

Gastroenteritis in children under 5 years

Subject:	Diarrhoea and vomiting caused by gastroenteritis: diagnosis, assessment and management in children younger than 5 years
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Designation of Author:	Dr K Baker ST1, Dr J Raine Consultant Paediatrician
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Version Control Sheet

Version	Date	Author	Status	Comment
1.0	30 th April 2010	Dr S D'Souza, Dr J Raine		
2.0	April 2013	Drs Mackay and Raine	Awaiting Approval	Significant amendments to original guideline
3.0	May 2016	Drs Baker and Raine	Awaiting Approval	Amendments to original guideline. Sentence added to first paragraph in background section. Editing of diarrhoea and vomiting explanation in background. Added sentence regarding using bicarb in investigation section. Added sentence to section on when to repeat blood tests regarding changing fluids if required. Deleted section from antibiotics and anti-diarrhoeals paragraph. Changed sentence to "oral" ondansetron in ondansetron section.

➤ Criteria for use

- This guideline has been written to manage
 - diarrhoea and vomiting lasting less than 7 days
- It should not be used in the assessment of children with complex medical backgrounds, e.g.
 - Immunodeficiency
 - ileostomies
 - metabolic disorders

➤ Background

Acute gastroenteritis is the leading cause of vomiting in children under three years of age and is a very common reason for children and adolescents attending emergency departments. It is defined as a decrease in the consistency of stools (loose or liquid) and/or an increase in the frequency of evacuations (typically >3 in 24 hours), with or without fever or vomiting.¹

In the UK acute gastroenteritis in children under five years accounts for 20% of general practitioner consultations and results in 24,000 hospital admissions annually², however it rarely needs hospital admission.

Dehydration, which is the decrease in total body water through a reduction in both the intracellular and extracellular fluid volumes, is an important cause of morbidity in children with vomiting². The clinical manifestations of dehydration are closely related to intravascular volume depletion, which may lead to complications including shock, seizures and renal failure.

Starvation caused by reduced caloric intake in children with vomiting can lead to ketonaemia.

In an episode of illness,

- **DIARRHOEA usually lasts for 5-7 days** and can **continue for up to 2 weeks**.
 - **VOMITING** is more short lived and usually **lasts 1-2 days** and **stops within 3 days**.
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➤ **Common causes of infectious gastroenteritis**

- VIRAL: 87% of cases (most commonly Rotavirus or Norovirus if high rotavirus vaccine coverage)
- BACTERIAL: Campylobacter, Salmonella, Shigella, or E.coli
- PARASITIC: Cryptosporidium

NOTE: Not all causes of diarrhoea and vomiting are due to gastroenteritis.

Box 1: Common differential diagnoses and associated features

<u>Differential diagnosis</u>	<u>Red flags and features that may indicate other diagnosis</u>
<ul style="list-style-type: none">• Urinary Tract Infection• Meningitis• Intussusception• Malrotation/Volvulus• Appendicitis• Haemolytic Uraemic Syndrome• Diabetic Ketoacidosis/Inborn errors of metabolism	<ul style="list-style-type: none">• Temp higher 38°C <3months• Temp higher 39°C 3-6months• Shortness of breath or tachypnoea• Any reduction in Glasgow Coma Scale• Neck stiffness• Bulging fontanelle• Non blanching rash• Blood +/- mucus in stool• Bilious (green) vomiting• Severe/localised abdominal pain• Abdominal distension or rebound tenderness

➤ **Clinical Assessment**

1. History and examination

- Red flag symptoms
 - As above (see Box 1)
 - Lack of wet nappies
- Current management at home by parents or carers
- Recent contact with someone with acute diarrhoea and vomiting
- Recent antibiotic treatment
- Exposure to a known source
- Recent travel abroad
- Latest weight – this may be written in the red book
 - If possible, calculate percentage weight loss to help with quantifying dehydration

NOTE: If you suspect an outbreak of gastroenteritis you must notify and act on the advice of the Health Protection Agency

