Diagnostic Imaging Pathways - Bowel Obstruction (Suspected)

Population Covered By The Guidance

This pathway provides guidance for imaging adult patients with suspected bowel obstruction, including the roles of plain abdominal radiography and more advanced imaging.

Date reviewed: January 2012

Date of next review: 2017/2018

Published: January 2012

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 (RRL) 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

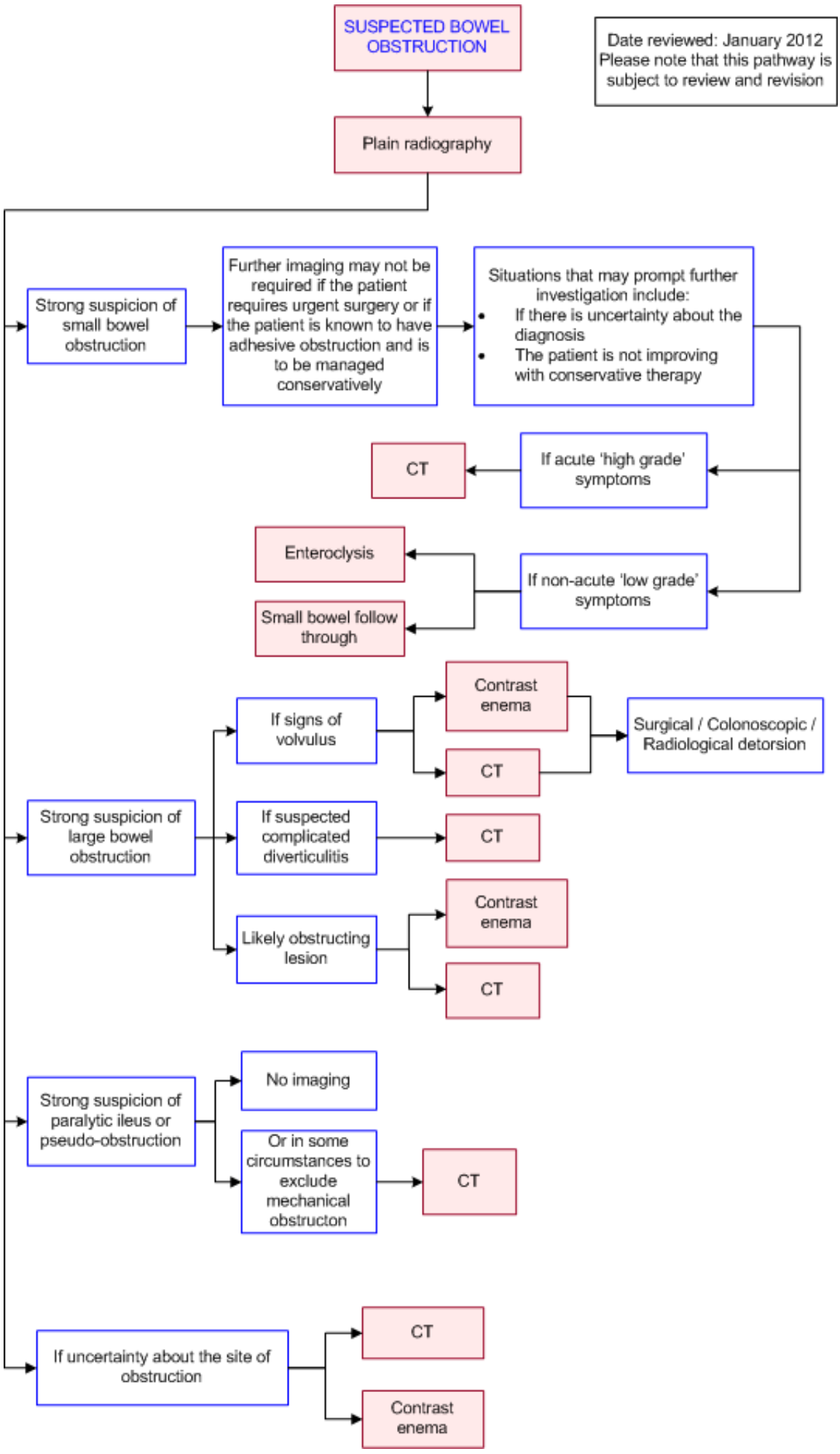


Image Gallery

Note: These images open in a new page

1a

Small Bowel Obstruction

Image 1a (Plain radiograph, Supine view): Multiple dilated loops of small bowel.

