Norfolk and Norwich University Hospitals NHS Foundation Trust

James Paget University Hospitals NHS Foundation Trust

Trust Guideline for the Management of Projectile Vomiting in Infants (Pyloric Stenosis)

A clinical guideline recommended

For use in:	CAU, Blakeney, NICU, Buxton, Paediatric Medicine and Paediatric Surgery Departments, Radiology and Anaesthetic Departments, NNUHFT _
By:	Medical and Nursing Staff
For:	Infants with Projectile vomiting / Pyloric stenosis
Division responsible For document:	Divisions 1, 2 and 3
Key words:	Pyloric stenosis, projectile vomiting, non bilious vomiting, infant
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Assessed and approved by:	Clinical Guidelines Assessment Panel (CGAP)
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To be reviewed before: This document remains current after this date but will be under review	18/01/2025
To be reviewed by:	Milind Kulkarni
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Compliance links: *(is there any NICE related to guidance)*	None
If Yes – does the strategy/policy deviate from the recommendations of NICE? If so, why?	N/A

This guideline has been approved by the Trust's Clinical Guidelines Assessment Panel as an aid to the diagnosis and management of relevant patients and clinical circumstances. Not every patient or situation fits neatly into a standard guideline scenario and the guideline must be interpreted and applied in practice in the light of prevailing clinical circumstances, the diagnostic and treatment options available and the professional judgement, knowledge and expertise of relevant clinicians. It is advised that the rationale for any departure from relevant guidance should be documented in the patient's case notes.

The Trust's guidelines are made publicly available as part of the collective endeavour to continuously improve the quality of healthcare through sharing medical experience and knowledge. The Trust accepts no responsibility for any misunderstanding or misapplication of this document.

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Version and Document Control:

Version Number	Date of Update	Change Description	Author
4	28/9/2018	PACS transfer any US scan image to NNUH/Surgical Centre. Made into a joint guideline.	Khizer Mansoor
4.1	18/01/2022	Reviewed, no clinical changes	Khizer Mansoor

This is a Controlled Document

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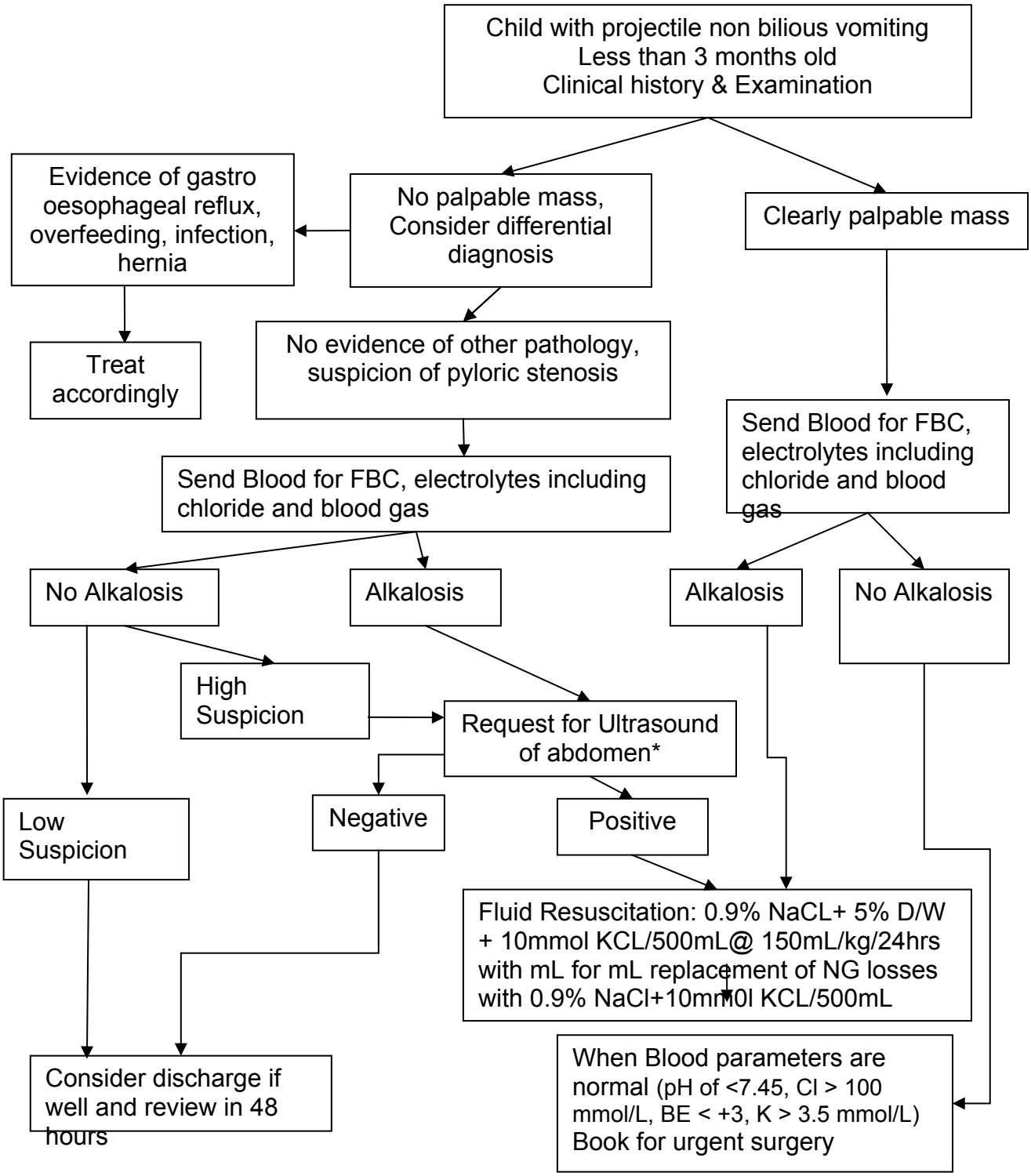
Quick reference guideline/s