Box 2: These children are at increased risk of dehydration⁴

- children younger than 1 year, especially those younger than 6 months
- infants who were of low birth weight
- children who have passed six or more diarrhoeal stools in the past 24 hours
- children who have vomited three times or more in the past 24 hours
- children who have not been offered or have not been able to tolerate supplementary fluids before presentation
- infants who have stopped breastfeeding during the illness
- children with signs of malnutrition

2. Investigations

- Weight
- Urine dipstick (if febrile)
- Blood pressure
- Stool samples (3 samples: **Microscopy, Culture & Sensitivities, Ova Cysts and Parasites and Virology**) should be sent if you suspect any of the list below:-
 - Septicaemia
 - Blood/mucus present in stool
 - Immunocompromised child
 - Recent travel abroad
 - No improvement in diarrhoea after 7 days (this is an exclusion in this protocol)
 - Uncertainty about diagnosis
- Laboratory investigations
 - **Do not** perform bloods routinely
 - Measure **U&E/creatinine and blood glucose** if IV rehydration is required or if you suspect hypernatraemic dehydration (see section on management of hypernatraemic dehydration). Normal bicarbonate is useful to confirm <5% dehydration.
 - **Capillary/Venous blood gas** – if in shock
 - **FBC, CRP and blood culture** if septic
- **Consider admission in the following:** History of premature birth, chronic medical conditions (renal/cardiac), concurrent illness, high output diarrhoea, no improvement in 48 hours, worsening condition, not passed urine in previous 12 hours.

Other considerations

- Diarrhoea recurs after re-introduction of feeds
 - Consider lactose intolerance
- Suspected Intussusception
 - Consider **early abdominal USS**
 - Usually occurs age 3 months to 3 years, peak incidence 4-6 months

➤ Assessment of dehydration

Use box 3 below to assess the level of dehydration. Red flag symptoms and signs may help to identify children at increased risk of progression to shock. If in doubt, manage as if there are red flag symptoms or signs. Dashes (-) indicate that these clinical features do not specifically indicate shock.

Increasing severity of dehydration →			
	No clinically detectable dehydration	Clinical dehydration	Clinical shock
Symptoms (remote and face-to-face assessments)	Appears well	▮ Appears to be unwell or deteriorating	–
	Alert and responsive	▮ Altered responsiveness (for example, irritable, lethargic)	Decreased level of consciousness
	Normal urine output	Decreased urine output	–
	Skin colour unchanged	Skin colour unchanged	Pale or mottled skin
	Warm extremities	Warm extremities	Cold extremities
	Signs (face-to-face assessments)	Alert and responsive	▮ Altered responsiveness (for example, irritable, lethargic)
Skin colour unchanged		Skin colour unchanged	Pale or mottled skin
Warm extremities		Warm extremities	Cold extremities
Eyes not sunken		▮ Sunken eyes	–
Moist mucous membranes (except after a drink)		Dry mucous membranes (except for 'mouth breather')	–
Normal heart rate		▮ Tachycardia	Tachycardia
Normal breathing pattern		▮ Tachypnoea	Tachypnoea
Normal peripheral pulses		Normal peripheral pulses	Weak peripheral pulses
Normal capillary refill time		Normal capillary refill time	Prolonged capillary refill time
Normal skin turgor		▮ Reduced skin turgor	–
Normal blood pressure		Normal blood pressure	Hypotension (indicates decompensated shock)

Box 3: Guidance on the assessment of dehydration⁴.

1. **NOT DEHYDRATED but have gastroenteritis**

- Continue breastfeeding and other milk feeds
- Encourage fluid intake
- Discourage the drinking of fruit juices and fizzy drinks
- Offer DIORALYTE as supplemental fluid to those at increased risk of dehydration

2. **CLINICAL DEHYDRATION including hypernatraemic dehydration³:**

- Use DIORALYTE for oral rehydration therapy
- **“Oral fluid challenge”**: Give 50 ml/kg for fluid deficit replacement over 4 hours in addition to maintenance fluid volume.
- Give the DIORALYTE solution frequently and in small amounts
- Consider supplementation with their usual fluids if refuse DIORALYTE
 - including milk feeds or water
 - but not fruit juices or fizzy drinks
- Give **the DIORALYTE solution via a nasogastric tube** if they are unable to drink it or if they vomit persistently
- Monitor the response to oral rehydration therapy by regular clinical assessment.

