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Case Note Review Booklet

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Australian and New Zealand Audits of Surgical Mortality
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DISCLAIMER: This booklet is produced for Fellows of the Royal Australasian College of Surgeons. Information is obtained under a quality assurance activity.

Case study 1: Leadership I - Communication problems around transfer

Case summary

An elderly patient presented to a peripheral hospital with a one week history of abdominal pain. A computed tomography (CT) scan the next day reported acute diverticulitis. The C-reactive protein (CRP) was 97 and WCC 13,700. The patient self-discharged the next day but it is not clear whether discharge antibiotics were given.

The patient re-presented in the evening, three days later, with an acute abdomen. The white cell count (WCC) was now 2,300 and the CRP was 282. The emergency department (ED) doctor wrote "worsening to generalised peritonitis". The patient was admitted overnight. The morning bloods revealed a CRP of 334. A repeat CT scan at 14:00 showed perforated diverticular disease. The patient was transferred to a tertiary hospital, arriving in the ED at 15:40, assessed at 16:00, but not seen by the surgical team until 22:00. Surgery started at 23:00. There was faeculent peritonitis secondary to perforated sigmoid colonic diverticular disease and a Hartmann's procedure was performed.

In recovery at 05:30, the patient was hypotensive and the pH at that time was 7.25. The patient was then admitted to a general ward, but at 14:00 was admitted to the intensive care unit (ICU) with severe acidosis and initially managed with supportive therapy and no ventilation.

On the morning of the second day in the ICU (some 30 hours after surgery), a medical emergency team (MET) call was placed due to the patient's reduced consciousness. The patient was reviewed by the on-call consultant surgeon 90 minutes later. A CT head (normal) was undertaken.

Eight days after the first laparotomy, the patient underwent a second laparotomy by a different surgeon. There was extensive faecal contamination with a retracted stoma that was leaking faeces. The colostomy was refashioned, the abdomen washed out and the patient returned to the ICU. The patient died from sepsis four days later.

Comment:

Issues associated with this case include delay in transfer between hospitals and delay to surgery. Admission to the ICU should have been considered immediately after the first operation. Closer consultant involvement would have been appropriate in this elderly patient.

Case study 2: Leadership II - Transfer to tertiary care still requires clear leadership

Case summary

A very elderly patient with a virgin abdomen presented to a peripheral hospital with a suspected small bowel obstruction. The patient was transferred to a regional facility with radiology and the diagnosis was confirmed on abdominal x-ray and CT. In view of the comorbidities, which included an aortic valve replacement (warfarinised), a degree of heart failure, new atrial fibrillation (AF) and a mild degree of renal impairment, the patient was transferred to a tertiary centre.

A nasogastric tube (NGT) was inserted and intravenous (IV) fluids commenced whilst awaiting transfer. On arrival at the tertiary centre, the patient's bowels opened and conservative management continued. The AF reverted and fluids were introduced. The following evening AF restarted, however the next morning the abdominal pain was worse. The patient was handed over to another surgical consultant on the same team.

On day three, the patient was in the high dependency unit (HDU) with increasing pain and vomiting around the NGT. On day four the warfarin was reversed and a heparin infusion was commenced. On day five the patient was taken to theatre. The renal function had now normalised and at no stage did the WCC rise.

The Fellow and a registrar performed a laparoscopic adhesiolysis. The tethering appeared to be around the appendix and an appendectomy performed. Postoperatively the urine output trailed off, the patient remained acidotic and a dopamine infusion was commenced. Overnight the patient developed bilateral pleural effusions. Further inotropes were commenced after the patient was admitted to the ICU and the abdomen remained soft. There was a family meeting and it was decided that treatment should not be escalated. The patient remained in a holding pattern until postoperative day seven when, after the first documented surgical consultant review since admission, a repeat CT showed free fluid and gas. The patient and family declined surgical intervention and the patient died shortly after.

Comment:

Some would argue that small bowel obstruction in a virgin abdomen mandates an operation. Others, such as Beardsley *et al*¹, suggest that surgery may not be required, as many small bowel obstructions that have no cause identified on CT, are adhesional and settle. A sooner intervention should have been considered in this patient who initially settled but then re-obstructed a day later. The failure to review the patient on day three may have delayed surgery, as may the failure to reverse the warfarin earlier.

