

# Low-Value Inpatient Gastrointestinal Practices Among Non-Gastroenterologists

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**Management of common gastrointestinal diseases by non-gastroenterologists often includes diagnostic tests that do not positively impact patient care but increases cost of care. Our study aimed to determine the prevalence of common inpatient practices by non-gastroenterologist providers. A validated anonymous survey was designed using ‘Google Forms’ (google.com/forms) and responses were collected on a handheld tablet. The questions included basic demographics, level of training, training specialty and practices related to common gastrointestinal diseases. The practices included fecal occult blood testing (FOBT), recognition of melena, use of lipase in management of acute pancreatitis, placement of nasogastric tube in cirrhosis, duration of nil per oral (NPO) before procedures and international normalized ratio (INR) threshold for paracentesis. Descriptive analysis was performed. We collected 150 responses from 4 different residency training hospitals in the United States. Of the respondents, 84% were resident trainees. Primary specialties of practice were internal medicine (82%), family medicine (11%), and others (7%). Inpatient FOBT was available in 95% of the facilities surveyed. With regards to melena, 77.5% correctly identified it as black tarry stool, but 17% also considered FOBT positive brown stool as melena. 21% correlated high lipase levels with more severe acute pancreatitis. 19% considered history of cirrhosis a contraindication for placement of nasogastric tube. Only 35% performed abdominal paracentesis regardless of INR value.**

**Non evidence based and low value tests and procedures related to common gastrointestinal diseases are prevalent among non-gastroenterologists. Better communication between primary team and specialist and education is needed to optimize patient care.**

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## INTRODUCTION

Health care costs in the United States are high and are increasing unsustainable: from \$253 billion in 1980 to \$3.3 trillion in 2016,<sup>1</sup> which is approximately 17.9 percent of the gross domestic product (GDP). Although several factors contribute the increase in annual health care spending, new prescription drugs, tests and interventions are the key drivers.<sup>2</sup> Efforts to control health care spending are crucial, and should focus both on the value and costs of the health care interventions. This is essential for high-value care - use of interventions whose medical benefits commensurate with their harms and costs.<sup>3</sup>

The general principles for high-value care stipulate that a diagnostic test should not be performed if the results will not change management, and when the pretest probability of the disease is low as there is higher likelihood of a false-positive result.<sup>4,5</sup> However, there are several commonly performed diagnostic tests and procedures that are not evidence based and are considered low value as they provide little or no benefit. Such low-value interventions continue to be performed presumably due to mistaken beliefs, inertia to change, or inattention to detail. This is especially true when these tests do not cause direct harm to the patients. Nevertheless, such seemingly inexpensive tests and interventions produce false-positive results (due to low pre-test probability), which adds to patients' anxiety and results in downstream costs due to subsequent testing, treatment, or follow up thereby substantially augmenting overall health care spending.<sup>3,6</sup>

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Practice of medicine is becoming increasingly specialized where general medicine partners with different specialties to provide necessary care to the patients. Most diagnostic tests and procedures are often ordered by the inpatient medicine teams and the specialists serve as consultants. We speculate that this sometimes creates a communication gap wherein the primary team may order a diagnostic test or procedure assuming that the specialist may need it, while the results of such low-value tests may have little or no utility for the consultant specialist.

In this study, we evaluated inpatient clinical practices related to diagnosis and management of gastrointestinal diseases by non-gastroenterology medical professionals including resident trainees and attending physicians. We focused on the non-evidence-based and low value gastroenterology (GI) practices that are apparently prevalent.

