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This too shall pass: Standardized Gastrografin protocol for partial small bowel obstruction

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ABSTRACT

Background: One of the most common reasons for admission to a surgical service is for a partial small bowel obstruction. There is considerable variation in management. Several studies suggest that the use of diatrizoate (Gastrografin), a hyperosmolar contrast agent, can be helpful as a diagnostic agent as well as possibly therapeutic, reducing the need for operative intervention. There is a paucity of data on the use of Gastrografin in the community setting. We hypothesized that this standardized algorithm of Gastrografin administration would decrease the need for surgery and shorten a patient's length of stay, even outside the confines of a regulated clinical trial.

Methods: We performed a retrospective review of all patients admitted to two major hospitals in our network with the diagnosis of partial small bowel obstruction. Patients were excluded if they were admitted within thirty days of bowel surgery or if they were <18 years of age. The primary variable for analysis was the subsets of patients who were placed on our protocol versus no protocol at the other hospital. The primary outcome was hospital length of stay. Secondary outcomes included rate of surgery during the same admission and readmission within 30 days of discharge. All analyses were performed using Fisher's Exact test of Mann-Whitney *U* Test, as appropriate.

Results: A total of 1302 patients with partial small bowel obstruction were identified (103 on-protocol and 1199 off-protocol at our sister hospital). On-protocol patients had a shorter duration of hospitalization (mean, 4.9 days vs. 6.0 days, $p < 0.001$), lower rates of surgery (2% vs. 16%, $p < 0.001$), and similar rates of readmission for the same diagnosis (8% and 5%, $p = 0.26$), compared to off-protocol patients at our sister institution.

Conclusion: A protocol utilizing Gastrografin for the management of partial small bowel obstruction decreases the need for surgery and shortens a patient's length of stay in a diverse community setting.

Introduction

A partial small bowel obstruction (PSBO) is a frequent reason for hospital admission.[1] The typical presentation is a patient with a history of previous abdominal surgery who develops acute abdominal pain and distension.[2] Most patients are admitted through the emergency department and are initially evaluated by non-surgical physicians.[1] As part of the work-up, a complete blood count and metabolic panel is obtained and either an upright plain radiograph or computed tomogram (CT) is performed that shows dilated loops of small bowel.[3] At this point, the algorithm for management varies from institution to institution.

Nevertheless, the priorities for management are the same. First, one must determine whether the treatment should be operative or non-operative. The answer to this question is usually made by physical exam and laboratory findings which are suggestive of ongoing or impending strangulation. These include tachycardia, peritonitis, leukocytosis and/or lactic acidosis.[4] When present, a surgeon is consulted and the patient is taken urgently for exploration. Far more common however, is non-operative management.[5] Unfortunately, the ability for a surgeon to prospectively predict which patients will require an operation and those who will not is limited, and in this lies a grey area of treatment.[6] Depending on the hospital culture, patients are admitted to either a medicine or surgical service and undergo a wide array of diagnostic and treatment interventions. This usually includes nasogastric suction, IV

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fluids, bowel rest, or any combination of these three.[7]

Gastrografin (GG) is a hyperosmolar oral contrast agent that has been recognized as a diagnostic and therapeutic agent for the management of partial small bowel obstruction secondary to adhesive disease.[8] GG is radiopaque and can be visualized on either serial X-Rays or a CT. As a hyperosmotic agent, GG also causes a shift of water into the lumen of bowel which may help relieve the obstruction.[3] We instituted a protocol in late 2012 at our hospital to utilize GG after admission for a partial small bowel obstruction. We hypothesized that a standardized protocol would shorten a patient's hospital length of stay and decrease the need for operative intervention without increasing the rate of re-admission. Furthermore, our aim was to provide an algorithm that all surgeons in our network could follow which would reduce complications such as unnecessary surgery or failure of non-operative management in this common patient population.

