

# Diagnostic Imaging Pathways - Paediatric, Abdominal Pain (Acute Non-Traumatic)

## Population Covered By The Guidance

This pathway provides guidance on imaging a child with non-traumatic abdominal pain.

**Date reviewed: July 2014**

**Date of next review: 2017/2018**

**Published: July 2014**

## Quick User Guide

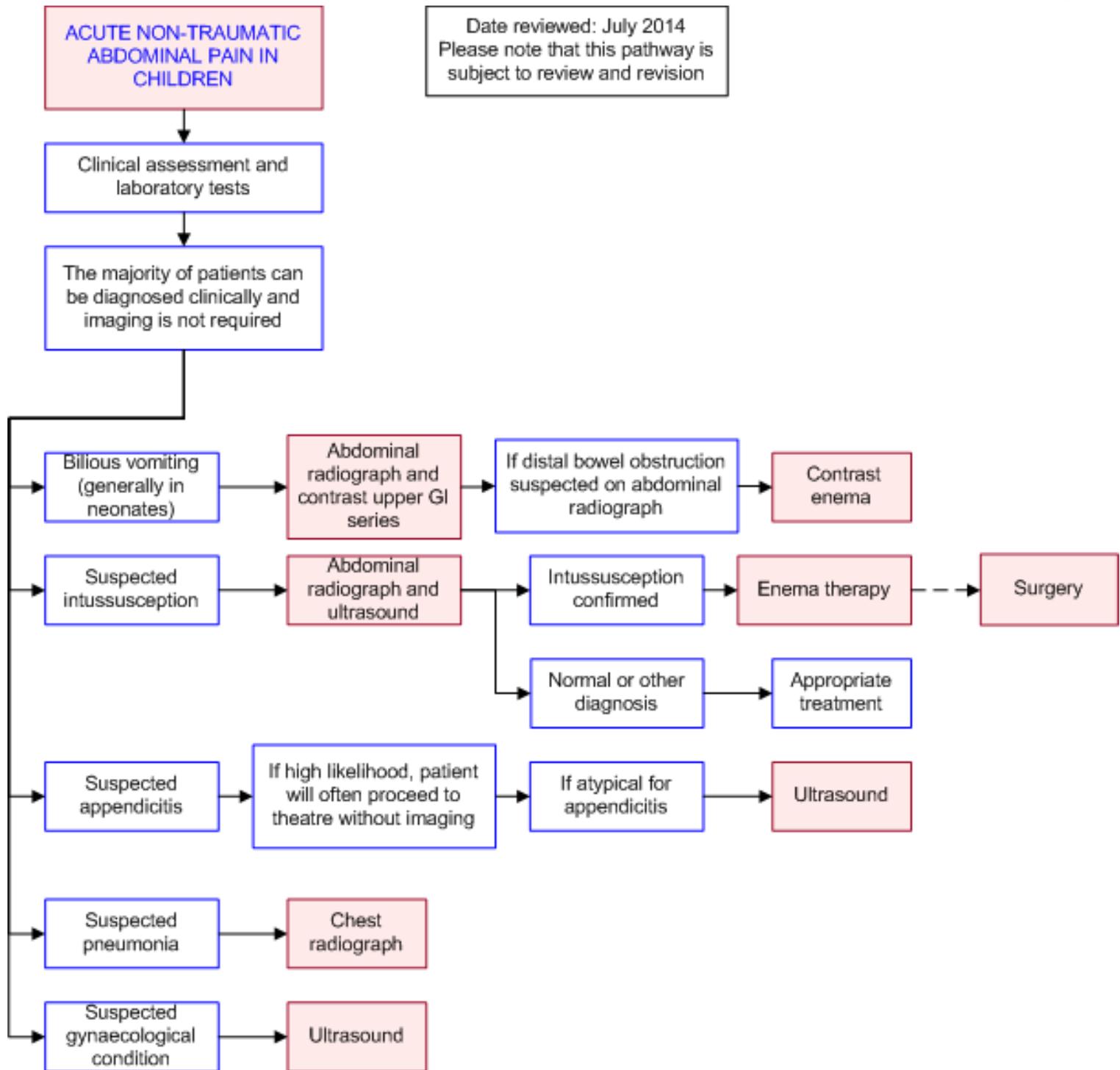
Move the mouse cursor over the PINK text boxes inside the flow chart to bring up a pop up box with salient points.