3. **Ondansetron⁴⁻⁷:**

- Consider oral ondansetron if failing “oral fluid challenge” and continuing to vomit.

This is to attempt to re-establish enteral fluids in a timelier manner

Oral dose as per cBNF

1. Body weight <10kg – 2mg BD
 2. Body weight >10kg – 4mg BD
- Consider IV ondansetron only in intractable vomiting, and only after oral ondansetron has failed.

4. **Use intravenous fluid therapy for clinical dehydration if:**

- shock is suspected or confirmed
- a child with red flag symptoms or signs shows clinical evidence of deterioration despite oral rehydration therapy
- a child persistently vomits the dioralyte given orally or via a nasogastric tube, and ondansetron has been used.

5. **What intravenous fluids shall I use?**

- FOR BOLUS IF SHOCKED:
 - i. **20mls/kg 0.9% Sodium Chloride**
- Ongoing fluid replacement
 - i. isotonic solution e.g. **0.9% sodium chloride with 5% glucose**
 - ii. Provide **intravenous potassium supplementation** once the plasma potassium level is known.

6. How much fluid should I give?

NB: This does not have to be given exclusively IV, but could be a combination of IV and orally.

- If SHOCKED and REQUIRED BOLUS **add 100 ml/kg over 24 hours for fluid deficit replacement in addition to maintenance fluid requirements**, and monitor the clinical response
- IF NOT SHOCKED at presentation, **add 50 ml/kg over 24 hours for fluid deficit replacement in addition to maintenance fluid requirements**, and monitor the clinical response

7. How do you calculate maintenance fluids?

Patient weight/kg	Total volume fluid in 24 hours (mls/day)
3-10kg	100 x wt
11-20kg	1000 +50 x (wt-10)
>20kg	1500 plus 20 x (wt-20)

- Total maintenance fluid requirement in 24 hours = (100 ml for each of the first 10kg) + (50ml for each kg 11-20) + (20 ml for each additional kg)
 - i. e.g. a 23 kg child maintenance fluids
= (100x10) + (50x10) + (3x20)
= 1560mls in 24 hours