Methods

We performed a retrospective review comparing a standardized protocol for management of a partial small bowel obstruction at our hospital to a hospital within our same network that did not have a protocol. This was done over a five-year span (2012–2017) during which we administered GG to all patients who were diagnosed with a partial small bowel obstruction. Our protocol is detailed in Fig. 1. Essentially, all patients who presented with a small bowel obstruction were admitted to our surgical service for management. If the patient had peritonitis or there was clinical concern for ongoing intestinal ischemia, patient underwent operative management. If not, then shortly after diagnosis, patients had a nasogastric tube placed for decompression and were then administered 120 cc's of GG. The tube was then clamped for 2 h and abdominal plain radiographs were obtained at 4 h and then again at 24 h. If contrast was seen in the colon on either film, the nasogastric tube was removed and the patient's diet was advanced. If not, then surgery was performed.

The primary cohort was defined by admitting ICD10 codes with a diagnosis of partial small bowel obstruction in an adult. Exclusion criteria included patients with a secondary diagnosis that would account for a non-adhesive source of partial small bowel obstruction, any patient who was less than 18 years of age, as well as those who had undergone any type of bowel surgery within the 30 days prior to admission. In order to identify patients who were "on protocol" at our hospital, in addition to the admitting diagnosis, patients all had an order for "XR small bowel series" as well as an order for GG administration during that admission. The primary outcome was hospital length of stay. Secondary outcomes included rate of surgery during the same admission and rate of readmission within 30 days. We considered both standard readmission (readmission for any cause) and nonstandard readmission (readmission for bowel obstruction). All statistical analyses were performed using Fisher's Exact test or Mann-Whitney *U* Test, as appropriate.

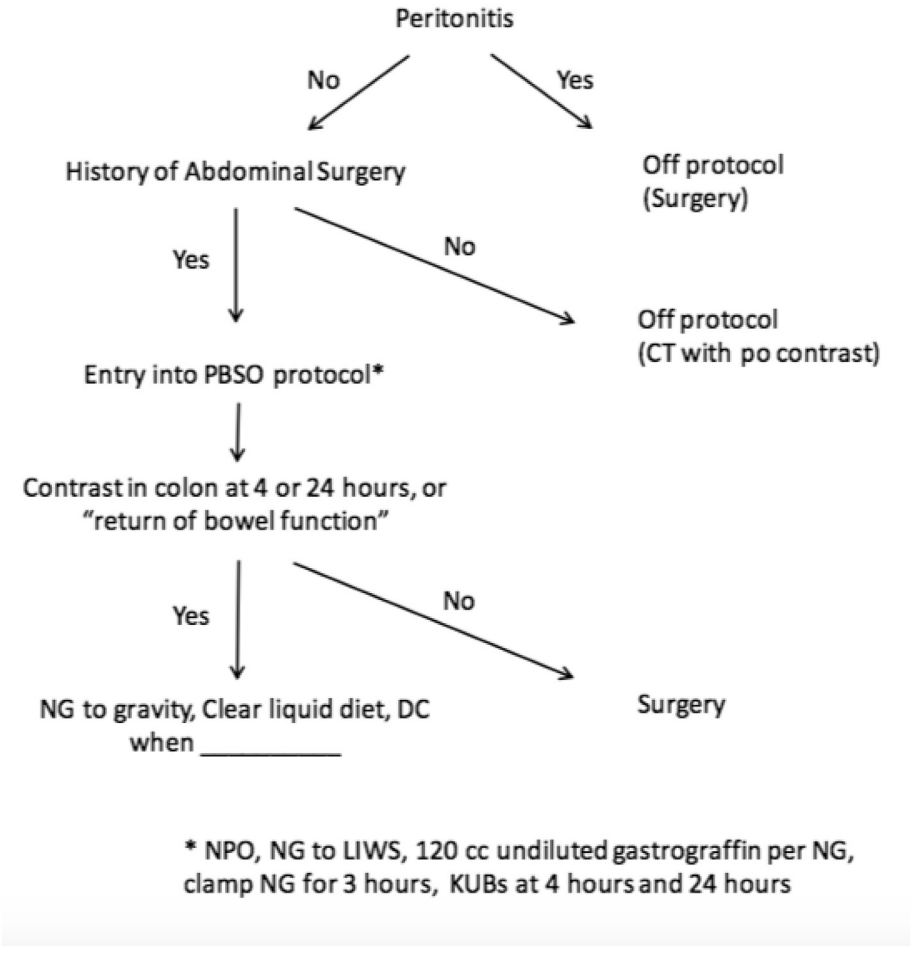

Fig. 1. Gastrografin protocol for patients with partial small bowel obstruction.

