

# Gastrointestinal Complications in Critically Ill Patients With COVID-19

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Extrapulmonary disease has been observed in patients with coronavirus disease 2019 (COVID-19).<sup>1-3</sup> We describe here the gastrointestinal (GI) complications of patients with severe COVID-19 admitted to the intensive care unit (ICU) at the Massachusetts General Hospital between March 13 and April 12, 2020.

During this time period, 141 patients were admitted to the ICU with severe acute respiratory syndrome coronavirus 2 infection confirmed by reverse-transcriptase–polymerase-chain-reaction testing. The median (interquartile range) age was 57 (47, 70) years, 65% of them were men, and 45% had GI symptoms (eg, abdominal pain, diarrhea, vomiting) on hospital presentation (Table 1). The median (interquartile range) Sequential Organ Failure Assessment Score upon admission to the ICU was 5 (4, 7.5), and 128 (91%) required mechanical ventilation. A total of 104 patients (74%) developed at least 1 GI complication.

We stratified the GI complications into 4 categories: hepatobiliary, hypomotility, bowel ischemia, and other. Among the hepatobiliary complications, transaminitis was the most common (67%). The mean highest values recorded for aspartate aminotransferase and alanine aminotransferase were 420.7 and 479.0 U/L respectively, representing a 7.5- and 12-fold increase from the physiological values. Four patients (4%) developed acute acalculous cholecystitis and 1 patient (1%) developed acute pancreatitis during their ICU stay.

Half of the patients developed hypomotility-related complications of variable severity. Almost all patients with GI complications required nasogastric or orogastric tubes. Forty-six percent of patients had gastric feeding held for at least 24 hours due to high gastric residuals, and 58 (56%) developed an ileus diagnosed clinically and/or radiologically. Four of the patients with severe ileus had clinical and radiologic findings concerning for bowel ischemia and were taken to the operating room on days 11, 14, 15, and 22 of

**TABLE 1.** Characteristics of Patients With Severe Coronavirus Disease 2019 Admitted to the Intensive Care Unit

Characteristics	Patients (n = 141)
Age, median (IQR)	57 (47, 70)
Male	92 (65.2%)
BMI, median (IQR)	30.8 (27.2, 35.5)
GI manifestations on admission	
Diarrhea	42 (29.8%)
Nausea/vomiting	31 (22.0%)
Abdominal pain	21 (14.9%)
ICU admission SOFA score, median (IQR)	5 (4, 7.5)
Mechanical ventilation	128 (90.8%)
Patients with at least 1 GI complication	n = 104 (73.8%)
GI manifestations during admission*	
Abdominal pain	15 (14.4%)
Abdominal distention	39 (37.5%)
Diarrhea	30 (28.8%)
Constipation	41 (39.4%)
Nausea	18 (17.3%)
Vomiting	44 (42.3%)
Enterostomies and drains*	
Nasogastric/orogastric tube	100 (96.2%)
Rectal tube	84 (80.8%)
Gastrostomy tube	5 (4.8%)
Ostomy	2 (1.9%)
Hepatobiliary complications*	
Transaminitis	70 (67.3%)
Highest AST, mean (SD)	420.7 (942.0)
Highest ALT, mean (SD)	479.0 (1712.8)
Acute cholecystitis	4 (3.8%)
Acute pancreatitis	1 (1.0%)
Hepatic ischemia and necrosis	1 (1.0%)
Hypomotility complications*	
Gastric feeding intolerance ≥24 h	48 (46.2%)
Ileus (clinical or radiological diagnosis)	58 (55.8%)
Parenteral nutrition	4 (4.8%)
Ogilvie-like syndrome	2 (1.9%)
Bowel ischemia*	5 (3.8%)
Cecum	1 (1.0%)
Small and large intestine	1 (1.0%)
Small intestine	3 (2.9%)
Other GI complications*	
Gastrointestinal bleeding	11 (10.6%)
<i>Clostridium difficile</i> colitis	4 (3.8%)

\*Percentage is of patients with at least 1 GI complication.

ALT indicates alanine aminotransferase; AST, aspartate aminotransferase; BMI, body mass index; IQR, interquartile range; SD, standard deviation; SOFA, Sequential Organ Failure Assessment.

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The authors of this study have no relevant conflicts of interest, financial or otherwise, to declare. No funding was received for this study.

Ethics committee approval: Institutional review board approval was obtained for this report. Consent for publishing the unidentifiable patient imaging and operative pictures was obtained.

Supplemental digital content is available for this article. Direct URL citations appear in the printed text and are provided in the HTML and PDF versions of this article on the journal's Web site ([www.annalsurgery.com](http://www.annalsurgery.com)).

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ISSN: 0003-4932/20/27202-0e61

DOI: 10.1097/SLA.0000000000004004

hospitalization, respectively, for an exploratory laparotomy. Two patients were found to have extensive patchy bowel necrosis involving half to two thirds of the total bowel length, despite patent proximal mesenteric vessels on the computed tomography scan, perhaps suggesting microvascular thrombosis. Intraoperatively, the necrotic bowel had a distinct bright yellow color in contrast to the common finding of purple-black color [(Fig. 1 in the Supplementary Appendix (Supplemental Figure 1. Diffuse patchy areas of necrosis of the entire small bowel and right colon, involving large and short stretches of the wall. Note the clear demarcation, the round shape, and the antimesenteric location, <http://links.lww.com/SLA/C197>)]. Another patient was found to have ischemia without frank necrosis of the terminal ileum. The fourth patient developed liver ischemia and necrosis, and had similar areas of yellow discoloration on the antimesenteric side of the small bowel, without frank transmural necrosis.

Two additional patients were diagnosed with a colonic paralytic ileus, clinically identical to colonic pseudoobstruction (Ogilvie syndrome) on days 6 and 14 of hospitalization. Figure 2 in the Supplementary Appendix (Supplemental Figure 2. Abdominal x-ray of a patient with an Ogilvie-like syndrome showing significant distention of the colon, <http://links.lww.com/SLA/C198>.) shows an abdominal x-ray of 1 of these 2 patients demonstrating significant colonic dilation with cecal wall pneumatosis. On exploratory laparotomy, patchy areas of necrosis of the entire colon were noted; a total colectomy and an end ileostomy were performed. The pathology of the resected bowel showed focal transmural areas of necrosis with acute fibrinopurulent serositis. The overall 14-day patient

mortality was 15%. The mortality rate of the subset of patients who required abdominal surgery was as high as 40%.

In this series of critically ill patients with COVID-19, we report a high incidence of hepatobiliary, hypomotility, and ischemic GI complications. Of 141 patients, 58 had ileus, 2 had an Ogilvie-like syndrome, 1 had extensive hepatic necrosis, and 4 had bowel ischemia necessitating emergent surgery and bowel resection. Although these GI complications could be attributed to pharmacologic adverse events and metabolic and electrolyte disturbances occasionally encountered in critically ill patients, severe acute respiratory syndrome coronavirus 2–induced small vessel thrombosis or viral enteroneuropathy are 2 possible hypotheses that warrant further investigation.<sup>4,5</sup> In summary, critically ill COVID-19 patients have a high incidence of GI complications with a subset that progress to bowel ischemia requiring emergent surgical intervention. Front-line clinicians should be made aware of these complications and should keep a high index of suspicion for GI symptoms warranting surgical consultation.

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