucus membranes (be wary in the mouth breather)</td>
<td>Increasingly marked signs from the mild-moderate group plus:</td>
</tr>
<tr>
<td></td>
<td>Sunken eyes (and minimal or no tears)</td>
<td>Decreased peripheral perfusion (cool/mottled/pale peripheries; capillary refill time &gt;2 sec)</td>
</tr>
<tr>
<td></td>
<td>Diminished skin turgor (pinch test 1–2 sec)</td>
<td>Circulatory collapse</td>
</tr>
<tr>
<td></td>
<td>Altered neurological status (drowsiness, irritability)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Deep (acidotic) breathing</td>
<td></td>
</tr>
</tbody>
</table>

Practical points:
- Children who are dehydrated are thirsty and do not normally refuse ORS.
- Pinch test: Pinch skin of abdomen. Skin recoils instantly = normal, 1–2 sec = mild–moderate, >2 sec = severe.
- Signs are ordered in each column by severity.
- If a pre-illness accurate weight is available, calculate deficit from weight loss.
- Pinch test: Pinch skin of abdomen. Skin recoils instantly = normal, 1–2 sec = mild–moderate, >2 sec = severe.
- Signs are ordered in each column by severity.
- If a pre-illness accurate weight is available, calculate deficit from weight loss.
- Pinch test: Pinch skin of abdomen. Skin recoils instantly = normal, 1–2 sec = mild–moderate, >2 sec = severe.
- Signs are ordered in each column by severity.
- If a pre-illness accurate weight is available, calculate deficit from weight loss.
- Pinch test: Pinch skin of abdomen. Skin recoils instantly = normal, 1–2 sec = mild–moderate, >2 sec = severe.
- Signs are ordered in each column by severity.
- If a pre-illness accurate weight is available, calculate deficit from weight loss.
- Pinch test: Pinch skin of abdomen. Skin recoils instantly = normal, 1–2 sec = mild–moderate, >2 sec = severe.
- Signs are ordered in each column by severity.
- If a pre-illness accurate weight is available, calculate deficit from weight loss.
- Pinch test: Pinch skin of abdomen. Skin recoils instantly = normal, 1–2 sec = mild–moderate, >2 sec = severe.
- Signs are ordered in each column by severity.
- If a pre-illness accurate weight is available, calculate deficit from weight loss.
- Pinch test: Pinch skin of abdomen. Skin recoils instantly = normal, 1–2 sec = mild–moderate, >2 sec = severe.
- Signs are ordered in each column by severity.
- If a pre-illness accurate weight is available, calculate deficit from weight loss.
- Pinch test: Pinch skin of abdomen. Skin recoils instantly = normal, 1–2 sec = mild–moderate, >2 sec = severe.
- Signs are ordered in each column by severity.
- If a pre-illness accurate weight is available, calculate deficit from weight loss.
- Pinch test: Pinch skin of abdomen. Skin recoils instantly = normal, 1–2 sec = mild–moderate, >2 sec = severe.
- Signs are ordered in each column by severity.
- If a pre-illness accurate weight is available, calculate deficit from weight loss.
- Pinch test: Pinch skin of abdomen. Skin recoils instantly = normal, 1–2 sec = mild–moderate, >2 sec = severe.
- Signs are ordered in each column by severity.
- If a pre-illness accurate weight is available, calculate deficit from weight loss.
- Pinch test: Pinch skin of abdomen. Skin recoils instantly = normal, 1–2 sec = mild–moderate, >2 sec = severe.
- Signs are ordered in each column by severity.
- If a pre-illness accurate weight is available, calculate deficit from weight loss.
- Pinch test: Pinch skin of abdomen. Skin recoils instantly = normal, 1–2 sec = mild–moderate, >2 sec = severe.
- Signs are ordered in each column by severity.
- If a pre-illness accurate weight is available, calculate deficit from weight loss.
- Pinch test: Pinch skin of abdomen. Skin recoils instantly = normal, 1–2 sec = mild–moderate, >2 sec = severe.
