NSW HEALTH DEPARTMENT

CIRCULAR

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MANAGING YOUNG CHILDREN AND INFANTS WITH GASTROENTERITIS IN HOSPITALS

The attached clinical practice guidelines, which incorporate recommended actions by the State Coroner, were prepared for NSW Health by an expert clinical reference group. Area Health Services are required to have local guidelines in place in all hospitals and facilities likely to be required to assess or manage children with gastroenteritis.

Local guidelines should be consistent with the state clinical practice guidelines, attached to this circular. In reviewing existing protocols, it should be borne in mind that in most cases the State guidelines will not be appropriate for adoption without some localisation, such as for variations in staffing available, referral patterns etc.

Gastroenteritis in infancy and childhood is a common acute communicable intestinal infection, which causes vomiting, diarrhoea and fever.

This circular should also be read in conjunction with the *NSW Health Department Guidelines for the Hospitalisation of Children Revised July 1998* (State Health Publication SWS 980088) and the *Infection Control Policy* (Circular 02/45).

The expert clinical reference group has prepared the attached clinical practice guidelines so that hospitals may have a resource to use in the development of local guidelines. This document reflects what is currently regarded as safe practice, but does not replace the need for the application of clinical judgement to each individual presentation.

Area Health Services are responsible for ensuring that all staff treating paediatric patients are educated in use of the locally developed paediatric gastroenteritis guidelines.

The NSW Health Department requires Area Health Services to forward the local guidelines to the Department for consideration within 3 months from the date of this circular.

Robert McGregor
Acting Director-General

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Acute Management of Young Children and Infants with Gastroenteritis

Clinical Practice Guidelines

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NSW HEALTH
Working as a Team

NSW HEALTH DEPARTMENT

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www.health.nsw.gov.au

A revision of this document is due May 2004.

June 2002

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Introduction

This document represents basic clinical practice guidelines for **managing gastroenteritis in infancy and childhood**. Further information may be required in practice, especially where intravenous fluid therapy is required; suitable widely available resources are listed on page 17.

Area Health Services are responsible for ensuring that all staff treating paediatric patients are educated in use of the locally developed paediatric gastroenteritis guidelines.

It is critical that contemporaneous, accurate and complete documentation is maintained during the course of patient management from arrival to discharge.

In cases of severe dehydration or clinical deterioration after admission or despite treatment, the Admitting Medical Officer in charge or consulting paediatrician should be notified and should personally review the patient as soon as possible.

Parental anxiety should not be discounted, it is often of significance even if the child does not appear especially unwell.

For hospitals employing junior medical staff: The Admitting Medical Officer **MUST** be notified within an hour of the child being admitted including details of the child's history, physical findings and details of the proposed fluid therapy.

This document reflects what is currently regarded as safe practice, but does not replace the need for the application of clinical judgement to each individual presentation.

Gastroenteritis in infancy and childhood

- This common acute intestinal communicable infection causes vomiting, diarrhoea and fever. It is usually viral, but sometimes bacterial or parasitic. Community outbreaks are sporadic and seasonal.
- A small proportion of those affected will suffer severe dehydration and electrolyte disturbance. Untreated or poorly treated dehydration may progress to shock and death. There are also risks from over-hydration and/or inappropriate electrolyte replacement, including death from cerebral oedema.
- Some other serious illnesses are sometimes incorrectly diagnosed as gastroenteritis. Warning signs of alternative diagnoses must be recognised and investigated.

Suggested hospital requirements for management of children with gastroenteritis

- 24 hour availability of nurses and medical practitioners experienced in the management of sick children.
- 24 hour availability of standard biochemistry for inpatient management.
- Availability of standard intravenous fluids, including normal saline, Hartmann's solution, N/2 saline with 2.5% glucose.
- Intravenous paediatric giving sets with burettes, and where possible, paediatric infusion pumps.

