

THAMES VALLEY & WESSEX NEONATAL OPERATIONAL DELIVERY NETWORK

**WESSEX CARE PATHWAY FOR NEONATES (≥34/40) REFERRED
WITH BILIOUS VOMITING FOR EXCLUSION OF MALROTATION**

Approved by/on:	Thames Valley & Wessex Neonatal ODN Governance Group 20 th March 2025
Date of publication	March 2025
Last Reviewed	V1 Feb 2015, V2 Jan 2023, V3 March 2025
Review date (Max 3 years)	March 2028
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Distribution	Wessex Neonatal Clinical Forums Thames Valley and Wessex Neonatal Network website Thames Valley and Wessex Neonatal Network e-bulletin
Related documents	References <ol style="list-style-type: none"> 1. Malrotation of the intestine. Torres AM, Ziegler MM. World J Surg. 1993 May-Jun;17(3):326-31. 2. The burden of excluding malrotation in term neonates with bile stained vomiting. Drewett M, Johal N, Keys C, J Hall N, Burge D. Pediatr Surg Int. 2016 May;32(5):483-6. 3. Management of Bilious Vomiting in the Newborn Period and Radiological Support for Neonatal Services. A BAPM Framework for Practice. February 2024. 4. Bilious vomiting in the newborn: How often is it pathologic? Godbole P, Stringer MD. J Pediatr Surg. 2002 Jun;37(6):909-11. 5. Green for danger! Intestinal malrotation and volvulus. Williams H. Arch Dis Child Educ Pract Ed. 2007 Jun;92(3):ep87-91.
Implications of race, equality & other diversity duties for this document	This guideline must be implemented fairly and without prejudice whether on the grounds of race, gender, sexual orientation, or religion.

**Wessex Care Pathway for Neonates (≥34/40) referred
with Bilious Vomiting for Exclusion of Malrotation**

Contents

Paragraph		Page
	Executive Summary	3
1.0	Introduction	4
1.2	Scope	4
1.3	Purpose	4
2.0	Definitions	5
3.0	Roles and Responsibilities	5
4.0	Guideline Principles	6
	Criteria for referral to the surgical team	6
	Initial management	6
	Process of obtaining a surgical consultation	8
	Emergency Transfers	8
	Non-emergency Transfers	8
	Drive-through for UGI contrast study (<i>only for babies ≥35/40 and ≥1.8kg</i>)	9
	Surgical review following admission	8
	Upper Gastrointestinal Imaging at UHS	9
	Management following surgical assessment and contrast study	9
5.0	Arrangements for review of the policy	10

Appendices

Appendix 1	Drive-through for UGI Contrast Study for Exclusion of Malrotation in Neonates (only considered for babies ≥35/40 and ≥1.8kg)	11
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Executive Summary

Malrotation results from a failure of the gastrointestinal tract to complete normal rotation and fixation as it returns to the abdominal cavity at 8 to 10 weeks' gestation. The incidence of malrotation is estimated at 1:500 live births¹. However acute presentation in the neonatal period is estimated in our network to be about 1:9000 live births². The most concerning feature is the lack of fixation which may permit the small bowel to twist around its narrow base with possible compromise to the superior mesenteric artery (volvulus). The tighter the twist, the more the midgut suffers from obstruction of the lumen, obstruction of venous and lymphatic return, and obstruction of arterial inflow, thus threatening midgut viability. Unless treated in a timely manner there may be extensive ischaemic damage and loss of small bowel resulting in short gut syndrome and parenteral nutrition dependence or death.

The purpose of this care pathway is to provide guidance for the multi-disciplinary team to ensure optimal management of a term neonate referred to the neonatal/ paediatric surgical service for exclusion of malrotation and volvulus in the presence of bilious vomiting.

Over time there has been a creep in practice resulting in a higher number of babies referred to specialist centres for purposes of diagnostic imaging to exclude a diagnosis of malrotation. This has been observed across the UK. Contributory factors are (i) concern about missing a diagnosis of malrotation in a baby with bilious vomiting and (ii) a reducing expertise in paediatric radiology outside specialist centres. Local historical data showed over a 4-year period (2010-2014); 166 patients had UGI contrast study to exclude malrotation of which 1 in 12 (9%) were found to have malrotation². A more recent review of 3 years data (2021-2023) showed 234 patients referred of whom only 1 in 40 (2.5%) had malrotation. This has resulted in increasing burden on neonatal transport services, reducing availability of services for other sick neonates, and unnecessary mother and baby separation with no clear patient benefit.