- Signs are ordered in each column by severity.
- If a pre-illness accurate weight is available, calculate deficit from weight loss.
- Pinch test: Pinch skin of abdomen. Skin recoils instantly = normal, 1–2 sec = mild–moderate, >2 sec = severe.
- Signs are ordered in each column by severity.
- If a pre-illness accurate weight is available, calculate deficit from weight loss.
- Pinch test: Pinch skin of abdomen. Skin recoils instantly = normal, 1–2 sec = mild–moderate, >2 sec = severe.
- Signs are ordered in each column by severity.
- If a pre-illness accurate weight is available, calculate deficit from weight loss.
- Pinch test: Pinch skin of abdomen. Skin recoils instantly = normal, 1–2 sec = mild–moderate, >2 sec = severe.
- Signs are ordered in each column by severity.
- If a pre-illness accurate weight is available, calculate deficit from weight loss.
- Pinch test: Pinch skin of abdomen. Skin recoils instantly = normal, 1–2 sec = mild–moderate, >2 sec = severe.
- Signs are ordered in each column by severity.
- If a pre-illness accurate weight is available, calculate deficit from weight loss.
- Pinch test: Pinch skin of abdomen. Skin recoils instantly = normal, 1–2 sec = mild–moderate, >2 sec = severe.
- Signs are ordered in each column by severity.
- If a pre-illness accurate weight is available, calculate deficit from weight loss.
- Pinch test: Pinch skin of abdomen. Skin recoils instantly = normal, 1–2 sec = mild–moderate, >2 sec = severe.
- Signs are ordered in each column by severity.
- If a pre-illness accurate weight is available, calculate deficit from weight loss.
- Pinch test: Pinch skin of abdomen. Skin recoils instantly = normal, 1–2 sec = mild–moderate, >2 sec = severe.
- Signs are ordered in each column by severity.
- If a pre-illness accurate weight is available, calculate deficit from weight loss.
- Pinch test: Pinch skin of abdomen. Skin recoils instantly = normal, 1–2 sec = mild–moderate, >2 sec = severe.
- Signs are ordered in each column by severity.
- If a pre-illness accurate weight is available, calculate deficit from weight loss.
- Pinch test: Pinch skin of abdomen. Skin recoils instantly = normal, 1–2 sec = mild–moderate, >2 sec = severe.
- Signs are ordered in each column by severity.
- If a pre-illness accurate weight is available, calculate deficit from weight loss.
- Pinch test: Pinch skin of abdomen. Skin recoils instantly = normal, 1–2 sec = mild–moderate, >2 sec = severe.
- Signs are ordered in each column by severity.
- If a pre-illness accurate weight is available, calculate deficit from weight loss.
- Pinch test: Pinch skin of abdomen. Skin recoils instantly = normal, 1–2 sec = mild–moderate, >2 sec = severe.
- Signs are ordered in each column by severity.
- If a pre-illness accurate weight is available, calculate deficit from weight loss.
- Pinch test: Pinch skin of abdomen. Skin recoils instantly = normal, 1–2 sec = mild–moderate, >2 sec = severe.
- Signs are ordered in each column by severity.
- If a pre-illness accurate weight is available, calculate deficit from weight loss.
- Pinch test: Pinch skin of abdomen. Skin recoils instantly = normal, 1–2 sec = mild–moderate, >2 sec = severe.
- Signs are ordered in each column by severity.
- If a pre-illness accurate weight is available, calculate deficit from weight loss.
- Pinch test: Pinch skin of abdomen. Skin recoils instantly = normal, 1–2 sec = mild–moderate, >2 sec = severe.
- Signs are ordered in each column by severity.
- If a pre-illness accurate weight is available, calculate deficit from weight loss.
- Pinch test: Pinch skin of abdomen. Skin recoils instantly = normal, 1–2 sec = mild–moderate, >2 sec = severe.
Table 8 Composition of fluids for intravenous and oral rehydration in acute gastroenteritis