¹ Beardsley C, Furtado R, Mosse C, Gananadha S, Fergusson J, Jeans P, Beenen E. Small bowel obstruction in the virgin abdomen: the need for mandatory laparotomy explored. *Am J Surg* [2014] 208, 243-248

Case study 3: Leadership III - Consultant assessment required prior to transfer

Case summary

An elderly patient, a significant vasculopath, presented to a general practitioner with symptoms of bowel obstruction. A CT abdomen at an outer metropolitan hospital the next day revealed moderate to high grade obstruction and there was high suspicion of a transition point. The patient was admitted under the care of a surgeon via the ED that evening. The consultant gave instructions for conservative management (drip and suck). On the morning round, the surgical team noted that the patient continued to complain of abdominal pain. It was also noted that the patient was “high risk for surgery”, and a medical review stated that the patient should be transferred to a tertiary hospital if surgery was contemplated. In the evening, some 24 hours after admission, a surgical review recorded abdominal tenderness but “no deterioration”, and conservative management was continued.

During the early hours of the night, there was a MET call for severe chest pain. The patient was transferred to the ED for closer observation where a raised troponin was recorded. A further medical review at midday advised transfer to a tertiary hospital, and this recommendation was supported by a further surgical review. The patient had been in hospital for over 40 hours and had been seen by the consultant surgeon who was overseeing the conservative treatment.

At arrival in the tertiary hospital six hours later it was felt that surgery was required. This was performed the following day by a consultant but the patient died in the early postoperative period.

Comment:

While the care at the tertiary hospital was timely and professional, consideration should have been given to earlier transfer. Despite the severity of known comorbidities the patient was admitted to the outer metropolitan hospital instead of a tertiary hospital, and as the patient was known to be a high operative risk in the context of his known vasculopathies and was therefore not a candidate for surgery at the peripheral hospital, earlier transfer should have been initiated.

Case study 4: Leadership IV - Delayed diagnosis and treatment of high risk patient

Case summary

An elderly vasculopath was referred with anaemia, weight loss and a positive faecal occult blood (FOB). It was three months before the patient was seen in the gastroenterology clinic and another three months before a colonoscopy was undertaken. This revealed a descending colon cancer which did not allow the passage of the scope.

The patient was admitted under the gastroenterology team. On review, the surgical registrar noted a distended abdomen and diagnosed an obstructing descending colon cancer. A CT was requested but a report was not available in the notes. Over the next five days the patient was reviewed by three different surgical registrars and two different consultants. During this time the patient was discharged once but never actually went home. There was no mention of any IV fluids being given during this period but Colonlytely and Epsom salts were given (presumably for constipation).

Five days following admission the decision was made to operate, and a Hartmann's procedure was performed two days later (seven days after admission). Admission to a HDU does not appear to have been discussed preoperatively and did not occur postoperatively. The patient was oliguric postoperatively and a bolus of one litre IV fluids was given. The patient vomited postoperatively and an NGT was inserted. On postoperative day one the patient was oliguric and fluids were increased to 250 mL per hour by the surgical registrar. On postoperative day two the renal team review stopped IV fluids, started frusemide and diagnosed acute tubular necrosis. On postoperative day three the patient developed shortness of breath, haemoptysis and became confused. On postoperative day four the ICU consultant reviewed the patient and treatment levels were capped in view of the poor prognosis. The patient died the following day.

Comment:

The issue of concern is the delay to colonoscopy in this elderly patient. Following the colonoscopy there was a delay to surgery and following surgery, admission to HDU should have been considered.

Case study 5: Leadership V - Death following elective reversal of ileostomy I

Case summary

An elderly patient was admitted for elective closure of a loop ileostomy and repair of parastomal hernia almost a year after elective low anterior resection with limited right hemicolectomy and loop ileostomy for mid-rectal cancer and dysplastic hepatic flexure polyp. A Gastrografin enema four months earlier showed no leak from either anastomosis.

Two advanced surgical trainees performed the operation with the consultant in theatre. The stapled anastomosis was oversewn with 3/0 polydioxanone sutures in an uneventful procedure that was completed in an hour. The patient was stable in the recovery room and was subsequently transferred to the ward. The blood pressure (BP) was low overnight and there were four episodes of per rectum (PR) bleeding. The resident medical officer gave a 250 mL bolus of Gelofusine and increased the IV maintenance fluid. At that time the haemoglobin (Hb) was 113 (compared with 136 preoperatively).

The patient was reviewed the following morning by the advanced surgical trainees at which time the low BP was noted and a further 250 mL bolus of Gelofusine was given. The Hb taken in the morning was 106. The BP responded transiently but subsequently settled at 90-100 systolic. The pulse rate steadily rose until it reached 100 at midnight. At about that time the patient also complained of severe abdominal pain (10/10) and the oxygen saturations dropped to 83% (responded to O₂). The night resident medical officer and registrar noted the abdomen to be tender in the upper abdomen, voluntary guarded but soft. Repeat Hb was 119 and WCC 3.09. A chest x-ray (CXR) was performed and it was felt to show atelectasis in the left base.

