# Impact of a Collaborative Small Bowel Obstruction Imaging and Care Protocol with the General Surgery Service on Radiology Workflow and Resource Utilization

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# Background

- Small bowel obstruction (SBO) is a common cause of diagnostic imaging, hospital admission, and surgical consultation
  - SBO accounts for up to 16% of hospital admissions for abdominal pain
- Water-soluble contrast challenge (WSCC) has been implemented by surgical services to aid in differentiation between partial or low-grade SBO from complete or high-grade SBO
  - Abbreviated protocol comparable to fluoroscopic small bowel follow-through using serial static radiographs
  - Can be obtained in the radiology department or via portable radiography
  - Involves administration of enteric water-soluble contrast (orally or via nasogastric tube) with consecutive abdominal radiographs to follow the progression of contrast to the colon (timing of radiographs can vary by institution)
  - Transit time threshold for contrast to reach the colon of 24 hours
- WSCC can aid in determining the likelihood of successful nonoperative management in patients with SBO
- Gastrografin® is a water-soluble oral contrast agent often used in WSCC
- Surgical intervention is often indicated if WSCC is unsuccessful (transit time to colon > 24 hours)
- The use of Gastrografin® for WSCC has been shown to:
  - Decrease length of stay and decrease the one-year mortality rate when administered within 12 hours of hospitalization
  - Reduce cost of hospitalization in patients with SBO

# Background - Protocol

- Patients with suspected SBO often undergo initial CT imaging without oral contrast
  - Prior to the new protocol, it was usual for a second CT with oral contrast to be performed at our institution to confirm the diagnosis of SBO and guide further management
- A new institutional SBO care protocol was created by the general surgery service in collaboration with the radiology department
  - The new protocol eliminates the second CT, using oral water-soluble contrast material (Gastrografin®) and serial abdominal radiographs for further assessment in clinically stable patients

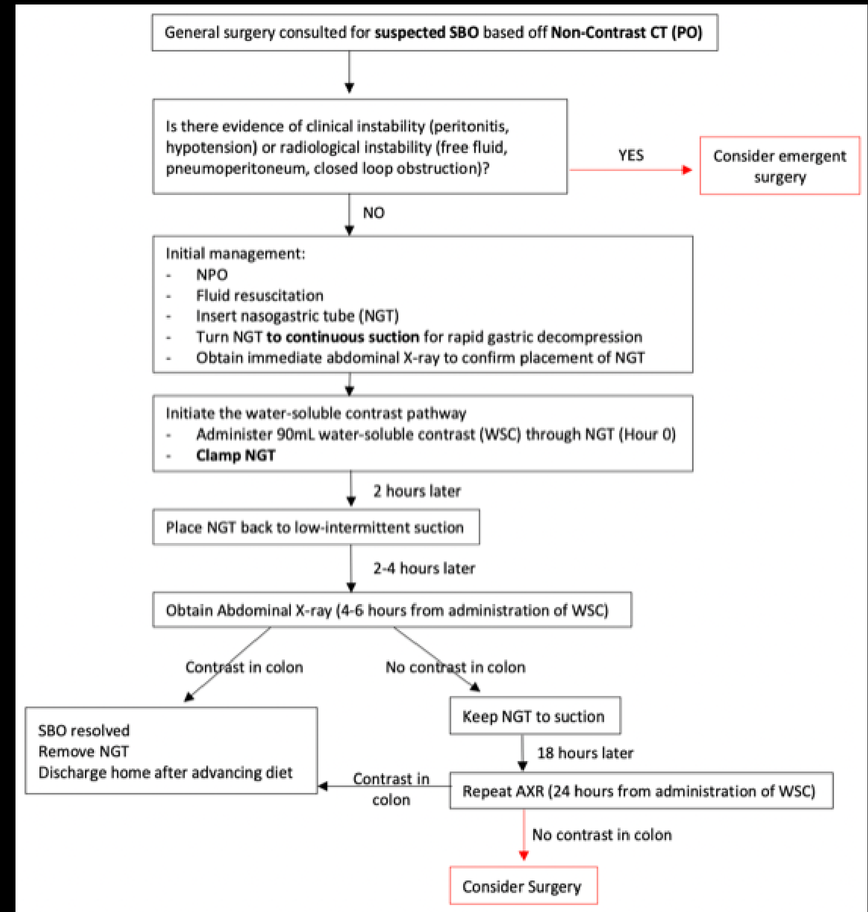
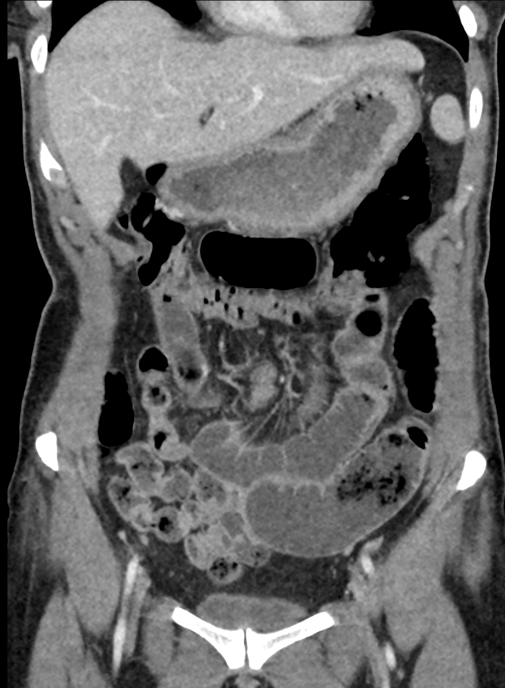
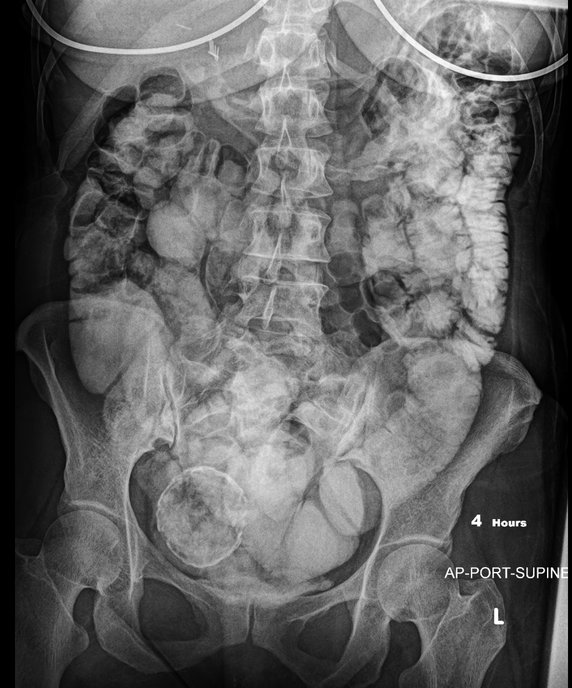