In 2024 the British Association of Perinatal Medicine (BAPM) published a framework that aimed to support clinicians in reducing this burden by providing guidance on criteria for surgical referral and investigation as well as recommended minimum standards for the provision of paediatric radiology outside of specialist centres³. Guidance on timings of surgical referral and investigations are also provided. This regional guideline has been updated to reflect this new BAPM national framework.

Prediction and identification of these babies is challenging; complete examination and assessment by a senior clinician should be undertaken prior to consider the need to formally exclude a diagnosis of malrotation and the appropriate timing for this. In well babies contrast studies should be undertaken in local hospitals wherever it is possible to achieve this in a timely fashion.

1.0 Introduction

Any term neonate with bilious vomiting should have the diagnosis of malrotation and volvulus considered as part of their diagnostic work-up. In the absence of a clear explanatory diagnosis a safe approach is to rule out the possibility of malrotation. The gold standard investigation for this is an upper gastrointestinal contrast study, by a consultant radiologist with the appropriate expertise, to determine duodeno-jejunal position. If clinical and abdominal signs warrant, immediate emergency surgery should be undertaken. Early consideration for the need for surgical intervention may mean the difference between intestinal salvage and catastrophe.

It is reported that 30% of neonatal malrotation cases present in the first 3 to 7 days of life and 50% by 1 month of age². Bilious vomiting is usually the initial symptom, but abdominal distension is often absent. Typically, these babies will have passed meconium. If there is associated volvulus causing ischaemic damage there may be progression to abdominal distension, the baby will become unwell with unstable haemodynamics and a metabolic acidosis may develop. Blood may pass per rectum or be seen in gastric aspirates.

1.2 Scope

This care pathway is for babies currently on a neonatal unit and is updated and is in line with the BAPM Framework February 2024. It is applicable to babies born at $\geq 34/40$ with bilious vomiting, it should not be applied to the assessment and management of more preterm infants with bilious aspirates. Babies who require surgical referral should be referred from a local NNU to UHS via the SONeT hub. This should be done by a senior clinician who has assessed the baby and feels that exclusion of malrotation is required.

Babies who are being referred from a local NNU to UHS for the purposes of a contrast study because the contrast study cannot be done locally in an acceptable timescale may be considered for the drive-through contrast study pathway. Criteria for this pathway are that they should be in a neonatal unit, gestational age $\geq 35/40$, weight $\geq 1.8\text{kg}$ and not have concern that they are unwell.

1.3 Purpose

The purpose of this care pathway is to provide guidance for the multi-disciplinary team to ensure optimal management of a neonate referred to the UHS neonatal surgical service for exclusion of malrotation in the presence of bilious vomiting.

2.0 Definitions

Bilious vomiting	Emesis containing green bile suggestive of bowel obstruction distal to the ampulla of Vater	
Malrotation	Failure during embryonic development of normal rotation of the midgut	
Volvulus	Twisting of part of the intestine	
Parenteral Nutrition	Nutrition provided by central intravenous route	PN
Upper Gastrointestinal contrast study	An upper gastrointestinal (UGI) series is an investigation performed under x-ray looking at the upper and middle sections of the gastrointestinal tract	UGI
SONeT	Southampton Oxford Neonatal Transport service	
UHS	University Hospital Southampton NHS Foundation Trust	

3.0 Roles and Responsibilities

All staff involved in the care of the newborn within the Wessex Neonatal Operational Delivery Network should be aware of this care pathway. Most referrals should be made by the neonatologist or paediatrician responsible for the initial care and assessment of the newborn baby. Malrotation with or without volvulus is one possible cause of bilious vomiting in the newborn although studies have shown many babies with bilious vomiting do not have surgical pathology⁴.