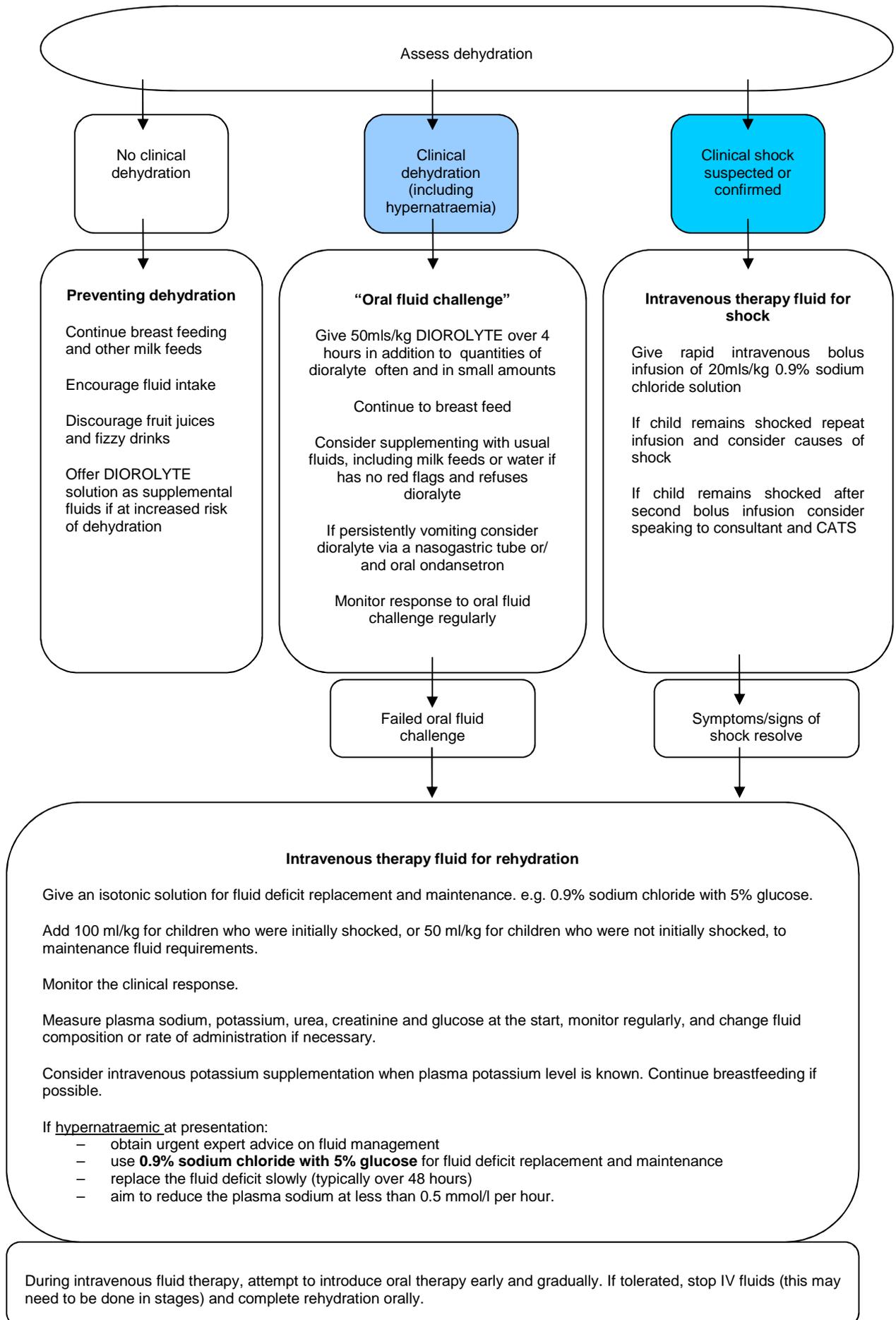
8. How often should I repeat blood tests?

If HYPERNATRAEMIC (Na>150mmol/l) at presentation and on IV fluids **U&E/creatinine** should be repeated **4 hourly** See management of hypernatraemic dehydration below

- If NOT HYPERNATRAEMIC and on IV fluids **U&E /creatinine** should be repeated **12 hourly**
- **Following blood tests results, change fluid composition or rate of administration if necessary.**

9. Provide **intravenous potassium supplementation** once the plasma potassium level is known.

➤ **Flowchart for fluid management for children with gastroenteritis⁵**



➤ **Hypernatraemic dehydration (Definition Na >150mmol)**

Causes of hypernatraemia².

- **Excessive loss of water**
 - Diabetes insipidus, diarrhoea
- **Excessive intake of sodium**
 - Iatrogenic poisoning or non-accidental injury
- **Combination of both**
 - Children with gastroenteritis given excessive sodium in rehydration fluids

2. Estimate the degree of dehydration.

- Assume **5% deficit** unless the child is clinically shocked
- **If shocked**, assume **10 % dehydration**.

Management of Hypernatraemic dehydration

General principles

- Bloods: U&E, serum osmolality, glucose and calcium.
- **U&E/creatinine 4 hourly**
- Weight twice daily
- Mild hyperglycaemia is not uncommon.
 - It is rectified by the correction of fluid balance.
 - Do not use insulin.
- In general **Sodium chloride 0.9% with glucose 5%** is a safe starting intravenous fluid.
- **Aim to replace deficit (5 or 10%) if giving IV fluids over 48 hours if hypernatraemic**
 - Lower blood sodium by no more **than 0.5 mmols/l/hour**.
 - Do not exceed a reduction in plasma sodium of >10 mmols/l/24hrs.
 - A rapid correction may cause cerebral oedema and fits.
- **Oral rehydration** may be possible if the child is not vomiting.
 - This may require a NG tube.
 - The composition of oral rehydration fluids is not crucial and Dioralyte is satisfactory.
 - Can rehydrate (maintenance + deficit) **orally over 24 hours**.