**Figure 1.** Institutional care algorithm for the management of small bowel obstruction (SBO).

# Background - Protocol

**Figure 2.** CT of the abdomen and pelvis without oral contrast (A) shows dilated fluid-filled small bowel loops in the left lower abdomen consistent with SBO. Frontal abdominal radiograph 4 hours after the administration of water-soluble contrast shows persistent mild small bowel dilatation with passage of contrast into the colon, excluding high-grade obstruction.





# Objective

- The purpose of this study is to assess the impact of this new institutional SBO care protocol and imaging algorithm on the radiology department’s workflow and resource utilization

# Methods

Single-institution retrospective cohort study conducted on patients from the emergency department with SBO as diagnosed initial abdominopelvic CT and for whom the general surgery service was consulted.

## Study subjects:

- Control group:
  - Patients who underwent two consecutive abdominopelvic CT scans for SBO within 24 hours
    - One with oral contrast and one without oral contrast
  - One year prior to implementation of the new protocol (February 2022 - February 2023)
- Experimental group:
  - Patients who underwent imaging for suspected SBO per the new care and imaging algorithm (February 2023 - December 2023)

## Outcomes assessed

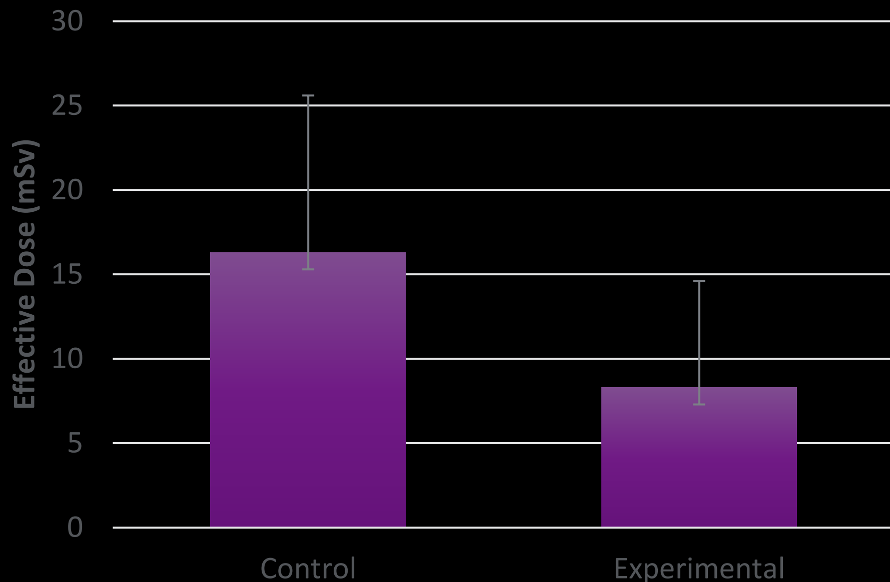
- Ionizing radiation exposure (effective dose)
- CT scanner/technologist time (based on technologist charting in electronic medical record)
- Contrast media utilization
- Operative vs nonoperative management
- Length of stay