Availability of assistance when treating severely ill children

- Ideally, the treatment of children with moderate or severe dehydration should be discussed with a paediatrician.
- Children with shock, after resuscitation, need consideration of transfer to a facility with a paediatric intensive care unit.
- For advice regarding management or to arrange transfer of children to any of the children's hospitals contact **NETS** (NSW Newborn & Paediatric Emergency Transport Service) **Hotline number: 1300 36 2500.** Calls to NETS are voice recorded and form part of the NETS medical record for the patient.

Principles of fluid management

- Infants and children with gastroenteritis require additional fluids to prevent dehydration, or for rehydration.
- **The enteral route is preferred for rehydration of children with mild or moderate dehydration. This is either as oral or nasogastric fluids. This is usually referred to as 'oral rehydration therapy'.**
- Intravenous rehydration is often a reasonable alternative for moderate dehydration (see table on page 8) and is essential where severe dehydration and/or shock are present.
- **Suitable fluids should be offered, for oral rehydration**
  - Babies who are breastfed should receive small frequent breastfeeds to ensure that normal urine output is re-established.
  - Otherwise, offer oral rehydration fluid (eg oral rehydration solutions, see table on page 20) mixed according to the manufacturer's instructions. **DO NOT** add flavouring or sweet drinks to oral electrolyte solutions.
  - If oral rehydration solution is unavailable, or refused, dilute juice/lemonade (mixed as 1 part juice/lemonade with 4 parts water).
  - Do not use low-calorie or diet drinks.
- Suitable **volumes** should be offered: try to give about 1mL/kg every 10 minutes or check that about 5mL/kg intake is achieved each hour.
- Achieving successful oral rehydration demands constant attention and persistence, usually by parents. The amount of time and effort involved generally precludes its use by nursing staff in a children's ward or hospital Emergency Department. In these situations, nasogastric or intravenous fluids should be considered.
- Calculations for oral rehydration therapy and nasogastric volumes are the same as intravenous therapy. Careful calculations are required regardless of route.
- The principles and practice of intravenous replacement therapy are described on page 12.

Medications

There are no indications for using anti-vomiting, anti-motility or anti-diarrhoeal agents in the management of gastroenteritis in infants or children.

Antibiotics should not be used, except with certain bacterial causes of gastroenteritis, and only following microbiological advice.

Alternative diagnosis

Always keep in mind the possibility that your diagnosis of gastroenteritis could be incorrect. Consider also:

- acute appendicitis
- strangulated hernia
- intussusception or other causes of bowel obstruction
- urinary tract infection
- meningitis and other types of sepsis
- any cause of raised intracranial pressure
- diabetic ketoacidosis
- inborn errors of metabolism
- inflammatory bowel disease
- haemolytic uraemic syndrome

Always consider an alternative diagnosis if there is:

- abdominal distension
- bile-stained vomiting
- fever >39°C
- blood in vomitus or stool
- severe abdominal pain
- vomiting in the absence of diarrhoea
- headache

Beware the very young infant and the malnourished child. They are more likely to suffer severe disease, or to have an alternative diagnosis.

The following table on page 8 gives an overview of dehydration definition, signs and symptoms, along with initial oral or parenteral fluid therapy The flow chart on pages 10-11 outlines a treatment overview and highlights decision points, also in regard to the initial management of an infant or child with gastroenteritis.

Assessment of dehydration and initial treatment

Description of dehydration	Dehydration (% of body weight)	Signs & symptoms	Fluid route	Fluid type
Very mild	3%	Reduced urine output Thirst No clinical signs	Oral	In order of preference 1. Frequent breastfeeds where possible/appropriate 2. Oral Rehydration Solution (eg Gastrolyte® see Glossary) 3. 1/5 strength clear fluids ie: 4 parts water and 1 part juice/lemonade (if electrolyte solution refused)
Mild	5%	Reduced urine output Thirst Dry mucous membranes Mild Tachycardia	Oral	In order of preference 1. Frequent breastfeeds where possible/appropriate 2. Oral Rehydration Solution (eg Gastrolyte®) 3. 1/5 strength ie: 4 parts water and 1 part juice/lemonade (if electrolyte solution refused)
			Nasogastric	Oral Rehydration Solution (eg Gastrolyte®)
			Intravenous	Start with N/2 saline with 2.5% Glucose
Moderate	7-8%	Dry mucous membranes Lethargy Tachycardia Reduced skin turgor Sunken fontanelle Sunken eyes	Intravenous	Start with N/2 saline with 2.5% Glucose
			Nasogastric	Oral Rehydration Solution (eg Gastrolyte®) ***NOTE!*** *Naso-gastric rehydration for moderate rehydration should be restricted to those experienced in the technique, or otherwise for emergency use when IV access is unavailable.*
Severe	10% or more	Above signs Poor perfusion Shock	Intravenous or intraosseous 20mL/kg stat and reassess fluid needs	Either as first choice therapy: Normal saline (0.9%) Hartmann's solution
				If unavailable, use as second choice therapy: • colloid • 4% normal serum albumin