Other considerations

- **Suspected acute severe salt poisoning:** This is a rare and complex situation - Always discuss with a consultant.
- **Hypernatraemia secondary to diabetes insipidus is rare:** Always discuss with consultant. Features of this are listed below:-
 - History of polyuria or polydipsia.
 - urine will be dilute (< 150 mmols/kg)
 - low urine sodium (< 20 mmols/l)
 - high plasma osmolality (> 295 mmols/kg)

In all cases of hypernatraemic dehydration discuss with the consultant if the clinical or biochemical picture is deteriorating.

NUTRITION IN GASTROENTERITIS

1) During rehydration therapy:

- Do not give solid foods
- Continue breast feeding
- NO red flag symptoms then DO NOT routinely give oral fluids other than DIORALYTE;
 - However, consider supplementing with usual fluids
 - If refusing dioralyte consider including milk feeds or water
 - Do not give fruit juices or fizzy drinks
- **RED FLAG SYMPTOMS or signs DO NOT give oral fluids other than DIORALYTE.**

2) After rehydration:

- Give full-strength milk straight away
- Reintroduce the child's usual solid food
- Avoid giving fruit juices and carbonated drinks until the diarrhoea has stopped

➤ **Antibiotics and anti-diarrhoeals**

Do not give anti-diarrhoea medication.

Do not routinely give antibiotics.

Only give antibiotics to children:

- with suspected or confirmed septicaemia
- with extra-intestinal spread of bacterial infection
- younger than 6 months with salmonella gastroenteritis
- who are malnourished or immunocompromised with salmonella gastroenteritis
- who have a confirmed diagnosis of the following:-
 - Clostridium difficile-associated pseudomembranous enterocolitis,
 - giardiasis
 - dysenteric shigellosis
 - dysenteric amoebiasis
 - cholera

Seek specialist advice about antibiotic therapy for children who have recently been abroad.

Children should not return to school until at least 48 hours after the last episode of diarrhoea and vomiting.

Children should not swim in swimming pools for 2 weeks after the last episode of diarrhoea.

➤ **Contacts (inside and outside the Trust including out-of-hours contacts)**

On call paediatric consultant (via switchboard)

Childrens Acute Transport Service (CATS) – 0800 085 0003

➤ **References**

1. Whyte et al (2015) “Guidelines for the management of acute gastroenteritis in Europe.” *Archives of diseases in childhood* 100:308-312
 2. Armon, K et al (2002) “An evidence and consensus based guideline for acute diarrhoea management”, *Archives of diseases in childhood* 86(2): 138
 3. Hartling, et al (2006) “Oral versus intravenous rehydration for treating dehydration due to gastroenteritis in children” *Cochrane Database Systematic Review*.
- 4NICE Guidelines‘Management of acute diarrhoea and vomiting due to gastroenteritis in children under 5. (accessed 7th Aug 2016)
- <https://www.nice.org.uk/guidance/cg84/chapter/1-guidance>
5. Fedorowicz Z, Jagannath VA, Carter B. Antiemetics for reducing vomiting related to acute gastroenteritis in children and adolescents. *Cochrane Database of Systematic Reviews* 2011, Issue 9. Art. No.: CD005506.
 - 6Taylor AT. Nausea and vomiting. In: DiPiro JT, Talbert RL, Yee GI, et al. editor(s). *Pharmacotherapy, A Pathophysiologic Approach*.4th Edition. Stanford CT: Appleton & Lange, 1999:586-96.
 - 7Flake ZA, Scalley RD, Bailey AG. Practical selection of antiemetics. *American Family Physician* 2004; **69**(5):1171.