Of the practices we looked at the use of FOBT, serial lipase measurement and NPO for procedure have found to provide no benefit and in some case harm to patients. Almost half the respondents in the survey believed FOBT to be a useful inpatient test, and many checked FOBT in patients with overt (visible) GI bleeding. Fecal occult blood testing is a recommended test only for colorectal carcinoma screening<sup>7,8</sup> but prior studies show it is inappropriately used to evaluate for gastrointestinal bleed in patients admitted to the hospital.<sup>9-11</sup> Serum lipase lacks the ability to predict severity and etiology of acute pancreatitis<sup>12</sup> however it is routinely used in clinical

practice and this was another area that we analyzed. The American Society of Anesthesiologists recommends a fasting period of 2 hours for clear liquids.<sup>13</sup> However, in many instances for procedures or surgeries scheduled the next day, patients are often kept NPO after midnight, irrespective of the actual time of the procedure. This is associated with poor patient experience, excessive use of intravenous medications resulting in increased cost burden<sup>14</sup> and adverse events like dehydration and hypoglycemia.

Remainder of practices looked at are low value and lack high quality clinical studies evaluating their utility.

To our knowledge, there are “no prior studies” on this subject and our data will be useful in preparing current and future medical professionals in practice of high value, cost-conscious health care.

## METHODS

### Survey Sample and Questionnaire

We conducted a cross-sectional survey-based study. An 11-item online survey based on the common inpatient GI related practices among non-GI medical professionals was designed using ‘Google Forms’. The survey questionnaire underwent a thorough content validation through review by the collaborating authors including GI experts. The survey respondents were anonymously asked to choose among multiple choices regarding their usual practice relating to the inpatient GI scenarios.

**Table 1.** Baseline characteristics of survey participants

Baseline Characteristics	Total N (%) 150
<b>Sex (%)</b>	
Female	40 (26.7)
Male	110 (73.3)
<b>Age</b>	
20-25	7 (4.7)
26-30	90(60)
31-35	36 (24)
36-40	9 (6)
> 40	8 (5.3)
<b>Level of training</b>	
*PGY 1	51 (34.0)
PGY 2	37 (24.7)
PGY 3	39(26)
Attending	23 (15.3)
<b>Primary specialty of residency training or practice</b>	
Internal Medicine	123 (82)
Family Medicine	16 (10.7)
Other	5 (3.3)
Emergency Medicine	6(4)
<b>Primary hospital setting of your practice</b>	
University affiliated	16 (10.7)
University affiliated community	86 (57.3)
Community	48 (32)
<b>Geographic region of practice/training</b>	
Northeast	27 (18)
Midwest	55 (36.7)
Southeast	64 (42.7)
Southwest	4 (2.7)

\*PGY: Post graduate year

We also queried the survey participants regarding demographics such as age, gender, year of residency training or practice, geographic location, primary training specialty and hospital practice setting. Respondents were also tested on their knowledge of the most common evidence-based and low value GI practices in the inpatient setting.

### Data Collection

To capture actual practice and discourage respondents from consulting resources, the survey questionnaire was administered in person on a handheld tablet by the collaborating authors to non-GI medical resident trainees and attendings at four accredited training programs across the United States. The collaborating authors supervised the administration of the questionnaire during routinely scheduled teaching conferences at their respective institutions. The respondents received no advance notice about the survey. All the responses were anonymous.

GI physicians at these institutions and collaborating survey administrators were excluded from participation as their inclusion would lead to responder bias. This study was granted a waiver of informed consent by our Institutional Review Board.

### Statistical Analysis

For each inpatient GI and liver disease related scenario, respondents' usual practice was compared to the evidence based guidelines established by American College of Gastroenterology (ACG), American Gastroenterological Association (AGA) and American Association for the Study of Liver Disease (AASLD) to determine if their practice was in line with the guidelines or not. Among the results, continuous variables were expressed as mean/median and categorical variables as proportions. Descriptive analysis was performed.

