Bilious Emesis

Emergency Department

Nationwide Children's — When your child needs a hospital, everything matters.

Center for Clinical Excellence

ED Patients Should be ESI Level 2

- Diagnosis & Definition
- Differential Diagnosis
- Risk Awareness

Patient presents to the ED with bilious emesis or imaging concerning for malrotation/volvulus

Previous abdominal surgery?

- Yes → **Off Pathway** See Adhesive Small Bowel Obstruction Pathway
- No ↓

Peritonitis or Hemodynamic Instability?

- Yes →
  - **Emergency Resuscitation**
  - **STAT Pediatric Surgery consult**
  - **If at LCED, transfer to MCED**
- No ↓

- If at LCED, transfer to MCED
- STAT Pediatric Surgery Consult
- NPO
- Place on cardio-respiratory monitors
- 2 view-AXR*
- Obtain CBC, CMP, Lactate
- IV Bolus + MIVF

* If patient is unable to transport to radiology due to age, weight or fragility consider:
- Portable 2 view AXR
  or
- Portable Abd US instead of Upper GI series to assess for volvulus.

Free air or obstruction on x-ray?
Negative x-rays do not rule-out malrotation or volvulus

- Yes → Possible OR for emergency surgery, dispo per Ped Surg
- No ↓

Pneumatosis present on x-ray or patient > 18 months of age?

- Yes → Discuss with surgery and radiology → Decision to proceed with pathway?
  - No → **Off Pathway**
  - Yes →
- No ↓

- Order US Limited for Volvulus/Malrotation
- RN to place NG‡ prior to US
- Order UGI
- Call radiology to communicate concerns for malrotation/volvulus (722-9244)

‡ The NG tube placed prior to Ultrasound needs to be a feeding-type NG tube with a single hole, not a tube used for decompression. If decompression is indicated, discuss with surgery and radiology.

Ultrasound negative for malrotation	**Ultrasound equivocal**	**Ultrasound positive for malrotation**	**Ultrasound positive for volvulus**

Proceed with UGI

Surgeon discretion to obtain UGI?

- Yes → Proceed with UGI
- No ↓

There should be no delay in obtaining UGI in patients undergoing Ultrasound

UGI + for malrotation/ volvulus?

- No → **Off Pathway**
- Yes → **Admit to Pediatric Surgery** Surgery and PEM discuss disposition, floor vs OR

Diagnosis & Definition

- Malrotation is a failure of the intestine to rotate normally in utero.
- Volvulus is twisting of the intestine around its vascular pedicle, resulting in compromised blood flow.
- Patients may present with signs of a bowel obstruction, including bilious emesis, abdominal distention, and inability to tolerate feeds. Symptoms vary, however, with some patients who are asymptomatic while others present in extremis from bowel ischemia.

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Differential Diagnoses

Findings suggestive of another diagnosis include:

- Incarcerated hernia – Patients may have bilious emesis from bowel incarcerated in a hernia, which can be identified on physical examination.
- Intestinal atresia (duodenal web, duodenal/jejunal atresia) – Patients may present with bilious or non-bilious emesis. An Upper GI series will aid in differentiation between atresia and malrotation.
- Pyloric stenosis – Patients typically present with non-bilious projectile emesis. The diagnosis can be confirmed with an abdominal ultrasound.
- Hirschsprung disease – Patients may present with a distal bowel obstruction. Physical examination may reveal projectile stool on rectal examination.
- Adhesive bowel obstruction – Patients with history of prior abdominal surgeries may present with bilious emesis due to adhesions.
- Acute Gastroenteritis- Patient's with severe cases of gastroenteritis may present with an ileus leading to bilious emesis.

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Testing

- Upper GI Series:
  - Considered the historic standard in diagnosing malrotation, with a sensitivity of 93-100%.
  - A feeding-type NG tube with a single distal hole improves the quality of the images and should be placed prior to transport to radiology
  - In malrotation, UGI may demonstrate the absence of: the duodenum crossing the midline from right to left, the duodenum coursing through the retroperitoneum (on lateral views), and the duodenojejunal junction reaching the level of the pylorus.
  - In patients with a volvulus, the Upper GI will demonstrate failure of passage of contrast through the duodenum, possibly with a bird's beak or a corkscrew configuration.
- Abdominal X-ray:
  - 2-view Abdominal X-ray should be performed.
  - May demonstrate a dilated gastric bubble and dilated loops of bowel.
  - **Negative x-rays do not rule-out malrotation or volvulus.**
- Abdominal Ultrasound:
  - In a patient with volvulus, an abdominal ultrasound may demonstrate a mesenteric swirl with a sensitivity of 89-95% and specificity of 89-100%. Malrotation without volvulus can also be identified, but at a lower sensitivity.
- Laboratory
  - Complete Metabolic Panel (CMP)
  - Complete Blood Count (CBC)
  - Lactate

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Recommended Treatments

- The treatment of malrotation with volvulus is an emergency exploratory laparotomy with reduction of volvulus (if volvulus is present) and Ladd procedure.
- All patients with concern for malrotation or volvulus should have IV placed and mIVF started.
- If clinically indicated 20 ml/kg NS fluid bolus should be administered and repeated if indicated by assessing physician
- If an UGI will be obtained, a feeding-type NG tube should be placed prior to transport to radiology
- If NG decompression is indicated, discuss with surgery and radiology the timing of placing a NG decompression tube

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Deterioration & Escalation of Care

- If a patient develops hemodynamic instability or peritoneal signs on examination, the surgical team should be notified immediately.