1b

Image 1b (Plain radiograph, Erect view): Multiple dilated loops of small bowel with air-fluid levels and "string of pearls" sign indicating a mechanical small bowel obstruction.

2a

Incarcerated Small Bowel Hernia

Image 2a (Plain radiograph): Multiple dilated loops of small bowel in the upper abdomen.

2b

Image 2b (Plain radiograph): Lower abdominal film showing increased density in the right obturator foramen.

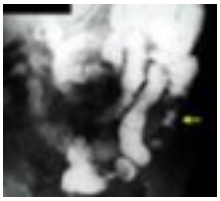
2c

Image 2c (Computed Tomography): Coronal view of the same patient demonstrating an incarcerated small bowel. Dilated proximal loops of small bowel enter a large right inguinal hernia. The distal small bowel loop exiting the hernia is collapsed.

2d

Image 2d (Computed Tomography): Axial view showing the dilated small bowel loop in the right inguinal hernia (arrow).

3



Malignant Small Bowel Obstruction

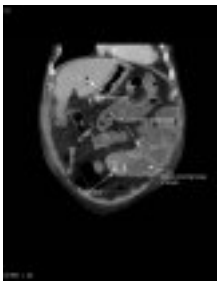
Image 3 (Small bowel enteroclysis): Small bowel obstruction due to a serosal metastasis (arrow).

4

Gallstone Ileus

Image 4 (Plain radiograph): Multiple loops of distended small bowel with air in the biliary tree (arrow).

5



Gallstone Ileus

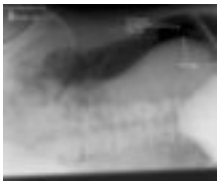
Image 5 (Computed Tomography): A large gallstone is impacted in the small bowel causing mechanical obstruction. Note air in the biliary tree.

6

Pneumoperitoneum

Image 6 (Plain radiograph): Perforated bowel and pneumoperitoneum. The intraabdominal gas outlines the liver edge, gallbladder and falciform ligament.

7



Pneumoperitoneum

Image 7 (Plain radiograph, Lateral decubitus): Perforated bowel with pneumoperitoneum. The intraabdominal gas outlines the liver edge and chest wall.

8a

Large Bowel Obstruction

Image 8a (Plain radiograph): Distension of the caecum, ascending and transverse colon.

8b

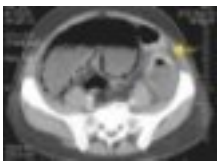


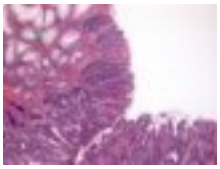
Image 8b (Computed Tomography): CT of the same patient showing marked caecal distension secondary to a constricting tumour (arrow).

9a

Colorectal Carcinoma

Image 9a: A right hemicolectomy showing a large, ulcerated and exophytic caecal adenocarcinoma.

9b



9c

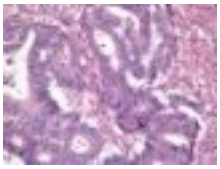


Image 9b (H&E, x2.5) and 9c (H&E, x10): Histological sections showing a moderately differentiated colorectal adenocarcinoma composed of malignant glands invading into the bowel wall (blue arrows). The glands are lined by cells showing marked nuclear atypia. Normal colonic mucosa is included for comparison (green arrow).

