# Gastrointestinal problems in intensive care

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## Abstract

Gastrointestinal problems are common in ICU patients and include both surgical and non-surgical problems. A high index of suspicion and regular clinical assessment and are necessary due to difficulty evaluating critically ill and ventilated patients. Gastrointestinal failure may complicate or even precipitate multiorgan failure with systemic inflammatory response due to bacterial translocation. Intra-abdominal hypertension can be under-recognized and causes renal failure and other problems. Although colonic pseudo-obstruction is often conservatively managed, early recognition and treatment can prevent perforation. Stress-related mucosal bleeding is common in ICU patients, but serious gastrointestinal haemorrhage is rare. Early enteral nutrition and $H_2$-receptor antagonists reduce the incidence of upper gastrointestinal bleeding in high-risk ICU patients. Although delayed bowel motions are the norm, lack of defecation may also occur. This does not necessarily equate to constipation and should only be treated if problems occur.

**Keywords** Constipation; gastrointestinal failure; haemorrhage; intensive care; intra-abdominal compartment syndrome; obstruction

**Royal College of Anaesthetists CPD matrix:** 2C00

## Learning objectives

After reading this article, you should be able to:

- describe the common and serious gastrointestinal problems that present in the ICU
- detail the complications and treatment of abdominal compartment syndrome and colonic pseudo-obstruction
- treat and prevent GI haemorrhage and assess motility problems including constipation

Gastrointestinal (GI) problems are often overlooked in the intensive care unit (ICU) or deferred to the attention and skills of nursing staff. However, GI dysfunction is a marker of systemic dysfunction and complete assessment and treatment of the critically ill patient should involve assessment of the GI system. Common GI problems are classified into surgical or non-surgical (Table 1).

## GI symptoms and signs

GI symptoms and signs are common in ICU patients, 60% of patients having at least one GI problem during their stay (Table 2). Significant increases in mortality and length of ICU stay occur with abnormal or absent bowel sounds, bowel distension, or haemorrhage.[1] Assessment may be difficult as many GI symptoms are subjective and patients are often unable to reliably report them.

Although care of the GI tract plays a significant role in ICU care, there are limited investigations or specific biochemical markers of function. The most easily quantifiable measurements are haemorrhage, nasogastric (NG) aspirates or serum lactate; however, there is lack of uniformity in definitions (for example, the expected normal daily NG aspirate volumes range from 150 ml to 500 ml). Because of this, regular thorough clinical examination and high index of suspicion is needed for potential GI problems.

## Gastrointestinal failure

Gastrointestinal failure (GIF) variously defined as 'gastroparesis and intestinal ileus', or 'gastrointestinal haemorrhage', is common, with an incidence of 18%.[2] However, GIF is not included in illness severity scores such as MOFS, SOFA or APACHE III, due to problems in the reliability of data and lack of consensus definition.

GIF may be one of the driving forces for multiorgan failure (MOF), secondary to bacterial translocation and entry of endotoxin into the circulation. Furthermore, because the GI tract is also involved in endocrine, metabolic, immunological, nutrition and barrier functions, development of GIF is associated with an increase a range of adverse outcomes, including prolonged ICU stay, additional ventilation days and a ninefold increase in mortality (44% vs 5%).[2] It is noteworthy that while the risk of serious gastrointestinal complications in elective cardiac-surgical patients is low (2.5%), when they do occur the associated mortality is up to 33%.[3] Further, GIF resulting from non-occlusive ischaemia is not uncommon in severe burns, with a high mortality.

## Abdominal compartment syndrome (ACS)

Normal intra-abdominal pressure (IAP) is 5–7 mmHg although this may be mildly elevated in obese patients and can increase to

### Classification of gastrointestinal problems in ICU

| Non-surgical | Surgical |
|---|---|
| Motility problems | Bowel obstruction |
| Diarrhoea | Ischaemia |
| • Infectious | Perforation |
| • Non-infectious | Haemorrhage or stress-related mucosal bleeding |
| Constipation | |
| Malabsorption | Intra-abdominal compartment syndrome |
| Hepatitis | Pancreatitis |
| Liver Failure | Cholecystitis (calculous and acalculous) |

**Table 1**

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## Approximate prevalence of bowel symptoms and signs in ICU patients (after Reintam et al[1])

| Bowel symptom or sign | Prevalence (%) |
|---|---|
| Absent or abnormal bowel sounds | 41 |
| Vomiting | 38 |
| High (>500 ml/day) NG aspirate | 23 |
| Diarrheoa | 14 |
| Bowel distension | 11 |
| Haemorrhage | 7 |

NG, nasogastric

**Table 2**

15 mmHg postoperatively. Intra-abdominal hypertension (IAH) is defined as an IAP ≥12 mmHg, and is graded I to IV in order of severity (Table 3). Abdominal compartment syndrome (ACS) is grade III or IV IAH, plus new organ failure or dysfunction.[4] If looked for, IAH is common in ICU patients (50%). However, ACS is rare, and the recorded incidence of 5–12% may reflect reporting bias.