Clicking on the PINK text box will bring up the full text.

The relative radiation level of each imaging investigation is displayed in the pop up box.

SYMBOL	RRL	EFFECTIVE DOSE RANGE
	None	0
	Minimal	< 1 millisieverts
	Low	1-5 mSv
	Medium	5-10 mSv
	High	>10 mSv

## Pathway Diagram



## Image Gallery

*Note: These images open in a new page*

1a



### Intussusception

Image 1a (longitudinal), 1b (transverse) and 1c (doppler) (Ultrasound):  
Intussusception with oedematous bowel walls.



Image 2: Resection of a caecal intussusception showing the relationship between the intussusceptum and intussusciens.

## Teaching Points (Acute non-traumatic abdominal pain)

- The imaging modality of choice is dependant on the clinical history and examination, as well as the most likely differential diagnosis with the age of the child in mind
  - In infants with vomiting, consideration should be given to bowel obstruction or hypertrophic pyloric stenosis (HPS). In the first case plain radiography/contrast enhanced upper GI study is indicated. In HPS an ultrasound is recommended
  - In older infants, intussusception should be considered. Ultrasonography is the imaging modality of choice

## Plain Radiography

### Bilious Vomiting

- Plain films are appropriate in neonates or infants who present with bilious vomiting as it can help to differentiate proximal from distal bowel obstruction [1](#)
- It may suggest the presence of volvulus-related ischaemia, or specific diagnoses such as volvulus or duodenal atresia [1,2](#)

### Intussusception

- Several radiographic signs suggestive for intussusception have been described [3,4,5](#)
- If a normally located caecum containing gas or faeces is seen the diagnosis of intussusception is unlikely [6](#)
- The accuracy of plain radiography for the diagnosis of intussusception has been shown to vary from 40-90%. Plain radiography is no substitute for ultrasonography for diagnosis but may demonstrate other causes of abdominal pain and may show evidence of intestinal perforation which is a contraindication to enema treatment [4,6,7,8](#)
- If there is high clinical suspicion for intussusception, an imaging modality with high sensitivity such as ultrasound is necessary [3,7](#)

## Contrast Upper GI Series

- The imaging study of choice to evaluate bilious vomiting in neonates and infants. Exceptions include critically ill patients who require urgent surgical intervention and suspected complete duodenal obstruction [9,10](#)
- Involves the use of a contrast agent to evaluate the stomach, duodenum and position of the duodeno-jejunal junction. Iodinated non-ionic contrast agents are used in acutely unwell patients and barium studies are reserved for non-acute situations where acute surgical intervention is unlikely. Contrast can be administered through a naso-gastric tube (preferred in acute) or orally
- Upper GI contrast studies are primarily used to diagnose malrotation/volvulus and detect other obstructive lesions of the upper GI tract [11](#)
- With malrotation/volvulus, the ligament of Treitz (duodenojejunal junction) is typically located inferiorly and to the right of normal [2,9,10,11,12](#)

## Chest Radiography

- Chest radiography is commonly used for the investigation of paediatric pneumonia
- The diagnostic yield of chest radiography for detecting pneumonia is generally low; however chest radiography is warranted in patients with clear clinical manifestations of pneumonia (eg.cough, wheeze, high fever, decreased oxygen saturation, high respiratory rate). The greater number of clinical risk factors, the more likely the diagnosis of radiographic pneumonia [44-46](#)

## Contrast Enema

- Its primary use is for evaluation of distal obstruction (eg. atresia, meconium ileus). The location of the caecum and proximal colon can suggest malrotation but it is neither sensitive nor specific in this regard [13](#)