Initial treatment process

History and examination results in provisional diagnosis of gastroenteritis.
Assessment of degree of dehydration (see Table on page 8-9).

Very mild or mild dehydration:
Offer frequent, small volume oral fluids (achieving about 5mL/kg/hr). Check urinalysis.

Moderate and severe dehydration:
Requires admission to hospital for prompt management and constant supervision.

Patient is not shocked

Patient is shocked

Tolerating oral fluids and clinical status satisfactory.

- Provide fact sheet.
- Discharge home.
- Advise about planned medical follow-up and need for earlier review.

Not tolerating oral fluids.

- Continue to encourage oral fluids.
- Admit to hospital if dehydration progressing and oral intake is inadequate.
- Consider nasogastric rehydration or intravenous rehydration.
- Consider the need for UEC.

Take UEC, check BSL. Start/continue rehydration using N/2 saline with 2.5% glucose.

If difficulty gaining vascular access commence nasogastric rehydration continuously using Gastrolyte® via infusion pump. Ensure the nasogastric tube is inserted in the stomach, eg aspirating fluid and testing acid by pH tape.

Gain vascular access urgently. If IV difficult, use the intraosseous route.

Take UEC BSL (if possible) but do not delay in giving bolus of 20mL/kg normal saline stat.

Reassess for signs of shock. Repeat bolus if necessary.

It is expected that the clinical status of an infant or child who is receiving rehydration therapy for gastroenteritis should gradually improve.
Reassess clinically and repeat UEC within 6-8 hours if necessary.

Continues on page 11

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Reassess clinically and repeat UEC within 6-8 hours if necessary.

NOT IMPROVING

IMPROVING

Or if:

- Deteriorating clinical status
- Worrying signs/symptoms (see page 8-9)

Seek urgent medical advice/review. Further consultation may be necessary. Local hospital policy should define the appropriate consultation mechanism.

Commence oral intake

Intraveneous fluid therapy

Resuscitation

- Where severe dehydration is accompanied by shock or imminent shock, rapid intravenous administration of fluids for resuscitation is required as shown on page 8. Commence with intraosseous infusion if IV route cannot be established.
- Normal Saline or Hartmann's solution, 20mL/kg should be given initially over 10-20 minutes (4% Normal serum albumin or colloid solutions are second choices; **DO NOT USE** lower sodium-containing fluids for resuscitation).
- Add glucose if BSL is low.
- Check serum electrolytes.
- Repeat boluses of 10-20mL/kg until signs of shock are reversed.

Continuing fluid therapy (or initial therapy, where resuscitation has not been required)

- Calculate the total intravenous fluids likely to be needed for the next 24 hour period. Do not include any volumes already required for resuscitation.

NOTE: This is a 'starting point' calculation which will be reviewed according to progress: this includes assessment of general appearance, urine output, heart rate, continuing vomiting or diarrhoea, fever, at intervals of not more than 6 hours.

- Generally children should not be rehydrated greater than 5% in the first 24 hours.
- **The volumes for rehydration versus maintenance are calculated separately, as the basis of calculation is different for each.**
  - It is generally safe to use 5% of body weight as the maximum for estimating rehydration volume, **even if the degree of dehydration is clinically estimated as greater.**
- **For rehydration:** Wt. (in kg) X estimated % dehydration X 10 = mL needed, eg for a 9kg child, who is estimated to be 5% dehydrated: ***9 X 5 X 10 = 450mL***

Give rehydration fluid as N/2 saline with 2.5% glucose, **NOT** as N/4 saline with 3.75% glucose.