**Table 2.** Survey Questionnaire

Survey questions	Total N (%) 150
<b>Do you have inpatient fecal occult blood test (FOBT/FIT) available at your practice hospital?</b>	
• Yes	142 (94.7))
• No	8 (5.3)
<b>When do you check inpatient fecal occult blood test? (check all that apply)*</b>	
• Patients with dark tarry stool	80 (53)
• Patients with bright red/maroon stool	46 (30)
• Patients with anemia and suspicion of GI blood loss but normal stool color	110 (72.4)
• I do not check this test	15 (10)
<b>Do you find occult blood test useful in inpatient setting?</b>	
• Yes, very useful	69 (46)
• No, but I order it to convince GI to see/scope patient	43 (28.7)
• No, not useful	38 (25.3)
<b>Do you order occult blood test on gastric emesis/aspirate if suspicious for upper GI bleed?</b>	
• Yes	66(44)
• No	84(56)
<b>What do you consider melena? (check all that apply)*</b>	
• Any occult blood positive stool	9(6)117(77.5)
• Tarry black stool	117 (77.5)
• Dark brown stool with occult blood positive	25(16.6)
<b>Do you routinely check daily lipase levels on patients with acute pancreatitis to follow disease activity?</b>	
• Yes	15 (10)
• No	135 (90)
<b>Do you think high lipase correlates with severity of pancreatitis?</b>	
• Yes	31 (20.7)
• No	119 (79.3)
<b>Placement of nasogastric (NG) or orogastric (OG) tube is contraindicated in patients with cirrhosis</b>	
• Agree	29 (19.3)
• Disagree	121 (80.7)
<b>Do you check <i>Clostridium difficile</i> stool PCR after treatment and resolution of diarrhea to document cure?</b>	
• Yes	13 (8.7)
• No	137 (91.3)
<b>What is your practice for keeping patient NPO to avoid aspiration risk associated with sedation for procedures/surgery?</b>	
• Keeping NPO the night before procedure	140 (93.3)
• Allowing clear liquids up to 2 hours before procedure	8 (5.3)
• NPO for six hours before procedure	1 (0.6)
• No NPO for emergent procedures	1 (0.6)
<b>What threshold INR value do you use for diagnostic or therapeutic paracentesis in patient with cirrhosis who is not on an anticoagulant?</b>	
• Less than 1.5	46 (30.7)
• Between 1.5 and 2	37 (24.7)
• Between 2 and 3	15 (10)
• I perform paracentesis regardless of INR value	52 (34.7)

\*multiple choice questions, respondents were allowed to check all that apply

**Table 3.** Responses based on level of training

TOTAL	Attending	%	PGY1	%	PGY2	%	PGY3	%	All Residents	%
	23		51		37		39		127	
1. Do you have inpatient fecal occult blood test (FOBT/FIT) available at your practice hospital?	Attending	%	PGY1	%	PGY2	%	PGY3	%	All Residents	%
Yes	21	91	48	94	36	97	37	95	121	95
No	2	9	3	6	1	3	2	5	6	5
3. Do you find occult blood test useful in inpatient setting?										
Yes	12	52	24	47	12	33	21	54	57	45
No	6	26	14	27	10	27	8	20	32	25
No, order to convince specialist	5	22	13	16	15	40	10	26	38	30
4. Do you order occult blood test on gastric emesis/aspirate if suspicion for upper GI bleed?										
Yes	11	48	23	45	11	30	21	54	55	43
No	12	52	28	55	26	70	18	46	72	57
5. What do you consider melena (check all that applies)										
Tarry black stools	21	91	40	78	28	76	28	72	96	76
Dark brown stool with occult blood positive	2	9	11	22	9	24	11	18	31	24
6. Do you routinely check daily lipase levels on patients with acute pancreatitis to follow disease activity?										
Yes	4	17	4	8	3	8	4	10	11	9
No	19	83	47	92	34	92	35	90	116	91
7. Do you think high lipase correlates with severity of pancreatitis?										
Yes	7	30	11	22	3	8	10	16	24	19
No	16	70	40	78	34	92	29	74	103	81
8. Placement of nasogastric (NG) or orogastric (OG) tube is contraindicated in patients with cirrhosis										
Agree	5	22	8	16	8	22	8	20	24	19
Disagree	18	78	43	84	29	78	31	80	103	81
9. Do you check clostridium difficile stool PCR after treatment and resolution of diarrhea to document cure?										
Yes	1	4	4	8	4	11	4	10	12	9
No	22	96	47	92	33	89	35	90	115	91
10. What is your practice for keeping patient NPO to avoid aspiration risk associated with sedation for procedures/surgery?										
Keeping NPO the night before procedure	21	91	51	100	34	92	36	92	121	95
Allowing clear liquids up to 2 hours before procedure	2	9	0	0	3	8	3	8	6	5