10

Caecal Volvulus

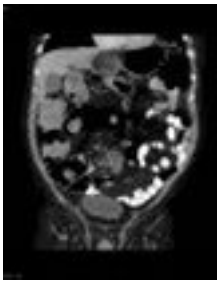
Image 10 (Plain radiograph): Markedly distended loop of large bowel from a caecal volvulus.

11

Sigmoid Volvulus

Image 11 (Plain radiograph): Markedly dilated loop of large bowel. The dense white line between the limbs (arrow) points to the origin of the volvulus.

12



Sigmoid Volvulus

Image 12 (Computed Tomography): Sigmoid volvulus with the classical "whirl" sign representing the twisted sigmoid mesentery (arrow).

Teaching Points

Small Bowel Obstruction

- Plain Films
    - May not diagnose low-grade obstruction

    - Rarely show the cause of obstruction
- If further imaging is required
    - CT is the investigation of choice in high-grade obstruction
    - Small bowel enteroclysis (or follow-through) if obstruction is low-grade or recurrent

Large Bowel Obstruction

- Plain films may show volvulus (sigmoid or caecal)
- The degree of caecal distention is important in assessing the urgency for decompression
- Further imaging may be by contrast enema or CT

Computed Tomography (CT) in Evaluation of Large Bowel Obstruction (LBO)

- Indicated as an alternative to contrast enema in evaluation of large bowel obstruction, particularly with elderly and/or immobile patients 14
- Advantages
    - Does not require insertion of rectal tube and contrast and is therefore better tolerated than a contrast enema
    - In one study, successfully diagnosed colonic obstruction in 96% of patients and pseudo-obstruction in 93% of patients 15
- Limitations 15
    - False negative and false positive results
    - Limited diagnostic utility with partly obstructing lesions

Computed Tomography (CT) in Evaluation of Small Bowel Obstruction (SBO)

- Generally considered the imaging modality of choice when plain abdominal radiography and the clinical features suggest an acute small bowel obstruction 1,2,3,4,8
- 90-96% sensitivity for detection of acute high-grade obstruction 1,2,3,9,10
- Useful in 4
    - Confirming or excluding small bowel obstruction (versus pseudo-obstruction) 1,2,3,11
    - Defining the degree and site of obstruction 1,8,11
    - Identifying the cause of small bowel obstruction (73-95% sensitivity) 1,3,8,10,12
    - Confirming or excluding the diagnosis of ischaemia (>90% sensitivity and specificity) 11,12,13
- Advantages 4
    - Superior to enteroclysis in showing extraluminal masses, revealing abscesses, malignancy, anterior adhesions as well as features of strangulation 3
    - Ability to depict other causes of an acute abdomen
- Limitations
    - Lower sensitivity (approximately 50%) for the detection and location of low-grade small bowel obstruction 1,9

Enteroclysis

- Requires nasoduodenal intubation and the administration of contrast, with images being taken to observe the passage of contrast through the small bowel 2
- Imaging modality of choice for evaluation of low-grade or intermittent small bowel obstruction 2,4
- Advantages
    - Superior to CT in diagnosis and defining the location of the low-grade obstruction 16
    - Has the ability to gauge the severity of obstruction objectively 5
- Findings in small bowel obstruction include 2
    - Dilatation of loops of small bowel
    - Delayed transit time of the barium to a point of transition in the calibre of the bowel lumen
- Limitations 2
    - Need for nasoenteric intubation
    - Time required for contrast to reach the obstruction
    - Dilution of barium because of excess residual intraluminal fluid
    - Demonstration of extrinsic causes is sometimes difficult
    - Contraindicated in complete obstruction with suspected bowel ischaemia
- Role of CT enteroclysis in the diagnosis and management of small bowel obstruction is being evaluated 17

Small Bowel Follow Through (SBFT)