<table>
<thead>
<tr>
<th>Fluid</th>
<th>Omolality (mOsm/l)</th>
<th>Glucose (mmol/l)</th>
<th>Sodium (mmol/l)</th>
<th>Chloride (mmol/l)</th>
<th>Potassium (mmol/l)</th>
<th>Base (mM)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oral</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ESPGAN</td>
<td>200–250</td>
<td>74–111</td>
<td>60</td>
<td>&gt;25</td>
<td>20</td>
<td>Citrate 10</td>
</tr>
<tr>
<td>Dioralyte</td>
<td>240</td>
<td>90</td>
<td>60</td>
<td>60</td>
<td>20</td>
<td>Citrate 10</td>
</tr>
<tr>
<td>Diocalm Jr</td>
<td>251</td>
<td>111</td>
<td>60</td>
<td>50</td>
<td>20</td>
<td>Citrate 10</td>
</tr>
<tr>
<td>Rehidrat</td>
<td>355</td>
<td>91*</td>
<td>50</td>
<td>50</td>
<td>20</td>
<td>Bicarb 20</td>
</tr>
<tr>
<td>Electrolyte</td>
<td>251</td>
<td>111</td>
<td>50</td>
<td>40</td>
<td>20</td>
<td>Bicarb 30</td>
</tr>
<tr>
<td>WHO ONS</td>
<td>330</td>
<td>111</td>
<td>90</td>
<td>80</td>
<td>20</td>
<td>Citrate 10</td>
</tr>
<tr>
<td>Intravenous</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ringer's lactate</td>
<td>280</td>
<td>—</td>
<td>130</td>
<td>110</td>
<td>4</td>
<td>Bicarb 25</td>
</tr>
<tr>
<td>0.9% saline</td>
<td>308</td>
<td>—</td>
<td>154</td>
<td>154</td>
<td>—</td>
<td>—</td>
</tr>
</tbody>
</table>

*Glucose given with fructose 1 mmol/l and sucrose 94 mmol/l.

Key recommendations

All gained consensus. The level of evidence and strength of recommendation follow each statement:

- Level of dehydration is assessed using a table modified from WHO criteria (III, C).
- Those with no dehydration (<3%) should continue with their normal fluids at at least maintenance levels (Va, D).
- Those with mild–moderate dehydration (3–8%) should have their deficit estimated and replaced over four hours with oral rehydration solution (glucose based and reduced osmolality, 200–250 mOsm/l) (I, A).
- Oral rehydration solution should be given in small aliquots frequently. If vomiting persists it should be given by nasogastric tube (preferred) or intravenous rehydration commenced (I, A).
- No routine investigations of U&E are required unless intravenous rehydration is commenced or hypernatraemia is suspected clinically (Va, D).
- Children with mild–moderate and severe dehydration should be admitted to hospital for rehydration (consensus, D).
- Following rehydration (four hours) normal feeds should be recommenced (I, A).
- There is no place for anti diarrhoeal medication (I, A).

Recommendation on medication (see table 7)

- Infants and children with acute gastroenteritis should not be treated with anti diarrhoeal agents.

(Level I and Delphi consensus, Grade A recommendation.)

Discussion

This guideline for the management of the child who presents with acute diarrhoea to hospital was developed using a systematic literature review and formal consensus using a Delphi panel. It is striking that for this type of management guideline the level of published evidence on which recommendations are based is poor. During the Delphi process, 41 statements were made, of which 13% were based on level I evidence, 25% on level III, 52% on level V, and 10% on textbook recommendation or Delphi panel contributions. The final guideline consists of 34 consensus statements (83% of the total presented to the Delphi panel).