## Enema Therapy for Intussusception

- Treatment options for intussusception include enema therapy and surgery. Contrast enema therapy is the treatment of choice for reduction of intussusception [3](#)
- The rationale for enema therapy is to exert pressure on the apex of the intussusceptum and in doing so push it back from the pathological to the normal position [3](#)
- Contraindications for enema therapy include untreated shock, evidence of bowel perforation and/or peritonitis [3](#)
- There are a number of agents used to perform enema therapy including air, barium, water-soluble contrast. There are few randomised control trials, one of which showed no significant difference. However the consensus among paediatric radiologists in Australia employing fluoroscopic guided reduction is the use of air enema if there is no clinical evidence of bowel perforation [22,38-41](#)
- Compared to barium, there is a smaller risk of bowel perforation using air as the agent for enema therapy [41](#)
- If required, fluid resuscitation should occur prior to enema therapy
- If the initial attempt is unsuccessful, the enema can be repeated 1-3 hours later
- The technique of ultrasound guided saline enemas has been shown to be an option that does not require exposure to radiation but is not widely used due to the lack of expertise and concern regarding its ability to detect the occurrence of perforation [3](#)
- Rates of perforation when enema reduction is attempted are reported to be generally <1% and factors like free fluid in peritoneum, bowel wall necrosis, long duration of symptoms and younger

- patients (<7 months) may be associated with increased risk of perforation [41](#)
- Recurrence rates following enema reduction using either hydrostatic or pneumatic have been reported to be around 10% and most recurrences occur soon after the initial reduction [41,42,43](#)
- Children with high recurrence rate, non-reduction of intussusception should be investigated for pathological lead points (e.g. Meckel's diverticulum, polyps, lymphomas) which may need surgical intervention

## Surgery

- Surgery is indicated if enema therapy fails to reduce the intussusception or is contraindicated (uncorrected shock/perforation/established peritonitis)
- Surgery usually involves manual reduction of intussusception or segmental bowel resection with end-to-end anastomosis if manual reduction fails or if non-viable bowel loops are discovered after manual reduction
- Recurrence rate following manual reduction is 1 % and almost none following surgical resection [43](#)

## Ultrasound

### Intussusception

- Has a sensitivity of 98-100% for the diagnosis of intussusception [14-17](#)
- Axial and longitudinal images are used to try and identify the intussusception mass [3](#)
- Various terms have been used to describe the characteristic appearance of the mass [17-21](#)

### Malrotation / Volvulus

- There are features on ultrasound that may suggest a diagnosis of malrotation/volvulus including inversion of the normal relationship between the superior mesenteric artery and vein; or the 'whirlpool' sign of a side-by-side arrangement of superior mesenteric vessels with opposite flow directions. However, these signs are neither sensitive nor specific and if there is clinical suspicion of malrotation/volvulus, an upper GI contrast study is indicated [23-27](#)

### Appendicitis

- Routine imaging is not required if a diagnosis can be established on history and physical examination [28](#)
- The principal imaging technique for evaluating suspected appendicitis is graded-compression sonography. In children this has a sensitivity and specificity of between 78%-100%, and 88%-95% respectively. Sensitivity and specificity is higher for uncomplicated appendicitis compared to cases with appendiceal perforation [28,29,30](#)
- Criteria for sonographic diagnosis is visualisation of an incompressible appendix that has a maximal cross-sectional diameter greater than 6mm, identification of an appendicolith, positive sonographic McBurney sign, demonstration of a complex mass, or focal fluid collection representing a peri-appendiceal abscess following perforation [28,29](#)

### Gynaecological Disorders

- Gynaecological disorders should be considered especially in adolescent girls. Disorders include Mittelschmerz syndrome, ovarian torsion, pelvic inflammatory disease, and ectopic pregnancy

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References are graded from Level I to V according to the Oxford Centre for Evidence-Based Medicine, Levels of Evidence. [Download the document](#)

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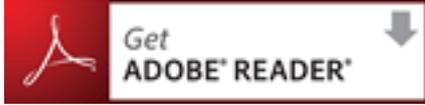
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