# Results

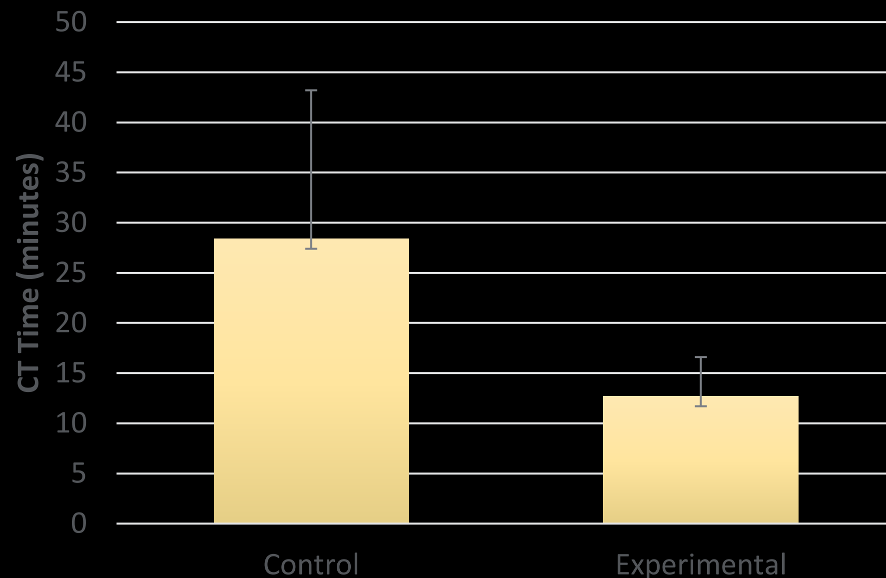
Experimental group: 18 patients

Control group: 38 patients

- Total effective dose (mSv) was significantly less in the experimental group (mean 8.3 mSv ± 6.3 mSv) relative to the control group (mean 16.3 mSv ± 9.3 mSv) ($p=0.02$)

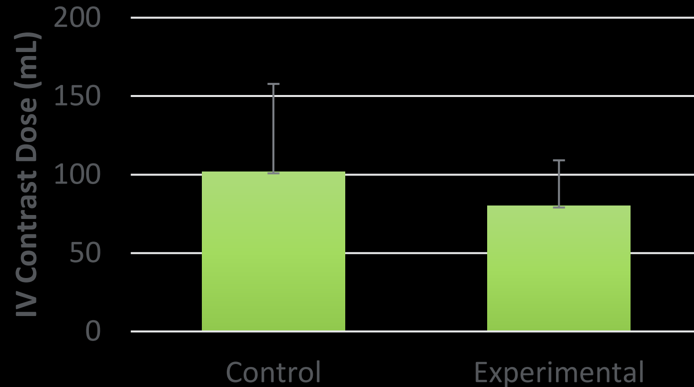



- Total CT time was significantly less in the experimental group (mean 12.7 minutes ± 3.9) relative to the control group (mean 28.4 minutes ± 14.8) ($p<0.001$)



# Results

- There was a trend for less use of intravenous contrast media in the experimental group relative to the control group, however, this was not statistically significant ($p=0.06$)




- Operative versus nonoperative management and length of stay were not significantly different between the two groups ($p=1.0$ and $p=0.517$, respectively)

# Conclusion

- Implementation of a collaborative SBO imaging and care algorithm resulted in reduced effective dose to patients and decreased CT scanner/technologist time
- Potential for improved efficiency in CT department given less repeat CT scans for suspected or confirmed SBO in the absence of complications

# References

1. Cohen RB, Olafson SN, Krupp J, et al. Timing of Gastrografin administration in the management of adhesive small bowel obstruction (ASBO): Does it matter?. *Surgery*. 2021;170(2):596-602. doi:10.1016/j.surg.2021.03.008

2. Ali M, Slack DR, Feinn R, Kurtzman S, Zhang ZJ. Early Use of Small Bowel Follow Through Reduces Stay and Cost in Small Bowel Obstructions. *Cureus*. 2021;13(5):e15023. Published 2021 May 14. doi:10.7759/cureus.15023

3. Nelms DW, Kann BR. Imaging Modalities for Evaluation of Intestinal Obstruction. *Clin Colon Rectal Surg*. 2021;34(4):205-218. doi:10.1055/s-0041-1729737

4. Alnachoukati O, Ray-Zack M, Godin S, Apodaca T, Zielinski M, Dunn J. Optimal Timing of First Abdominal Radiography after Gastrografin Administration for Small Bowel Obstruction. *J Surg Res*. 2020;256:193-197. doi:10.1016/j.jss.2020.06.053

5. Almafreji I, Chinaka U, Hussain A, Lynch M, Cottrell R. Role of Gastrografin in Patients With Small Bowel Obstruction. *Cureus*. 2020;12(8):e9695. Published 2020 Aug 12. doi:10.7759/cureus.9695

6. Feister K, Konstantinoff K, Hamade M, Mellnick V. Pearls and Pitfalls of Imaging Small Bowel Obstruction. *Can Assoc Radiol J*. Published online February 27, 2024. doi:10.1177/08465371241230276