This Delphi method of guideline development has several advantages. The use of a nationally selected panel of clinicians allows for a consensus view to be gained on those issues on which published evidence is lacking. Thus a comprehensive guideline can be produced with recommendations on all areas of management, which is likely to be acceptable and practical. It is likely that these need only simple local tailoring prior to being adopted. This method ensures that the guideline is clear on the level of evidence for each recommendation so that the clinician knows which are based on strong evidence from the literature and which on consensus.

There are also potential weaknesses with this approach. For the areas where there is little or no good evidence in the literature the process relies on the opinion of the participating panels, which is therefore possible to tap into collective error—the whole group managing children in a certain way based on historical practice rather than evidence. The importance of stating the level of evidence for each recommendation is again highlighted, so individual clinicians and local guideline development panels can immediately see which are based on strong evidence and which are not. The method was time consuming, with the whole process taking one year from initiating literature review to implementation of the guideline. It is therefore possible that high quality evidence is published in the intervening period which cannot be included in the recommendations at the time of publication, since it did not go through the Delphi process.

Further research would be beneficial on many of the decision points discussed, for example: the assessment of risk of dehydration in the child in a developed country, outpatient versus inpatient management of rehydration, nasogastric versus oral rehydration, and cereal versus glucose based ORS for rehydration (palatability) in a developed country.

We intend to review the evidence and consensus on which this guideline is based in approximately three years from the date of its completion (May 1999).

The authors acknowledge Children Nationwide Medical Research Fund for their generous funding of this research, and Jeanette Taylor-Meech for effective administration of the Delphi process. The following Delphi panelists are acknowledged for contributing a great deal of time and effort: Ackland F (paediatric consultant), Arrowsmith W A (paediatric consultant), Bailey R (A&E consultant), Barker R (paediatric nurse), Bennett-Brown J (paediatric consultant), Boun A W (paediatric consultant), Boyle R (paediatric specialist registrar), Cadis A (paediatric consultant), Carter B (paediatric consultant), Charalson C P F (paediatric consultant (gastroenterology)), Cutting W A M (paediatric consultant), Curtis J (paediatric nurse), Devane S (paediatric consultant), Edge J (paediatric consultant), Elhardt F (paediatric consultant), Egesen E (A&E specialist registrar), Green C (paediatric consultant), Hewerton J (paediatric consultant), Hodge S (paediatric consultant), Huyhn H (paediatric specialist registrar), Jefferson I (paediatric consultant), Jenkins H (paediatric consultant (gastroenterology)), Kershaw C (paediatric consultant), Laurent S (paediatric consultant), Lewis H M (paediatric consultant), Marcovich H...
Armon, Stephenson, MacPaul, Eccleston, Werneke

Appendix

Table A1 summarises levels of evidence and grade of recommendation.

**Table A1** Levels of evidence and grade of recommendation

<table>
<thead>
<tr>
<th>Strength of evidence</th>
<th>Grade of recommendation (Cook et al)</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>Supported by Level I evidence and therefore highly recommended</td>
</tr>
<tr>
<td>II</td>
<td>Supported by Level II evidence, and therefore recommended</td>
</tr>
<tr>
<td>III</td>
<td>Supported by Level III evidence; several potential clinical actions might be considered appropriate</td>
</tr>
<tr>
<td>IV</td>
<td>Supported by Level IV and V evidence; the consensus route would have to be adopted</td>
</tr>
<tr>
<td>V</td>
<td>Opinions of respected authorities</td>
</tr>
<tr>
<td></td>
<td>Clinical evidence, descriptive studies, or reports of expert committees</td>
</tr>
</tbody>
</table>

Commentary

No doctor can hope to keep up to date with the literature across a broad spectrum of practice. National guidelines are helpful where they bring together all the evidence from research and synthesise it into a series of recommendations showing the strength of that evidence. Dr Armon and colleagues have used a formal consensus process to provide guidance, and this raises a number of important questions. It happens that there are also recent guidelines on acute diarrhoea management published by Murphy in 1998,1 and by the American Academy of Paediatrics (AAP) in 1996.2 If guidelines are to provide truly evidence based recommendations, they must be developed rigorously. How do these three guidelines measure up to the standards published by the Royal College of Paediatrics and Child Health?3