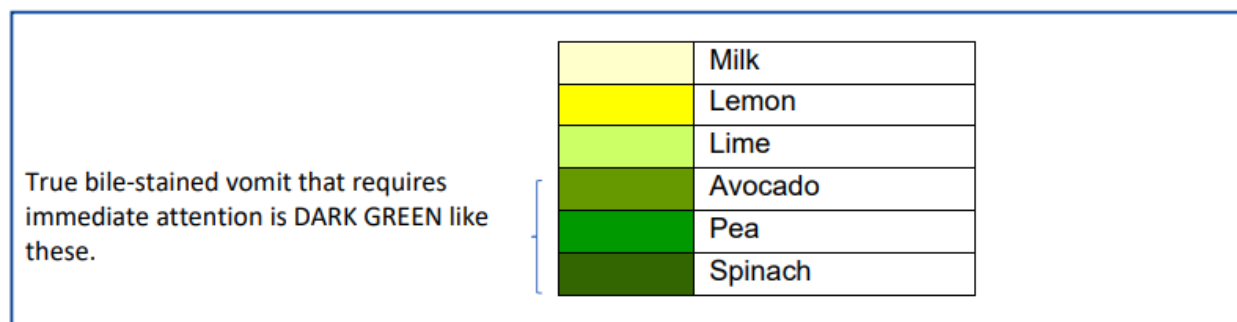
All babies with suspected surgical pathology will have a designated Consultant Paediatric Surgeon, with joint responsibility with a Consultant Neonatologist if admitted to the neonatal unit, in accordance with operational policy. If surgical pathology is excluded, it is the responsibility of the paediatric surgical team to handover responsibility for ongoing management as applicable and document this accordingly.

4.0 Guideline Key Principles

Criteria for referral to the surgical team

In the presence of malrotation, with or without volvulus, babies can develop bilious vomiting. Bilious vomit is described as green (avocado/ pea/ spinach) emesis as shown in Figure 1.

Figure 1.