## RESULTS

### Demographics of the Respondents

We obtained completed survey questionnaires from a total of 150 residents and attending physicians at four accredited teaching hospitals located in Alabama, Texas, Illinois, and New York. The response rate was 100% as the survey was administered in person at teaching conferences. The demographic breakdown of the survey respondents according to their age, gender, level of training, primary specialty of practice, and the hospital setting are detailed in **Table 1**. Survey questions with the results are given in **Table 2**. **Table 3** further subdivides the responses based on level of training.

### Use of FOBT in Hospitalized Patients

Ninety five percent respondents had fecal occult blood test (FOBT) available for their inpatients and 45% found the test useful. Of the respondents, who did not find FOBT useful, 28.6% still ordered it to facilitate a gastroenterology consult. The indications for ordering FOBT included dark tarry stools (53%), work up of anemia despite normal stool color (72%), and bright red blood in stools (30%). With regards to melena, 77.5% correctly identified it as tarry black stool, while 16.6% considered dark brown FOBT positive stool also as melena. Furthermore, 44% used occult blood test on gastric

aspirates/emesis to evaluate for upper GI bleeding. However, as the residents advanced in their training, they were significantly less likely to use occult blood tests (59% PGY1, 16% PGY2, 39% PGY3, 70% attendings;  $P = 0.00005$ ) (**Supplemental Table 1B**).

#### **Use of Serum Lipase in Acute Pancreatitis**

Of the respondents, 32 (21%) believed that a high lipase level correlates with severity of pancreatitis and 15 (10%) routinely checked daily lipase levels to follow disease activity. First year resident trainees were more likely to order daily lipase and this significantly decreased as they progressed in their training (84% PGY1, 54% PGY2, 5%PGY3, 13% attendings,  $P < 0.00001$ ) (**Supplemental Table 1D**).

#### **Placement of nasogastric tubes in patients with cirrhosis**

Of the respondents, 19% believed placement of orogastric or nasogastric tube was contraindicated in patients with cirrhosis, even though there is no evidence to support this. The responses did not differ significantly with level of training (23% PGY1, 24% PGY2, 18% PGY3 and 9% attending physicians;  $P = 0.43$ ) (**Supplemental Table 1E**).

#### **Rechecking *Clostridium difficile* PCR after Successful Treatment**

13(9%) of the respondents checked *Clostridium difficile* PCR after treatment and resolution of diarrhea to document cure, which is contrary to published guidelines. The first-year trainees were less likely to follow guidelines (86% PGY1, 95% PGY2, 92% PGY3 and 96% attendings;  $P = 0.43$ ) (**Supplemental Table 1F**).

#### **Nil Per Oral Before Procedures**

Overall, 93% of the respondents kept their patients nil per oral (NPO) after midnight for procedures scheduled the next day. This is in contrast to the guidelines that the patients can consume clear liquids up to 2 hours before receiving sedation for a procedure. There was no significant difference in this practice between years of training as a resident and attending physicians (**Supplemental Table 1F**).

#### **INR Threshold for Paracentesis**

Overall 35% of the respondents followed the guidelines that abdominal paracentesis can be performed without need for correction of high INR. With higher level of training there was a significant trend of following the guidelines (65% PGY1, 57% PGY2, 62% PGY3 and 87% attending physicians;  $P = 0.020$ ) (**Supplemental Table 1G**).