- **Calculate the maintenance fluid requirement, for 24 hours, by age:**
  - Infants up to 9 months: 120-140mL/kg/24hrs
  - Children 9-24 months: 90-100mL/kg/24hrs
  - Children 2-4 years: 70-90mL/kg/24hrs
  - Children 4-8 years: 60-70mL/kg/24hrs
  - Older children: 50-60mL/kg/24hrs

NOTE: There are other commonly-used satisfactory methods for calculating maintenance fluids for children. Please see the Glossary for an alternative method for calculating maintenance fluid requirements for 24 hours by body weight.

- **Add the two volumes together:**
  - **Calculate a drip rate to give the calculated volume over 24 hours. Start by giving N/2 saline and 2.5% glucose over the first 6-8 hours, then review.**
  - It is likely that N/2 +2.5% glucose will be the only intraveneous fluid required in the first 24 hours.
- Clinicians experienced in the management of sick children may choose to rehydrate the total calculated deficit within the 24 hour period.

Assessment and review – ongoing

- Formal review by a medical officer after 6-8 hours is required. Check hydration. Check patient physically, including mental state. Wake fully!
- Take note of parental observation.
- **Rapid improvement over 2-4 hours is the 'norm'. Onset of any new symptoms, eg drowsiness, headache, abdominal pain, demand urgent review.**
- Atypical behaviour of patient should raise the question of alternate diagnosis.
- Repeat UEC if the child still appears unwell, if the electrolytes were markedly abnormal initially as determined by the Admitting Medical Officer, or if the child was seriously ill initially as assessed by the Admitting Medical Officer.

- If there is no improvement in the child's condition contact the Admitting Medical Officer.
- Add potassium at 3mmol/kg/24hrs when urine is passed, if initial serum potassium chloride was normal (up to 5mmol/kg/24hrs if marked hypokalaemia is present). Generally this is covered by adding 10 mmol of potassium to each 500mL bag of IV fluid.

Example of fluid therapy calculation

- A 12 month old baby presents with 7-8% dehydration. The child weighs 9kg, and is continuing to vomit. Initial UEC shows sodium 132 mmol/L and mildly raised creatinine.
  - Maintenance requirements for 24 hours = **100mL/kg/24hrs = 900mL**
  - Fluid deficit = weight in kg X % dehydration X 10 = **9 X 5 X 10 = 450mL**

  (Note: 5% is the maximum for calculating rehydrating fluid at this stage)
  - Abnormal ongoing losses – don't add anything yet; but keep in mind if vomiting and diarrhoea continue, or if the child is slow to improve.
  - Total fluid requirement over **next 24 hours** = 900mL (maintenance 24 hours) + 450mL (fluid deficit) = 1350mL
  - Fluid regime = 1350mL/24hrs = 56mL/hr for next 24 hours (BUT review at 6-8 hours).
  - Give N/2 saline with 2.5% glucose depending upon repeat UEC, clinical preferences.

Hypernatraemic dehydration

Hypernatraemic dehydration is uncommon, but potentially more dangerous than when serum sodium is initially normal or slightly low; this situation should always be discussed with a paediatrician. There is a greater likelihood of cerebral oedema, seizures and brain damage. Rehydration is normally given entirely as **normal saline** or N/2 saline with 2.5% glucose (as for 5% dehydration, not greater) over 48, not 24 hours.