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Discharge Criteria & Planning

Patients who have a confirmed diagnosis and undergo operative intervention:

- Discharged home once they have had return of bowel function and have tolerated resumption of a diet
- Follow-up with the operating surgeon in 3-4 weeks

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Patient & Caregiver Education

- Education On
  - **Helping Hands: HH-I-281 Intestinal Malrotation Surgery**

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Risk Awareness

- A delay in diagnosis of malrotation with volvulus could have catastrophic adverse events with long-term implications, including the loss of a significant length of small bowel, which, in turn, could result in the development of intestinal failure and dependence on parenteral nutrition.
- Newborns with non-accidental trauma will present with symptoms similar to pyloric stenosis. In patients with normal US, NAT work-up should be completed.

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Key References

1. Schiess DM, Sammer MBK, Sher AC, et al. Impact of Focused Abdominal Ultrasound Utilization on Outcomes for Children With Midgut Volvulus. *J Pediatr Surg*. 2024;59(6):1101-1107. doi:10.1016/j.jpedsurg.2024.01.017

2. Nguyen HN, Navarro OM, Guillerman RP, Silva CT, Sammer MBK. Untwisting the complexity of midgut malrotation and volvulus ultrasound. *Pediatr Radiol*. 2021;51(4):658-668. doi:10.1007/s00247-020-04876-x

3. Nguyen HN, Kulkarni M, Jose J, et al. Ultrasound for the diagnosis of malrotation and volvulus in children and adolescents: a systematic review and meta-analysis. *Arch Dis Child*. 2021;106(12):1171-1178. doi:10.1136/archdischild-2020-321082

4. Ladd WE. Congenital obstruction of the duodenum in children. *N Engl J Med*. 1932;206:277-280

5. Applegate KE, Anderson JM, Klatte EC. Intestinal malrotation in children: a problem-solving approach to the upper gastrointestinal series. *Radiographics*. 2006;26(5):1485-1500. doi:10.1148/rg.265055167

6. Zhang W, Sun H, Luo F. The efficiency of sonography in diagnosing volvulus in neonates with suspected intestinal malrotation. *Medicine (Baltimore)*. 2017;96(42):e8287. doi:10.1097/MD.0000000000008287

7. Zhou LY, Li SR, Wang W, et al. Usefulness of Sonography in Evaluating Children Suspected of Malrotation: Comparison With an Upper Gastrointestinal Contrast Study. *J Ultrasound Med*. 2015;34(10):1825-1832. doi:10.7863/ultra.14.10017

8. Shimanuki Y, Aihara T, Takano H, et al. Clockwise whirlpool sign at color Doppler US: an objective and definite sign of midgut volvulus. *Radiology*. 1996;199(1):261-264. doi:10.1148/radiology.199.1.8633156

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Quality Measures

Process measures:

- ED Order Panel utilization
- Time from abdominal ultrasound or upper GI result to OR for patients diagnosed with malrotation or volvulus (goal less than 1 hour).

Outcome measures:

- ED:
  - Time from abdominal x-ray result to abdominal ultrasound
  - Time from abdominal x-ray result to upper GI series
  - ED length of stay
- Surgery:
  - Time from positive UGI or US to OR
  - Time from UGI/US order to OR for those undergoing surgery
  - Finding of bowel necrosis/ required bowel resection
  - Percentage of UGI performed when US is read as positive for malrotation/volvulus
  - Percentage of UGI positive when US read as negative or equivocal
  - Percentage of OR findings congruent with imaging results

Balancing measure:

- Percent of patients presenting with bilious emesis and receive an abdominal ultrasound or upper GI and not found to have malrotation or volvulus.

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Pathway Team & Process

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Clinical Pathway Development

This clinical pathway was developed using the process described in the NCH Clinical Pathway Development Manual Version 6, 2022. Clinical Pathways at Nationwide Children's Hospital (NCH) are standards which provide general guidance to clinicians. Patient choice, clinician judgment, and other relevant factors in diagnosing and treating patients remain central to the selection of diagnostic tests and therapy. The ordering provider assumes all risks associates with care decisions. NCH assumes no responsibility for any adverse consequences, errors, or omissions that may arise from the use or reliance on these guidelines. NCH's clinical pathways are reviewed periodically for consistency with new evidence; however, new developments may not be represented, and NCH makes no guarantees, representations, or warranties with respect to the information provided in this clinical pathway.

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