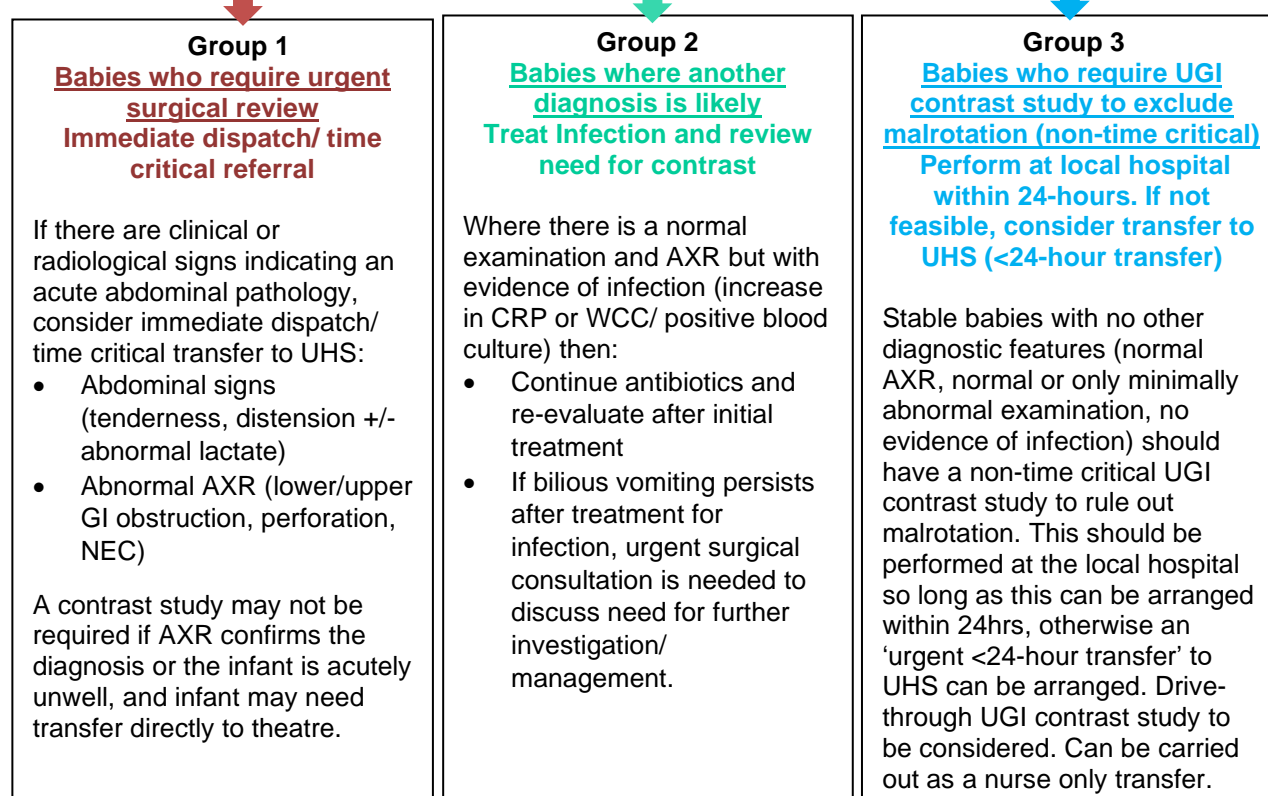
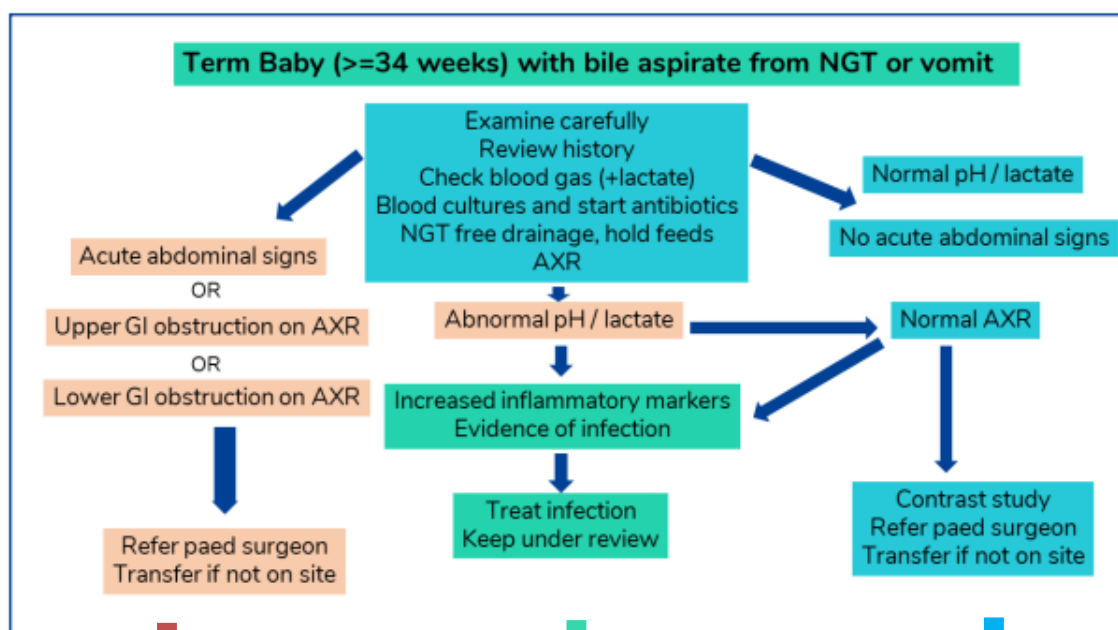
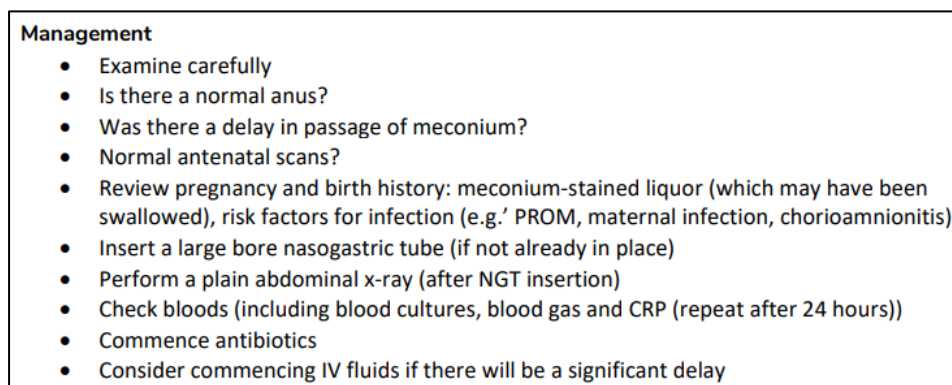