They are all based on a detailed review of the literature, and two contain explicit levels of evidence for the recommendations. They were not conducted with the rigour of the systematic reviews in the Cochrane database. For example, the review of Dr Armon et al did not include textword searching, and none included hand searching through journals not covered by the electronic databases. There was no attempt to establish whether unpublished trials exist; publication bias can result when journals are more likely to publish trials with positive results. The AAP guideline was supplemented by a technical report and focused on three specific aspects of management.

The consensus guideline of Dr Armon et al involved consultants from several specialties, nurses, and specialist registrars. This is important in ensuring that the perspectives of all those involved contribute to the guidance. However, with only two nurses on the panel, the Delphi process would have allowed consensus to be achieved, even when both nurses disagreed. The lack of any primary care or parental input to the process undermines the section on admission criteria, for which research evidence appears to be lacking. The assistance of parents with recent experience of managing acute diarrhoea in their children would have been most valuable in formulating written material for parents.

The key message to emerge from all three guidelines is the safety and effectiveness of oral rehydration solutions, even in children with moderate (up to 8%) dehydration without shock. Additionally, that administration of the calculated deficit over a few hours is simple and effective. Critical to achieving success with oral rehydration solution is the time that it takes carers to administer. All three guidelines recommend the correction of dehydration orally over a period of four hours. This would mean for some infants and children a rate of up to 80 ml/kg over four hours. However, in none of six controlled trials that I looked up,4–9 was this rate of oral administration attempted, and in only one5 was it achieved. Is this recommendation therefore actually consistent with the evidence, or indeed better than six or eight hours for achieving rehydration? It was rated an A grade in Dr Armon and colleagues’ guideline.

Where does this leave the UK practising paediatrician? Given the limitations of the three guidelines, there is a risk that important evidence may be missing or inadequately interpreted. We still need a well conducted evidence based guideline, involving all professional groups, primary care and parents, and based on a rigorous literature review. However, the studies that support these guidelines are compelling, and we should not wait before using a multiprofessional approach to getting oral rehydration therapy into practice at the local level. Read all three guidelines as a starting point in reviewing or developing local guidelines, but check back to the key original publications. I will leave it to you, the reader, to judge how much extra value you get from Dr Armon and colleagues’ consensus statements.

**Rapid responses**

Letters on the following papers have been published recently as rapid responses on the ADC website. To read these letters visit [www.archdischild.com](http://www.archdischild.com) and click on “Read eLetters”:


**Adrenaline syringes are vastly over prescribed.** Unsworth DJ. *Arch Dis Child* 2001;84:410–11.


If you would like to post an electronic response to these or any other articles published in the journal, please go to the website, access the article in which you are interested, and click on “eLetters: Submit a response to this article” in the box in the top right hand corner.
Acute diarrhoea management

K Armon, T Stephenson, R MacFaul, P Eccleston and U Werneke

Arch Dis Child 2001 85: 132-142
doi: 10.1136/adc.85.2.132

Updated information and services can be found at:
http://adc.bmj.com/content/85/2/132

These include:

Supplementary Material
Supplementary material can be found at:
http://adc.bmj.com/content/suppl/2001/07/20/85.2.132.DC1

References
This article cites 55 articles, 23 of which you can access for free at:
http://adc.bmj.com/content/85/2/132#BIBL

Email alerting service
Receive free email alerts when new articles cite this article. Sign up in the box at the top right corner of the online article.

Topic Collections
Articles on similar topics can be found in the following collections

Child health (3922)
Diarrhoea (182)

To request permissions go to:
http://group.bmj.com/group/rights-licensing/permissions

To order reprints go to:
http://journals.bmj.com/cgi/reprintform

To subscribe to BMJ go to:
http://group.bmj.com/subscribe/