### **DISCUSSION**

Our study showed that low value clinical practices, related to gastrointestinal and liver diseases, are common among non-GI clinical providers.

Gastrointestinal and liver diseases are common reasons for inpatient admissions which are managed by the primary medicine team and/or in consultation with gastroenterology.<sup>15</sup> An important factor in cost effective and efficient provision of high-value patient care is remaining up-to-date with evidence

based medicine. Prevalence of non-evidence based practices among non-GI physicians leads to inappropriate low-value testing, exposes patients to unnecessary interventions, and raises cost of health care. To our knowledge, this is the first study to objectively assess the knowledge and practices of non-GI resident trainees and attending physicians regarding management of common gastrointestinal conditions.

Using a consensus-based exercise approach, the American College of Physicians (ACP) identified 37 common clinical situations relevant to internal medicine wherein common screening and diagnostic tests are used unnecessarily and do not reflect high-value care.<sup>4</sup> However, the only GI practices highlighted by the ACP ad hoc workgroup included: the use of screening colonoscopy in adults older than 75 years with a life expectancy of less than 10 years, and repeating colonoscopy within 5 years of an index colonoscopy in asymptomatic patients with low-risk adenomas.

Our survey answers showed that some of the clinical practices were appropriate, evidence based and in line with high-value cost-conscious care. For example, majority of our survey respondents correctly identify melena, did not order *Clostridium difficile* stool PCR after treatment and resolution of diarrhea to document cure, and avoided ordering daily lipase levels to follow activity of acute pancreatitis. Notably, as physicians progressed in their level of training, they were more likely to follow evidence based high-value practices.

Certain tests had significant variability in use and are thus potential targets for educational intervention. Testing for occult blood on gastric aspirates/emesis was also quite common. Data has shown that guaiac testing is not a valid measure of gastric mucosal bleeding,<sup>16</sup> and physicians should exercise caution when interpreting guaiac card tests of gastric aspirates as multiple substances can lead to false positive tests.<sup>17</sup> Many physicians considered placement of orogastric (OG) or nasogastric tube (NG) in patients with cirrhosis a contraindication despite specific practice guidelines attesting this procedure as safe.<sup>18</sup> Yet, gastroenterologists are often asked this question including requests to endoscopically place the NG tubes. Similarly, elevated INR in patients with cirrhosis does not increase risk of bleeding after paracentesis. Practice guidelines recommend that paracentesis can be safely performed regardless of the INR value without the need of transfusion of fresh frozen plasma. Two-thirds of respondents did not follow these guidelines, possibly delaying a needed procedure or resulting in unnecessary blood product transfusions. Further, twenty percent respondents erroneously believed that lipase levels correlated with the severity of pancreatitis. These low-value non-evidence based practices and tests often result in unnecessary consultations to gastroenterologists.

We also evaluated the practices related to pre-procedure fasting. Among the providers surveyed, it was a common practice to keep patients NPO after midnight for GI procedures requiring sedation the next day, despite specific practice guidelines stating that clear liquids can be consumed up to 2

hours before the procedure. The practice of NPO after midnight results in patients fasting for 12 hours and many times much longer, which is uncomfortable for patients, increases anxiety, and is associated with adverse post-operative outcomes. In fact, preoperative carbohydrate loading that requires patients to drink carbohydrate beverages up to 2 hours before surgery is often recommended as part of enhanced recovery after surgery protocol.<sup>19</sup> Nonetheless, many physicians (including gastroenterologists) do not allow their patients to eat or drink anything for many hours before procedures, possibly to allow flexibility in patient scheduling.