The surgical literature states any term neonate with bilious vomiting mandates immediate assessment and evaluation and should have this diagnosis considered⁵. The decision to refer a baby with bilious vomiting for exclusion of malrotation is a clinical one and should be made by a senior neonatologist/ paediatrician. If malrotation is considered as a possible cause for their presentation then an UGI contrast study should be considered and arranged to be completed at the local hospital in well babies where possible. If a surgical diagnosis is considered likely, the surgical team should be consulted.

The BAPM framework outlines initial management guidance and a decision tree to aid clinicians (figure 2). Babies can be categorised into 3 groups:

1. **Babies who require urgent surgical review** or emergency uplift transfer for a time critical surgical review on the basis of their clinical presentation and/or current status.
2. **Babies where another diagnosis is likely** e.g. infection – treat likely diagnosis and keep under review. If bilious vomiting persists after treatment for infection, discuss via conference call with tertiary neonatologist and paediatric surgeon and consider a contrast study. If the baby remains well this may be completed at the local hospital so long as this can be arranged within an acceptable agreed timeframe (usually within 24 hours).
3. **Babies who require upper GI contrast to exclude malrotation and is not urgent** - these are babies with (no evidence of acute abdominal pathology and stable and well with no other diagnosis likely to explain the bilious vomit. signs). Ideally, an UGI contrast study should be completed at the local hospital so long as this can be arranged within an acceptable timeframe (usually within 24 hours).

Figure 2. BAPM framework: guidance of initial management and decision tree



Process of obtaining a surgical consultation

In summary, babies who need a surgical referral are those who fall into:

- Group 1
- Group 2 – if bilious vomiting persists after treatment for infection
- Group 3 – if malrotation confirmed on local UGI contrast OR if UGI contrast cannot be done locally in an appropriate timescale

1. Neonate to be assessed by senior clinician at local hospital, **all babies must be discussed with DGH consultant** prior to referral.
2. Prior to surgical consultation:
 - AXR to be made available to the Southampton team via PACS.
 - For group 2 and 3 babies, explore feasibility of completing UGI contrast study locally including timing
3. Contact SOnET for surgical consultation – this will be with Surgical Registrar or Consultant, SOnET team and the local referring clinician. Consultation/ referrals made directly to the surgical team will not be accepted. If surgical consultant is not initially on the conference call but their contribution is felt helpful, then they should be patched in.
4. During this call the decision will be made as to whether the baby should be: accepted for emergency uplift transfer, is suitable for an UGI contrast at the local hospital, or if accepted for transfer, whether they are suitable for drive-through UGI contrast study (*only for babies $\geq 35/40$ and $\geq 1.8\text{kg}$*).
5. If accepted for transfer and no bed available on NNU at UHS then a possibility of a bed on PICU at UHS should be investigated by the surgical team prior to transfer. If no bed is available on either NNU or PICU then transfer to another surgical centre may be required. This decision should be jointly made by the surgical consultant and the SOnET clinical team.

Emergency Transfers

One of the main aims of the BAPM framework is to reduce the transfers of well babies for UGI by using the group 1-3 categories to determine which transfers are imperative. Therefore, only babies categorised into group 1 or babies found to have malrotation on UGI contrast performed at local units require to be completed as emergency uplift.

In the circumstance when a baby cannot have their UGI contrast performed at their local centre within an appropriate time frame, transfer to UHS would be considered either via the drive-through pathway or admission on to UHS NNU/ PICU (Appendix 1).

