Bilious Emesis

Emergency Department

Center for Clinical Excellence

Inclusion criteria:

- Patients with bilious emesis
- Patients with imaging findings concerning for malrotation +/- volvulus

Exclusion criteria:

- Patients with concern for necrotizing enterocolitis
- Patients with history of prior abdominal surgery

Place on continuous monitors

STAT Pediatric Surgery Consult

- 2 view-AXR*
- Obtain CBC, CMP, Lactate NS
- IV Bolus + MIVF

Peritonitis or Hemodynamic Instability?

Yes → **OR for Exploratory Laparotomy**

No

Review abdominal xray

Free air?

Yes → **OR for Exploratory Laparotomy**

No

Pneumatosis Intestinalis?

Yes

Abd US to Differentiate Diagnoses

Malrotation +/- Volvulus?

Yes → **OR for Exploratory Laparotomy**

No

Off Pathway
Treat Pneumatosis

No

STAT Upper GI Series*

Malrotation +/- Volvulus?

Yes → **OR for Exploratory Laparotomy**

No

Off Pathway
Continue work-up as indicated

* 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.

Diagnosis & Definition

Differential Diagnosis

Risk Awareness

Discharge Criteria & Planning

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 standard in diagnosing malrotation, with a sensitivity of 93-100%.
  - In malrotation, it may demonstrate 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.
- Abdominal Ultrasound:
  - In a patient with a volvulus, an abdominal ultrasound may demonstrate a mesenteric swirl with a sensitivity of 89-95% and specificity of 89-100%.
- Laboratory
  - Complete Metabolic Panel (CMP)
  - Complete Blood Count (CBC)
  - Lactate (Can be excluded in hemodynamically stable NICU pts)

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Admission Criteria

- Diagnosis of malrotation with symptoms or evidence of volvulus.
- Patient's without malrotation or volvulus will be managed dependent on diagnosis.

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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 20cc/kg NS fluid bolus should be administered and repeated if indicated by assessing physician

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

2. 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.

3. Zhang W, Sun H, Luo F. The efficiency of sonography in diagnosing volvulus in neonates with suspected intestinal malrotation. *Medicine (Baltimore)*. 2017;96(42).

4. Zhou LY, Li S, Wang W, et al. Usefulness of sonography in evaluation of children suspected of malrotation. *J Ultrasound Med*. 2015;34(10):1825-1832.

5. Shimanuki Y, Ahira T, Takono H, et al. Clockwise whirlpool sign at color Doppler US: an objective and definite sign of midgut volvulus. *Radiology*. 1996;199:261-264.

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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

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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