Gastrointestinal problems in intensive care

Mark Kubicki

Stephen J Warrillow

Abstract

Gastrointestinal issues are common in ICU and include both surgical and non-surgical problems. A high index of suspicion and regular clinical assessment are necessary due to inherent difficulties evaluating critically ill and ventilated patients. Gastrointestinal failure may complicate or even precipitate multi-organ failure with systemic inflammatory response due to bacterial translocation. Intra-abdominal hypertension can be under-recognized and causes renal failure and other complications. Although colonic pseudo-obstruction is often conservatively managed, early recognition and treatment can prevent perforation. Stress-related mucosal bleeding is common in ICU, 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
- outline the treatment and prevention of GI haemorrhage and assessment of 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 unwellness. 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, with 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 and serum lactate. However, there is a lack of uniform 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 are 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 multi-organ failure (MOF), secondary to bacterial translocation and entry of endotoxin into the circulation. The GI tract is colonized by ~100 trillion organisms and it has become increasingly recognized that alterations in the intestinal microbiome plays a role in the development in numerous diseases, including sepsis.[3] 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. These including prolonged ICU stay, additional ventilation days and a nine fold 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%.[4] GIF resulting from non-occlusive ischaemia is not uncommon in severe burns and is associated 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 15 mmHg postoperatively. Intra-abdominal hypertension (IAH) is defined as an IAP ≥12 mmHg, and is graded I to IV according to severity (Table 3). Abdominal compartment syndrome (ACS) is grade III or IV IAH, plus new organ failure or dysfunction.[5] IAH occurs in 50% of ICU patients, but is often unrecognized. 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). It may be primary (due to an intra-abdominal cause), secondary

Mark Kubicki *MBBS FCICM is an Intensive Care Specialist at the Austin Hospital, Heidelberg, Melbourne, Australia. Conflicts of interest: none declared.*

Stephen J Warrillow *MBBS FCICM FRACP is a Senior Intensive Care Consultant at the Austin Hospital, Heidelberg, Melbourne, Australia. Conflicts of interest: none declared.*

Please cite this article in press as: Kubicki M, Warrillow Stephen J, Gastrointestinal problems in intensive care, Anaesthesia and intensive care medicine (2017), https://doi.org/10.1016/j.mpaic.2017.12.011

Classification of gastrointestinal problems in ICU

Non-surgical	Surgical
Motility problems	Bowel obstruction
Diarrheoa	Ischaemia
• Infectious	Perforation
• Non-infectious	Haemorrhage or Stress Related Mucosal Bleeding
Constipation	Intra-abdominal Compartment Syndrome
Malabsorption	Pancreatitis
Hepatitis	Cholecystitis (calculous and acalculous)
Liver Failure	

Table 1

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[a] aspirate	23
Diarrheoa	14
Bowel distension	11
Haemorrhage	7

[a] NG, nasogastric.

Table 2

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[a] grade	Normal	I	II	III	IV
IAP[b] (mmHg)	5–7	12–15	16–20	**21–25**	**>25**

[a] IAH, intra-abdominal hypertension.
[b] IAP, intra-abdominal pressure.

Table 3

(due to an extra-abdominal cause, especially massive fluid resuscitation) or recurrent (which persists or recurs despite treatment). The incidence is higher in patients with 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. An APP less than 60 mmHg is associated with a 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 a reported mortality of up to 50%.

Physiological consequences occur also to organs outside the peritoneal cavity due to the systemic effects of ischaemia and

Causes and pathology of abdominal compartment syndrome[3]

Primary cause	Pathological process
Increased intra-abdominal volume	Gastrointestinal dilatation
	Intra-abdominal or retro-peritoneal 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

mechanical effects. The kidneys are the main extra-peritoneal organs affected and renal impairment appears to be independent of cardiac output. Impaired renal vascular flow results in an increase in renin, angiotensin and aldosterone production, and a reduction in 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 afterload, the latter is due to direct vascular bed compression and sympathetic activation. Finally, ventilation is compromised due to decreased thoracic wall and diaphragm compliance.

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 of assessing IAP.

Measurement of IAP[a]

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[b].
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 mid-axillary line as the zero, at end of expiration.

From www.wsacs.org, accessed September 2011.
[a] IAP = intraabdominal pressure.
[b] IDC = indwelling catheter.

Box 1

Please cite this article in press as: Kubicki M, Warrillow Stephen J, Gastrointestinal problems in intensive care, Anaesthesia and intensive care medicine (2017), https://doi.org/10.1016/j.mpaic.2017.12.011