We speculate the reasons for persistence of non-evidence-based low-value care practices include lack of formal high-value care training curriculum, inertia of previous practice and lack of incentive to change (in absence of obvious direct patient harm). The implementation of residency work-hour restrictions and the shift-work model for practicing hospital based attending physicians, has limited the time available for formal instruction on the evidence based practice guidelines.<sup>20</sup> Young trainees often mirror the clinical practices of more experienced clinicians. The lack of awareness or teaching by attending physicians solidifies single occurrences into habitual practices, which are difficult to change. Often, not ordering a laboratory test is faulted and ordering an unnecessary test overlooked. This was exemplified by a survey of internal medicine and general surgery residents who clearly attributed their practice of unnecessary inpatient laboratory test ordering to the health system culture and lack of faculty role model who practice restraint.<sup>21</sup>

Another plausible reason could be that some medical practices are perpetuated by the emergency department (ED) in teaching hospitals across the United States. For instance, the routine availability of inpatient FOBT tests in the ED at most practice hospitals that we surveyed (95%) may presumably have contributed to the misperception that FOBT test should be done on almost every patient admitted with a suspected GI bleed. Further, the lack of transparency of costs associated with inpatient tests in the electronic order sets could be contributing to perpetuation of low-value care practices. A randomized controlled study by Feldman et al showed that displaying the fee data to ordering providers at the time of order entry resulted in 8.59% decrease in rate of inpatient test ordering.<sup>22</sup>

One of the main limitations of our study is that our survey sample consisted of resident trainees and attending physicians at only four accredited teaching hospitals in the United States. Therefore, our findings may not be generalizable to all hospitals across the United States. Moreover, our survey-based study relied on self-reported practice and did not measure actual clinical practice. As with every questionnaire-based study, there is potential for responder bias, although we attempted to minimize the bias by administering the survey in person to the target group and the respondents were familiar with it being anonymous. Despite these limitations, our study is the first to measure the knowledge gap of both non-GI resident trainees and attending physicians regarding inpatient

low-value non-evidence-based GI practices in a broader way.

Our results underscore the need for inclusion of cost-conscious decision making in the training of young physicians during residency training. Many approaches have been described such as resident education, redesigning of the daily progress notes on laboratory test ordering, and system redesign including interventions at the computerized physician order entry level. Sadowski et al showed that optimizing the automated electronic order entry system to include cost displays at order entry, and blocking the admission order set from allowing repetitive multiple routine tests helped substantially reduce laboratory tests per inpatient day by 15.3% and 19.4%, respectively.<sup>23</sup> This extrapolated to a cost savings of \$290,000 over 2 years, while not adversely affecting patient care outcomes. Similarly, use of a clinical decision support tool to block unnecessary duplicate test orders in the computerized order entry system by Procop et al resulted in cost savings of \$183,586 over 2 years.<sup>24</sup> Thakkar et al showed that educating internal medicine providers through flyers displayed in their offices and periodic email reminders for two months resulted in more rational ordering of daily blood tests.<sup>25</sup> However, the sustainability of interventions just based on education are limited. Certain tests such as FOBT have no role in the management of inpatients (since it is a test to screen for colorectal cancer) and can be discontinued as an orderable test.

Our study highlights the need for improved collaboration between specialists and primary medicine providers. One way to achieve this is partnering of general medicine societies such as American College of Physicians (ACP), Society of General Internal Medicine (SGIM), and the American Academy of Family Physicians (AAFP) with the national gastrointestinal and hepatology organizations such as American College of Gastroenterology (ACG), American Gastroenterology Association (AGA) and the American Association for the Study of Liver Disease (AASLD) to educate trainees on avoidance of the use of low-value diagnostic tests and interventions. Such an educational initiative would help address the gap in awareness about the most accurate and updated GI practice guidelines, reduce misconceptions, and improve adherence and associated clinical outcomes and health care cost. Equally important is to improve communication of the non-GI physicians at all levels of training with the gastrointestinal specialists to promote focused and clinically appropriate consultation requests and thereby reduce wasteful resource utilization.

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#### **GUARANTOR OF THE ARTICLE**

Deepak Agrawal accepts full responsibility for the conduct of the study and is the final guarantor of the article.