Table 1
Results of patients on protocol versus patients off protocol.

	ON Protocol	OFF Protocol	P value
N	103	1199	
Insured	52% (52)	97.4% (1168)	<0.001
Same Admission Surgery	2% (2)	15.8% (189)	<0.001
Nonstandard Readmission	8% (8)	5.0% (64)	0.2624
Standard Readmission	19% (19)	12.8% (153)	0.0952
Mean Length of Stay	4.86	6.03	<0.001

Results

A total of 1302 patients with small bowel obstruction were identified (103 on-protocol at our hospital and 1199 at our sister hospital who were deemed off protocol). As seen in Table 1, on-protocol patients did have a shorter duration of hospitalization (mean, 4.86 days vs 6.03 days, $p < 0.001$). They also had a lower rate of surgery (2% vs. 16%, $p < 0.001$). Although not statistically significant, patients on protocol appeared to have similar rates of readmission for the same diagnosis (8% and 5%, $p = 0.2624$), as well as any diagnosis (19% and 13%, $p = 0.095$) compared to off-protocol patients at our sister institution.

Discussion

One of the biggest challenges facing healthcare today is to improve the efficiency of delivery and decrease cost without sacrificing the quality of care. Our results show that a protocol for management of partial small bowel obstruction reduces the need for operative intervention and decreases hospital length of stay. This has profound implications for both cost and generalizability. While previous studies have demonstrated the benefit of GG, nearly all have been done in an academic setting. Our study shows that an academic model can be applied in the community setting to help decrease hospital length of stay and the need for surgery. Our next step in the application of these results is to meet with key administrators and physicians at our sister hospital so that they will adopt this protocol. Moving forward, it is our belief that all hospitals within our network will begin using the protocol.

There have been several other larger randomized controlled studies that have demonstrated the benefit of GG.[9] Many have treatment algorithms which are similar to ours but often require a more complex knowledge base about the radiographic features of so called “complete” small bowel obstructions. Perhaps the best consequence of our protocol is that it simplifies the algorithm for non-surgeons and eliminates the discharge delay seen in many hospitals. If a patient has a bowel movement or contrast is noted in the colon at either the four or 24 h film, then physicians can be assured that the obstruction has resolved. These patients are extremely unlikely to require operative intervention and can have their diets advanced and be discharged.

There are several limitations to our study. This is a non-blinded, non-randomized retrospective review of patients admitted to two different hospitals with different demographics and payer bases. Admissions to both internal medicine as well as surgery were lumped into the same “off-protocol” designation whereas in our hospital, all “on-protocol” admissions were to surgery exclusively. Previous research has demonstrated that admissions to a surgical service for management of adhesive small bowel obstruction results in a shorter length of stay and few complications.[10] While we did not look at this specifically in this study, it could be that the longer length of stay at our sister hospital stemmed from admissions to medicine instead of surgery. Furthermore, one could make the argument that the higher rate of surgery in our sister hospital may have led to overall lower rates of non-standard (same condition) re-admission although this was not statistically significant. Despite these limitations, we do feel that our study contributes to the body of literature surrounding this topic and is especially applicable towards community hospitals where this has not been extensively studied.

Conclusion

A top priority in the delivery of health care today is to improve the overall value of care to the patient as well as to the health care system. A major component to value with regards to hospitalized patients is length of stay. Many believe that by reducing variability in management of common surgical diseases, we can reduce cost and improve outcomes. A protocol utilizing Gastrografin for management of partial small bowel obstruction decreased the need for surgery and shortened a patient's hospital length of stay.

Conflicts of interest

The authors report no conflicts of interest in conjunction with this research.

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