This guideline is for diagnosis, preoperative and post operative management of child with non-bilious projectile vomiting. See flowchart.



*** if the US results are equivocal consider review within one week and possible repeat US.**

**** If USS is from outside hospital, we recommend review/repeat scan by our paediatric radiologists.**

2) Objective/s

- This guideline is to be used for infants under 3 months of age who come in with a history of projectile non bilious vomiting. The diagnosis of projectile vomiting should be considered in this age group even if the vomiting is not projectile, but there is a clinical suspicion of pyloric stenosis (e.g. loss of weight, persistent vomiting).
- This guideline is for use by the staff of the paediatric and A&E departments who deal with infants with vomiting.

3) Rationale

The rationale of the guideline is to help early diagnosis of pyloric stenosis, optimise the resuscitation and streamline the pre and post operative care.

Background: Pyloric stenosis presents with a clinical picture of gastric outlet obstruction due to thickening of pyloric muscle. Exact aetiology is not known. It is commonly seen in first born male infants and with a positive family history.

Pyloric stenosis presents with increasingly forceful and ultimately projectile non bilious vomiting. Bilious vomiting needs different management. Vomiting usually occurs after a feed and the child is often hungry after the vomit. Significant weight loss is present in long standing cases. Stools may be dry and pellet like. Haematemesis occurs in about 10% of cases. The differential diagnosis of gastroesophageal reflux, overfeeding, infection (e.g. UTI, ear infection, gastroenteritis, meningitis), and inguinal hernia need to be ruled out.

Appropriate clinical examination, assessment of dehydration and weight loss are important. Gastric peristalsis (waves of muscle contraction across the abdomen passing from the left upper quadrant to the right lower quadrant) may be noticed but is not diagnostic of pyloric stenosis (level D evidence). If a pyloric mass is felt (best felt in the right upper quadrant with the infant supine when examined from the left side), it usually indicates the presence of pyloric stenosis. This examination could be enhanced by performing a test feed. This should be repeated by the operating surgeon. Use of Ultrasound is well established for diagnosis of pyloric stenosis and we recommend a scan to be done locally if the operating surgeon thinks it's needed. External genitalia must be examined in order to rule out a hernia.

4) Broad recommendations

If pyloric stenosis is suspected on history and clinical examination, the child should have bloods taken. An IV cannula and NG tube may be placed at this time. Blood should be examined for FBC, Blood Glucose, U & E, Chlorides, Bicarbonates and Blood gas. This may show a picture of hypokalemic, hypochloraemic, hyponatremic, metabolic alkalosis (abnormal levels when pH of >7.45, Cl < 100 mmol/L, BE > +3, K < 3.5 mmol/L, Na> 130 mmol/L)

If there is palpable mass, blood results are normal and there is no dehydration, early surgery should be considered.

If there is no palpable pyloric mass but a positive picture for alkalosis, ultrasound is the best investigation (Level B/C, 95% sensitivity and specificity). Pyloric stenosis is not an emergency and urgent ultrasound is not required and should ideally be done by an experienced paediatric radiologist.