- Ingestion of oral contrast is followed by intermittent fluoroscopy of the small bowel every 15 to 30 minutes until contrast reaches the right colon
- In cases of high-grade obstruction, dilution of oral contrast in dilated proximal small bowel may diminish the ability to assess mucosal detail and the entire length of the small bowel 3,19,20
- Using a cutoff of 4 hours to differentiate between complete/high-grade obstruction from lesser degrees, SBFT was able to predict 96% of patients who did not require surgery, but only 56% of those with high-grade obstruction 4
- In suspected low-grade small bowel obstruction, a dedicated small bowel follow through examination is appropriate if enteroclysis is unavailable 19
- Findings in small bowel obstruction include 2
    - Failure of contrast to reach the colon within 4 hours
    - Dilatation of loops of small bowel
    - Delayed transit time of the barium to a point of transition in the caliber of the bowel lumen
    - With complete obstruction, no barium will be visualised past the point of obstruction in delayed images taken 24 hours after administration of contrast
    - With partial obstruction, barium will pass the obstructed portion into collapsed bowel loops
- Advantages 2
    - Does not require nasointestinal intubation
    - Compared to enteroclysis, SBFT is easier to perform and does not require additional expertise
- Limitations 2,19
    - Time required for contrast to reach the obstruction
    - Dilution of barium because of excess residual intraluminal fluid resulting in non-uniform small bowel filling
    - Partially obstructing lesions may not be visualised due to limitations in assessment of intestinal distensibility and fixation of small bowel loops

- Inability of the patient to drink sufficient quantities of barium
- Contraindicated in complete obstruction with suspected bowel ischaemia

Single Contrast Retrograde Enema

- Useful investigation in the management of patients with apparent large bowel obstruction 18
- 96% sensitivity and 98% specificity diagnosing large bowel obstruction 6
- Delineates the level of large bowel obstruction and distinguishes distal small bowel obstruction from colonic obstruction 18
- In some patients in whom an acute distal small bowel obstruction is suspected on plain abdominal films, or whom the level of obstruction is indeterminate, it is appropriate to perform a single contrast retrograde enema to exclude a caecal lesion
- Dilute barium or water soluble iodinated contrast is used. If surgery is imminent, water-soluble contrast is preferred
- Limitations: The examination is sometimes incomplete if a patient cannot hold the contrast or tolerate insertion of the rectal tube. False positives (e.g. localised spasm) and false negatives may lead to misdiagnoses 15

Plain Radiograph

- The initial imaging study of choice for confirming bowel obstruction, defining the approximate level of obstruction and may very rarely show the likely cause; e.g. gallstone ileus, incarcerated hernia, closed loop obstruction/volvulus and ischaemic bowel 1,2,3,4
- 60-70% sensitivity for detection of small bowel obstruction 1,5
- Performs better in high-grade obstruction 1
- Findings suggesting the diagnosis of small bowel obstruction include 1,2
    - Distended loops of small bowel
    - Collapsed colon
    - The "string of pearls" sign resulting from the small amount of residual air compared with the large amount of retained fluid
    - Pseudotumour related to distended fluid filled loops
- Approximately 80% sensitivity for detecting and predicting the level of large bowel obstruction 6,7
- In large bowel obstruction, it is important to note the degree of caecal distension on the plain abdominal films, since marked distension will point to the need for urgent decompression (by surgery or other intervention) to prevent caecal perforation
- Limitations 1,2
    - Fails to diagnose the cause of obstruction in most cases
    - In obstruction of ileocaecal region, it may be difficult to determine whether the level is in the proximal large bowel or distal ileum
    - Cannot reliably detect the presence of ischaemic complications