Non-emergency Transfers

SOnET will retrieve babies from neonatal units in an appropriate time frame based primarily on the clinical condition of the baby and on discussion with the surgical team. If the clinical condition of the baby changes whilst waiting for transfer, the SOnET team should be recontacted. Users of SOnET service ensure that all referral requests are made to SOnET hub in a timely manner.

Upper Gastrointestinal Imaging at UHS

UGI contrasts are undertaken by a Consultant Paediatric Radiologist. Requests should be made to the radiology department by the surgical team following assessment of the baby, as outlined below. The paediatric radiology team at UHS accept that these studies should be performed in a timely manner and will prioritise according to clinical need.

Requests should be made by the surgical team directly to the on call paediatric radiologist. The radiology registrar/ consultant will then organise accordingly and liaise back to the surgical team.

Management following surgical assessment and contrast study

Babies who have a surgical diagnosis will be managed by the paediatric surgical team. Babies requiring immediate surgery should be transferred to the operating theatre as soon as possible. If this is not possible immediately, care in an alternative location (e.g. PICU) may be required.

If no surgical problem is identified consideration will be made by the surgical team as to where ongoing management is best placed. Babies undergoing a drive-through UGI contrast will typically be repatriated to the referring hospital. Timing of repatriation will be dependent on the SOnET activity and in accordance with SOnET transfer policy. If repatriation is not immediate consideration will be made by the UHS teams as to where the baby is best placed until repatriation can occur.

There may be a small number of babies who do not have an immediate surgical diagnosis in whom it is desirable to have a period of ongoing assessment at UHS, these babies should be cared for on NNU at PAH whenever possible.

5.0 Arrangements for Review of the Policy

This policy will be reviewed every 3 years as appropriate.

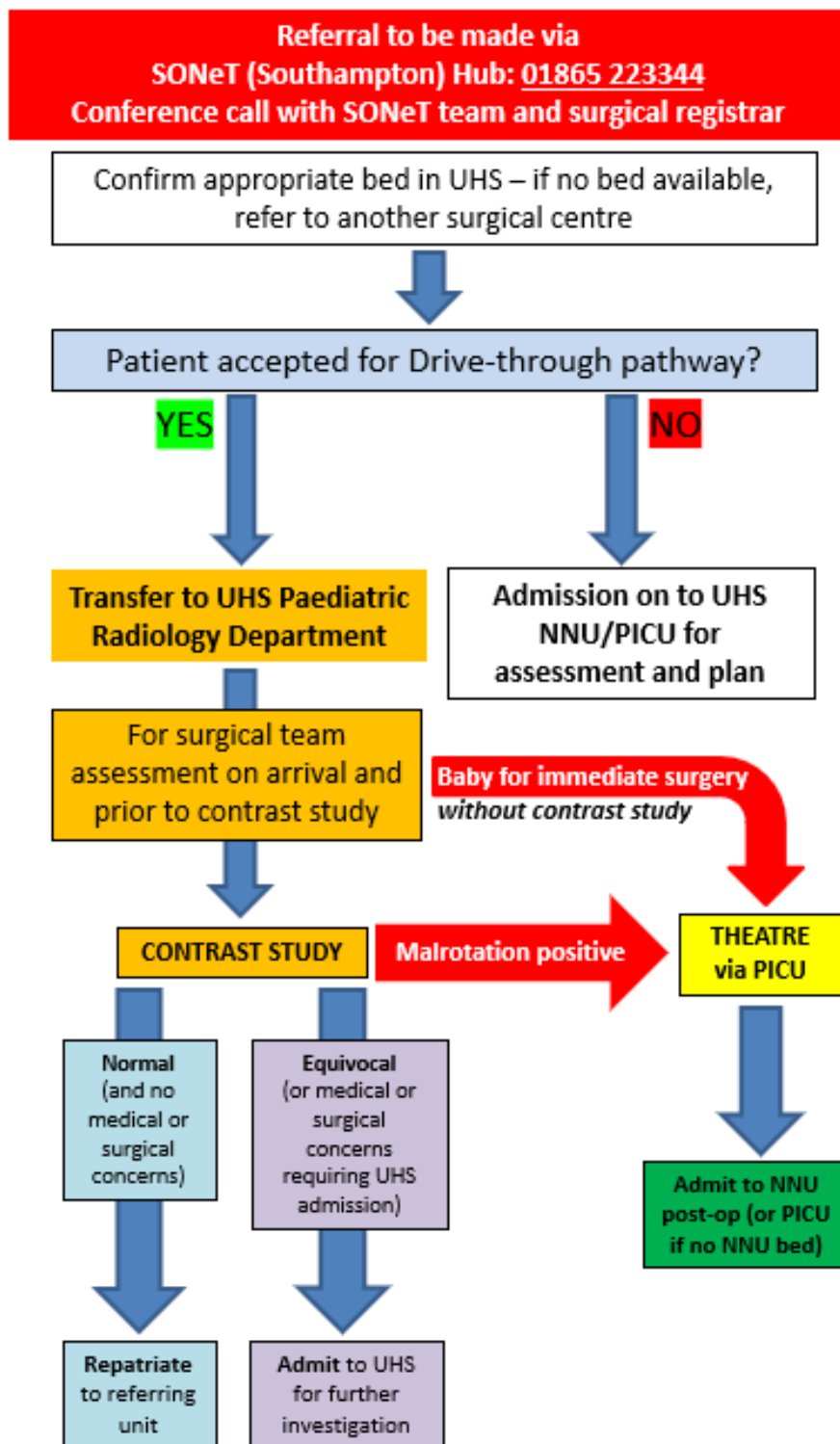
Version Control:

Version	Date	Details	Author(s)	Comments
1	Feb '15	Final for ratification	Melanie Drewett	Wessex Neonatal Clinical Forum
1.7	Jan '17	Updated to reflect the Network Transport Services. Document reviewed and Emergency Transfer (page 6) revised by Dr Puddy and Mr Keys.	Melanie Drewett Mr Charles Keys Dr Victoria Puddy	Approved by TV&W Neonatal ODN Governance Group
1.8	Mar '17	Transposed to the Network format. Link for the Related Trust Documents removed as not available outside UHS, therefore Dr Victoria Puddy removed from the Author list.	Melanie Drewett Mr Charles Keys Dr Victoria Puddy	Updated as requested
1.9	Apr '17	Network Manager/Chair to approve	Melanie Drewett Mr Charles Keys	Approved
2.0	Feb '22	Updated with Rapid Assessment Pathway (appendix 1) Entire document reviewed and updated accordingly.	Hannah Wells Mr Nigel Hall	Circulated Dec 22, finalised for ratification Jan 23
3.0	Feb '25	Updated to sit correctly alongside the BAPM framework. Updated March 2025 prior to ratification in response to comments.	Hannah Wells Mr Nigel Hall Jessica Ng	Ratified March 2025
Review Date: March 2028				

Appendix 1: Drive-through Pathway for Exclusion of Malrotation ($\geq 35/40$ and $\geq 1.8\text{kg}$)

Babies transferred for Drive-through upper GI contrast to exclude malrotation at UHS
 For babies transferred by SONeT Wessex Hub only from TVW (South) ODN Neonatal Units
Inclusion criteria: $\geq 35/40$ and $\geq 1.8\text{ kg}$, clinically well baby, admission on to neonatal unit
Exclusion criteria: $<35/40$ or $<1.8\text{kg}$, unwell baby, admission on to paediatric ward

STANDARD PROCESS



Prior to referral:

Assess baby as per 'Wessex Care Pathway for neonates ($\geq 34/40$) referred with bilious vomiting for exclusion of malrotation' (Fig 3):

- Ensure wide bore NG tube inserted – aspirate and on free drainage
- Obtain AXR
- Infant to be assessed by senior clinician
- If an upper GI contrast is indicated, try to perform at local centre

Prior to transfer:

- Obtain maternal blood sample
- If mother is an in-patient, they do not need to be transferred to UHS unless confirmed UHS admission

Other considerations:

- Following clinical team assessment – if baby is unwell, then directly transfer to neonatal unit rather than to radiology for Drive-through pathway
- The timing of repatriation is dependent on SONeT activity – baby may be admitted to UHS until the transfer

Hannah Wells/Jess Ng/Mr Nigel Hall (Jan 2025)