➤ **Compliance with this guideline (how and when the guideline will be monitored e.g. audit and which committee the results will be reported to) Please use the tool provided at the end of this template**

To be completed and attached to any procedural document when submitted to the appropriate committee for consideration and approval

		Yes/No	Comments
1.	Does the procedural document affect one group less or more favourably than another on the basis of:		
	• Race	No	
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	• Nationality	No	
	• Gender	No	
	• Culture	No	
	• Religion or belief	No	
	• Sexual orientation including lesbian, gay and bisexual people	No	
	• Age	No	
	• Disability - learning disabilities, physical disability, sensory impairment and mental health problems	No	
2.	Is there any evidence that some groups are affected differently?	No	
3.	If you have identified potential discrimination, are any exceptions valid, legal and/or justifiable?	No	
4.	Is the impact of the procedural document likely to be negative?	No	
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If you have identified a potential discriminatory impact of this procedural document, please refer it to the Director of Human Resources, together with any suggestions as to the action required to avoid/reduce this impact.

Checklist for the Review and Approval of Procedural Document

To be completed and attached to any procedural document when submitted to the relevant committee for consideration and approval.

	Title of document being reviewed:	Yes/No	Comments
1.	Title		
	Is the title clear and unambiguous?	Yes	
	Is it clear whether the document is a guideline, policy, protocol or standard?	Yes	
2.	Rationale		
	Are reasons for development of the document stated?	Yes	
3.	Development Process		
	Is it clear that the relevant people/groups have been involved in the development of the document?	Yes	
	Are people involved in the development?	Yes	
	Is there evidence of consultation with stakeholders and users?		A consultant and junior doctors who see pts with this condition wrote this protocol
4.	Content		
	Is the objective of the document clear?	Yes	
	Is the target population clear and unambiguous?	Yes	
	Are the intended outcomes described?	Yes	
5.	Evidence Base		
	Are key references cited in full?	see comment	Article is referenced
	Are supporting documents referenced?	N/A	
6.	Approval		
	Does the document identify which committee/group will approve it?	Yes	If necessary can be presented at Clin guidelines committee
7.	Dissemination and Implementation		
	Is there an outline/plan to identify how this will be done?	Yes	Document will be on hospital intranet
8.	Document Control		
	Does the document identify where it will be held?	Yes	On paediatric site on hospital intranet
9.	Process to Monitor Compliance and Effectiveness		
	Are there measurable standards or KPIs to support the monitoring of compliance with and effectiveness of the document?	Yes	
	Is there a plan to review or audit compliance	Yes	

	Title of document being reviewed:	Yes/No	Comments
	with the document?		
10.	Review Date		
	Is the review date identified?	Yes	In 2 years ie about August 2018
	Is the frequency of review identified? If so is it acceptable?	Yes	Approx every 2 years
11.	Overall Responsibility for the Document		
	Is it clear who will be responsible for co-ordinating the dissemination, implementation and review of the document?	Yes	Dr Raine

Executive Sponsor Approval

If you approve the document, please sign and date it and forward to the author. Procedural documents will not be forwarded for ratification without Executive Sponsor Approval

Name		Date	
Signature			

Relevant Committee Approval

The Director of Nursing and Patient Experience's signature below confirms that this procedural document was ratified by the appropriate Governance Committee.

Name		Date	
Signature			

Responsible Committee Approval – only applies to reviewed procedural documents with minor changes

The Committee Chair's signature below confirms that this procedural document was ratified by the responsible Committee

Name		Date	
Name of Committee		Name & role of Committee Chair	
Signature			

Tool to Develop Monitoring Arrangements for Policies and guidelines

What key element(s) need(s) monitoring as per local approved policy or guidance?	Who will lead on this aspect of monitoring? Name the lead and what is the role of the multidisciplinary team or others if any.	What tool will be used to monitor/check/observe/Assess/inspect/ authenticate that everything is working according to this key element from the approved policy?	How often is the need to monitor each element? How often is the need complete a report ? How often is the need to share the report?	What committee will the completed report go to?
Element to be monitored	Lead	Tool	Frequency	Reporting arrangements
Compliance with guideline	Dr J Raine	Audit	Approx every 2 years	Report/present to paediatric department