### Causes and consequences of ACS

ACS is caused by increased intra-abdominal volume, decreased abdominal wall compliance or a combination of both (Table 4) and may be primary (due to an intra-abdominal cause), secondary (due to an extra-abdominal cause, especially massive fluid resuscitation) or recurrent (which persists or recurs despite treatment). The incidence is higher in septic shock, acute pancreatitis, liver transplant, major trauma (including burns) and following major abdominal surgery.

As a result of reduced abdominal perfusion pressure (APP), IAH results in decreased perfusion and eventual ischaemia of intra-abdominal organs, with an APP less than 60 mmHg associated with worse outcome. This causes splanchnic hypoperfusion, increased mucosal permeability and bacterial translocation. IAH is an independent predictor of poor outcome, and if ACS develops, has reported mortality of up to 50%.

Physiological consequences also occur to organs outside the peritoneal cavity, due to the systemic effects of ischaemia and mechanical effects. The kidneys are the main extraperitoneal organs affected and renal impairment appears to be independent of cardiac output in patients with IAH. Impaired renal vascular flow results in increased in renin, angiotensin and aldosterone production, and reduced glomerular filtration rate.

IAH also increases central venous, pulmonary artery occlusion and intracranial pressures. Increased intrathoracic pressure results in decreased end-diastolic volume, reduced preload and increased after load, the latter due to direct vascular bed compression and sympathetic activation. Finally, ventilation is compromised due to decreased thoracic wall and diaphragm compliance.

## Grading of IAH according to IAP (adapted from de Waele et al)[3]

**ACS is grade III or IV plus new organ dysfunction (shaded area)**

| IAH grade | Normal | I | II | **III** | **IV** |
|---|---|---|---|---|---|
| IAP (mmHg) | 5–7 | 12–15 | 16–20 | **21–25** | **>25** |

IAH, intra-abdominal hypertension; IAP, intra-abdominal pressure.

**Table 3**

## Causes and pathology of abdominal compartment syndrome[3]

| Primary Cause | Pathological Process |
|---|---|
| Increased intra-abdominal volume | Gastrointestinal dilatation |
| | Intra-abdominal or retroperitoneal mass |
| | Intra-abdominal fluid (ascites/blood) |
| | Pneumoperitoneum |
| Decreased abdominal wall compliance | Abdominal surgery (tight closure) |
| | Abdominal wall haematoma |
| | Surgical correction of large hernias |
| Both | Obesity |
| | Trauma |
| | Sepsis and shock |
| | Pancreatitis |
| | Massive fluid resuscitation |
| | Burns |
| | Colonic ischaemia |
| | Intra-abdominal infection |

**Table 4**

### Measurement and treatment of ACS

Clinical examination is unreliable in estimating IAP, so it must be measured using an indwelling urinary catheter (Box 1). Renal and mesenteric vascular ultrasound is an alternative means for assessing IAP.

First-line treatment options for ACS include avoidance of prone positioning, titration of PEEP, gastric and colonic decompression, neostigmine or other prokinetic agents and neuromuscular blockade to prevent splinting. Diuresis, renal replacement therapy or peritoneal fluid drainage may also be useful. Rarely decompressive laparotomy may be needed.

## GI ischaemia

GI ischaemia presents variously as peritonism, abdominal distension, ileus or pseudo-obstruction, lower GI bleeding, abnormal biochemical markers (e.g. lactic acidosis) or worsening

## Measurement of IAP (from www.wsacs.org, accessed September 2011)

Step 1: Fill an empty bladder to 50–100 ml with sterile saline
Step 2: Allow fluid to flow back to the clamp and occlude the IDC
Step 3: Attach a manometer via a Y-connector to the IDC
Step 4: Measure IAP with the patient supine, using the symphysis pubis or midaxillary line as the zero, at end of expiration

IAP, intraabdominal pressure; IDC, indwelling catheter.

**Box 1**