Investigations & observations

- All children with dehydration >5% do UEC, BSL and consider FBC.
- Consider blood culture if the child has a temperature >38.5°C.
- Infants and children who are severely dehydrated require constant observation and monitoring, including, where possible, cardiac monitoring, pulse oximetry, frequent blood pressure measurement and urine output measurement.
- Every child being treated in hospital for gastroenteritis, whether or not having intravenous therapy, requires observation of, and recording of, standard observations (eg pulse, respiration, temperature etc.) on a regular basis (not less than 4 hourly).
- Children needing IV fluid therapy require UEC at initial assessment and again at 6-8 hours, if initial UEC was markedly abnormal, or if the child is still unwell, or if the child was severely dehydrated initially.
- If there is failure to improve, deterioration or development of new signs, there should be discussion with the Admitting Medical Officer.
- A daily lightly clothed weight remains a useful clinical parameter in the assessment of progress after admission, as well as a retrospective guide to the accuracy of the initial assessment of dehydration.

Reintroduction of diet

- Children who have diarrhoea and are not dehydrated should continue to be fed age appropriate diets. Children who require rehydration should be fed age appropriate diets within the first 12-24 hours.
- Refer to *Gastroenteritis Fact Sheet* jointly developed by the Children's Hospital Westmead at: **www.chw.edu.au** and the Sydney Children's Hospital at: **www.sch.edu.au**

Readily available resources

Fuller details may be necessary in practice, especially for the management of children with moderate or severe dehydration. Possible sources include:

- NSW Health Department CIAP website, *Managing Young Children and Infants with Gastroenteritis in Hospitals* at: **www.ciap.health.nsw.gov.au** also the NSW HealthNet: **internal.health.nsw.gov.au:2001** look under Specialties.
- The *New Children's Hospital Handbook*, 1999 (Sections 7 – Fluid Therapy, and Section 16 – Gastroenterology), available as a book from the Children's Hospital at Westmead, or at: **www.chw.edu.au**
- *Gastroenteritis Fact Sheet* jointly developed by the Children's Hospital Westmead at: **www.chw.edu.au** and the Sydney Children's Hospital at:**www.sch.edu.au**
- The Sydney Children's Hospital *Clinical Pathway for the Management of Gastroenteritis*, available at: **www.sch.edu.au**

Glossary

Admitting Medical Officer	Most senior medical officer under who the child is admitted to hospital
BSL	Blood Sugar Levels
FBC	Full Blood Count
Gelofusine®	Modified fluid gelatin
Haemaccel®	Colloidal intravenous infusion solution
Hartmann's solution	Isotonic intravenous solution (see 'Composition' table on page 19)
ORS	Oral Rehydration Solution
UEC	Urea, Electrolytes and Creatinine. Ideally this should include measurement of serum sodium, potassium, chloride, bicarbonate, urea and creatinine. It is recognised that not all local laboratories offer all of these parameters 24 hours. It is essential that the serum sodium be measured on any child who is receiving intravenous rehydration therapy.

Composition

	Osmolality mOsm/L	Na mmol/L	Cl mmol/L	Glucose g/L	K mmol/L
Normal Saline (0.9%)	300	150	150		
Hartmann's Solution	274	129	109		5
Gelofusine®	283	154	120		
N/2 Dextrose saline	292	76	76	25	
N/4 Dextrose saline	284	38	38	37.5	

Alternative method for calculating maintenance fluid requirements for 24 hours by body weight

Weight increments	Maintenance fluid rate
First 0-10kg	100mL/kg/24hrs
Next 11-20kg	50mL/kg/24hrs
Next >20kg	20mL/kg/24hrs

For example: A child weighing 25kg has a maintenance fluid requirement for 24 hours of: (10x100) + (10x50) + (5x20) = 1600mL/24 hours.

Comparison of oral rehydration solutions

Solution	Sodium mmol/L	Potassium mmol/L	Chloride mmol/L	Citrate mmol/L	Glucose mmol/L	Rice Starch g/L
Gastrolyte® powder 1 sachet per 200mLs	60	20	60	10	90	-
Gastroyte® tablet 2 tablets per 200mLs	60	25	45	20	90	-
Gastrolyte® R 1 sachet per 200mLs	60	20	50	10	-	6
Repalyte® 1 sachet per 200mLs	60	20	60	10	90	-
Hydralyte® Ice blocks	45	20	35	30	90	-
Pedialyte® 1 sachet per 200mLs	45	20	35	10	126	-

Source: MIMS January 2002

Gastroenteritis Clinical Expert Reference Group

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