#### **SPECIFIC AUTHOR CONTRIBUTIONS**

Sumant Arora, Zunirah Ahmed, Gurpratap Sidhu, Steven Young, Muhammad Yasir Khan: acquisition and interpretation of data; review of the manuscript.

Sumant Arora, Zunirah Ahmed, Omair Atiq and Deepak Agrawal: study concept and design; analysis and interpretation of data; drafting and review of the manuscript.

Jewell Halanych: survey design and review of the manuscript.

All the authors approved the final manuscript draft submitted.

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#### CONFLICT OF INTEREST

None.

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Level of training	YES (%)	No (%)	NO, but I do order for GI (%)
PGY1	24 (47.1)	14 (27.5)	13 (25.5)
PGY2	12 (32.4)	10 (27)	15 (40.6)
PGY3	20 (51.3)	9 (23.1)	10 (25.7)
Attending	12 (52.2)	6 (26.1)	5 (21.7)
	P = 0.592449		

**Supplementary Table 1B.** Do you order occult blood test on gastric emesis/aspirate if suspicion for upper GI bleed?

Level of training	YES (%)	No (%)
PGY1	30 (58.8)	21 (41.2)
PGY2	6 (16.2)	31 (83.8)
PGY3	15 (38.5)	24 (61.5)
Attending	16 (69.6)	7 (30.4)
	P = 0.000048	

**Supplementary Table 1C.** Do you routinely check daily lipase levels on patients with acute pancreatitis to follow disease activity?

Level of training	YES (%)	No (%)
PGY1	43 (84.3)	8 (15.7)
PGY2	2 (54.1)	35 (94.6)
PGY3	2 (5.1)	37 (94.9)
Attending	3 (13)	20 (87)
	P < 0.00001	

**Supplementary Table 1D.** Do you think high lipase correlates with severity of pancreatitis?

Level of training	YES (%)	No (%)
PGY1	10 (19.6)	41 (80.4)
PGY2	8 (21.6)	29 (78.4)
PGY3	8 (20.5)	31 (79.5)
Attending	6 (26)	17 (74)
	P = 0.936573	

**Supplementary Table 1E.** Placement of nasogastric (NG) or orogastric (OG) tube is contraindicated in patients with cirrhosis.

Level of training	YES (%)	No (%)
PGY1	12 (23.5)	39 (76.5)
PGY2	9 (24.3)	28 (75.7)
PGY3	7 (18)	32 (82)
Attending	2 (8.7)	21 (91.3)
	P = 0.428627	

**Supplementary Table 1F.** Do you check *Clostridium difficile* stool PCR after treatment and resolution of diarrhea to document cure?

Level of training	YES (%)	No (%)
PGY1	7 (13.7)	44 (86.3)
PGY2	2 (5.4)	35 (94.6)
PGY3	3 (8)	36 (92)
Attending	1 (4.3)	22 (95.7)
	P = 0.434349	

**Supplementary Table 1G.** What threshold INR value do you use for diagnostic or therapeutic paracentesis in patient with cirrhosis who is not on any anticoagulant?

Level of training	< 1.5 (%)	1.5-2 (%)	2-3 (%)	Perform regardless (%)
PGY1	18 (35.3)	10 (19.6)	5 (9.8)	18 (35.3)
PGY2	4 (10.9)	9 (24.3)	8 (21.6)	16 (43.2)
PGY3	13 (33.3)	10 (25.6)	1 (2.6)	15 (38.5)
Attending	12 (52.2)	6 (26.1)	2 (8.7)	3 (13)
	P = 0.020305			

**Supplementary Table 1H.** Do you keep your patient's NPO before the procedure?

Level of training	YES (%)	No (%)
PGY1	51 (100)	0 (0)
PGY2	35 (95)	2 (6)
PGY3	35 (90)	4 (10)
Attending	23 (100)	0 (0)