If there is no alkalosis, and no pyloric mass is felt, clinical suspicion should guide further management. It may include review in 48 hours, early ultrasound or admission depending upon clinical severity (Level D).

If the child has been referred from a peripheral hospital with an ultrasound scan, we recommend review/repeat scan by our paediatric radiologists. PACS transfer any USS image to NNUH/surgical centre.

The child should be resuscitated according to the level of dehydration. Fluid resuscitation should be with 0.9% NaCL+ 5% D/W + 10mmol KCL/500mL@ 150mL/kg/24hrs with mL for mL replacement of NG losses with 0.9% NaCl. In cases of severe dehydration a bolus of 0.9% NaCl @ 10mL/kg can be given initially over half hour and repeated if needed. Once metabolic correction is achieved, continue further fluid management as per the Intravenous Fluid Infusion in Children, Excluding Neonates Trustdocs Id: 1208**.**

The nasogastric losses need to be replaced mL per mL by 0.9% NaCl 500mL with 10mmol KCL. The bloods need to be repeated in 24 hours or prior to proposed surgery time whichever is earlier (level C/D). **A cap gas needs to be done prior to surgery if a venous sample has not been done.**

Surgery is considered only after the blood electrolytes and blood gas parameters are normal (normal levels when pH of <7.45, Cl > 100 mmol/L, BE < +3, K > 3.5 mmol/L, Na> 130 mmol/L (Level D)). With adequate resuscitation, pyloric stenosis does not need emergency surgery and this should be performed on an urgent basis within 8 am – 5 pm period, including weekends. The theatre booking is done only after normal results have been received and discussed with the consultant paediatric anaesthetist.

Correction of pyloric stenosis is achieved surgically by Ramstedt's procedure (either open or laparoscopic) (Level A/B).

Post operatively continue IV maintenance fluid as per IV fluid management guidelines until the infant is able to tolerate enteral feedings. Enteral milk feeding is begun immediately after recovery from anaesthesia. A full feed is offered to the infant by bottle/ breast (Ad Libitum feeds) (Level B). The nasogastric tube is removed one the first feed is tolerated. A small amount of vomiting is expected (few vomits are expected post-operatively specially during the first 24 hours).

The use of pre and post operative ranitidine should be considered in patients showing evidence of gastritis or patients with a long-standing history. This should be documented in post operative orders (Level D).

5) Clinical Audit Standards derived from guideline

A 3 yearly audit should be undertaken to look at the effect of ad libitum feeds, fluid management during the preoperative resuscitation period and Ranitidine use on outcome.

6) Summary of development and consultation process undertaken before registration and dissemination

The authors listed above drafted this guideline on behalf of the Paediatric Department who has agreed the final content.

Evidence: A comprehensive review of English language literature using the electronic databases from 2000 to February 2009 was performed. Articles were selected if they addressed the specific clinical question and personal reviews were excluded. Review articles and text book articles were taken in consideration. The literature was appraised. Due to lack of sufficient randomised controlled trials, the non Grade A recommendations were subject to consensus development.

Consensus: Consensus was first agreed between the consultant paediatric surgeons about pre and post operative management protocol and then was distributed to junior doctors, nurses, consultant paediatricians, neonatologists, paediatric anaesthetists and paediatric radiologists for comments. It has been re circulated for comments within paediatric surgery department in October 2012.

This version has been endorsed by the Clinical Guidelines Assessment Panel.

7) Distribution list / dissemination method

The guideline will be distributed to CAU, A&E, Buxton ward and available on the intranet.

8) References / source documents

1. Guideline for Intravenous Fluid Management in Children on intranet. http://trustdocs/Doc.aspx?id=1208
2. Negative exploration for pyloric stenosis – is it preventable. D Mullasery, S Mallapa, R Shareef et al, **BMC Pediatrics 2008;8:37**
3. Current management of pyloric stenosis. Aspelund G, Langer, **JC Semin Pediatr Surg. 2007 Feb;16(1):27-33**
4. Schwartz MZ. Hypertrophic pyloric stenosis. **In Pediatric Surgery by Grosfeld et al: 6th ed, 2006 Mosby**
5. Ad libitum feeding: safely improving the cost-effectiveness of pyloromyotomy. Puapong D, Kahng D, Ko A, Applebaum H, **J Pediatr Surg. 2002 Dec;37(12):1667-8**