References

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

1. Maglinte DDT, Reyes BL, Harmon BH, et al. **Reliability and role of plain film radiography and CT in the diagnosis of small bowel obstruction.** AJR 1996;167:1451-5. (Level III evidence)
2. Macari M, Megibow A. **Imaging of suspected acute small bowel obstruction.** Seminars in Roentgenology 2001;36(2):108-17. (Review article)
3. Peck JJ, Milleson T, Phelan J. **The role of computed tomography with contrast and small bowel follow-through in management of small bowel obstruction.** Am J Surg 1999;177:375-8. (Level III evidence)
4. Burkill GJC, Bell JRG, Healy JC. **The utility of computed tomography in acute small bowel obstruction.** Clinical Radiology 2001;56:350-9. (Review article)
5. Shrake PD, Rex DK, Lappas JC, et al. **Radiographic evaluation of suspected small bowel obstruction.** Am J Gastroenterol 1991; 86:175-8. (Level III evidence)
6. Chapman AH, McNamara M, Porter G. **The acute contrast enema in suspected large bowel obstruction: value and technique.** Clinical Radiology 1992;46:273-8. (Level III evidence)
7. Grunshaw ND, Renwick IGH, Scarisbrick G, et al. **Prospective evaluation of ultrasound in distal ileal and colonic obstruction.** Clinical Radiology 2000;55:356-62. (Level II evidence). View the reference
8. Taourel PG, Fabre JM, Pradel JA, et al. **Value of CT in the diagnosis and management of patients with suspected acute small-bowel obstruction.** AJR 1995;165:1187-92. (Level III evidence)
9. Maglinte DDT, Gage S, Harmon B, et al. **Obstruction of the small intestine: accuracy and role of CT in diagnosis.** Radiology 1993;188:61-4. (Level III evidence)
10. Megibow AJ, Balthazar EJ, Cho KC, et al. **Bowel obstruction: evaluation with CT.** Radiology 1991;180:313-8. (Level III evidence)
11. Frager D, Baer JW, Medwid SW, et al. **Detection of intestinal ischaemia in patients with acute bowel obstruction due to adhesions or hernia: efficacy of CT.** AJR 1996;166:67-71. (Level II/III evidence)
12. Balthazar EJ, Liebeskind ME, Macari M. **Intestinal ischaemia in patients in whom small bowel obstruction is suspected: evaluation of accuracy, limitations, and clinical implications of CT in diagnosis.** Radiology 1997;205:519-22. (Level II evidence). View the reference
13. Zalcman M, Sy M, Donckier V, et al. **Helical CT signs in the diagnosis of intestinal ischaemia in small-bowel obstruction.** AJR 2000;175:1601-7. (Level II evidence). View the reference
14. Fink M, Freeman AH, Dixon AK, et al. **Computed tomography of the colon in elderly people.** BMJ 1994;308:1018. (Level III evidence)
15. Frager D, Rovno HDS, Baer JW, Bashist B, Friedman M. **Prospective evaluation of colonic obstruction with computed tomography.** Abdom Imaging 1998;23:141-6. (Level IV evidence)
16. Walsh DW, Bender GN, Timmons JH. **Comparison of computed tomography: enteroclysis and traditional computed tomography in the setting of suspected partial small bowel obstruction.** Emerg Radiol 1998;5:29-37. (Level III evidence)
17. Bender GN, Maglinte DDT, Kloppel VR, et al. **CT enteroclysis: is it another superfluous diagnostic procedure or does it have a role in the investigation of small bowel disease?** AJR 1999;172:373-8.

18. Stewart J, Finan PJ, Courtney DF et al. **Does a water soluble contrast enema assist in the management of acute large bowel obstruction: a prospective study of 117 cases.** BJS 1984;71:799-801. (Level II evidence)
19. Maglinte DDT, Heitkamp DE, Howard TJ, Kelvin FM, Lappas JC. **Current concepts in imaging of small bowel obstruction.** Radiol Clin N Am 2003;41:263-83. (Review article)
20. Maglinte DDT, Kelvin FM, O'Connor K et al. **Review: current status of small bowel radiography** Abdominal Imaging 1996;21:247-57 (Review article)

Further Reading

1. Maglinte DDT, Kelvin FM, Rowe MG, et al. **Small-bowel obstruction: optimizing radiologic investigation and nonsurgical management.** Radiology 2001;218:39-46. (Review article)
2. Maglinte DDT, Balthazar EJ, Kelvin FM, et al. **The role of radiology in the diagnosis of small-bowel obstruction.** AJR 1997;168:1171-80. (Review article)

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