On review on the morning of the second postoperative day, the patient appeared well and denied any further PR bleeds. There was no documentation of the abdominal findings. The BP was noted to be low at 89/52 and the pulse rate was 110. The patient was given a further 250 mL bolus of Gelofusine. Later that morning the patient's condition deteriorated and a MET call was made for hypotension and shortness of breath. The abdomen was recorded to be tender and guarded by the MET team. The CXR performed earlier was noted to have bibasal atelectasis and showing pneumoperitoneum. The impression was either a pulmonary embolus or sepsis, and an IV Tazocin was given and catheter inserted. The advanced surgical trainee was notified and the initial plan was for a CT abdomen and CT pulmonary angiography (not actually done). There were no further medical entries although the nursing notes record a laparotomy three hours later.

At surgery, a perforation was found at the old ileotransverse anastomosis with perianastomotic abscess. The recent loop ileostomy closure site was intact. The adhesions were taken down and both anastomotic sites were resected. The distal transverse colon was stapled closed and a loop end ileostomy was created. Surgery was completed in three hours and the patient sent to the ICU and ventilated.

The postoperative course was stormy. Two days after the second operation, a review by the consultant surgeon noted that the stoma was pink and the abdominal drains were not purulent. It was felt that reoperation would be of no benefit and it was decided that the patient was not for resuscitation. The patient died shortly after.

Comment:

A recent review reported that loop ileostomy closure can be associated with significant morbidity (17%), leak (1.4%) and even mortality (0.4%)². In this particular patient the leak was at an unusual site – the previous ileocolic anastomosis. The dissection at the time of ileostomy closure was almost certainly the cause of the leak, as the most recent preoperative Gastrografin enema did not demonstrate any leak at both anastomotic sites. Also, during the second operation there were a number of adhesions around the small bowel. This would have made the closure more difficult and presumably resulted in injury to the adjacent ileocolic anastomosis.

Early detection was the only possible way to save this patient and the subtle early signs of sepsis (leucopenia and a pneumoperitoneum noted on the CXR which was larger than expected after surgery) were not appreciated. Ward round documentation of abdominal findings in this case could have been better.

² Chow A, Tilney HS, Paraskeva P, Jeyarajah S, Zacharakis E, Purkayastha S. The morbidity surrounding reversal of defunctioning ileostomies: a systematic review of 48 studies including 6,107 cases. *Int J Colorectal Dis* [2009] 24:711-723.

Case study 6: Leadership VI - Death following elective reversal of ileostomy II

Case summary

An elderly patient was admitted for closure of a loop ileostomy having previously undergone neoadjuvant chemo-radiotherapy of a rectal cancer, followed by an ultra-low anterior resection with covering loop ileostomy. The reversal of the ileostomy was delayed slightly by a leak from the anastomosis, which eventually healed. The timing for the reversal of ileostomy was appropriate.

The operation note from the initial operator was clear: this was a straightforward reversal of the ileostomy, with a stapled anastomosis and mass closure of the rectus sheath with a single running nylon suture. The operation was performed in a peripheral hospital by a registrar with no consultant present. This seemed appropriate.

The postoperative care of the patient was concerning as there were several reports of PR bleeding, vomiting, chest pain, leakage of large amounts of ascites from the ileostomy wound, and significant abdominal distension. Multiple notes documented that the patient looked well and was not in significant discomfort. The patient was not seen at all by the registrar who had performed the operation and the ward rounds appear to have been conducted by a junior registrar. There was no documentation of any discussions being held with the consultant who did not see the patient until six days after the surgery.

The patient was then transferred to a tertiary hospital. The patient remained unwell and slow to progress until a MET call was made on day 12. It was only at this time that a CT scan was ordered, which demonstrated an incarcerated or strangulated incisional hernia (in the ileostomy wound), free intra-abdominal fluid and gas.

A laparotomy was performed by a surgical registrar and Fellow but the consultant was not present. Significant peritoneal soiling from enteric contents with a lot of fibrin was found, suggesting that this had been present for some time. There was a one-line mention of the incarcerated incisional hernia. A relook laparotomy was undertaken the following day with the consultant. Unfortunately, the patient did not respond to further measures and passed away soon after with the withdrawal of significant inotropic support.

Comment:

Closer supervision and involvement of the consultant at the peripheral hospital would have been beneficial, and the signs of sepsis were not initially recognised. Also, there were delays following transfer to the tertiary hospital.

Case study 7: Delay in transfer not helpful, but probably did not contribute to death

Case summary

An elderly patient presented to the ED of a peripheral hospital with an acute abdomen of one hour duration. The patient's history included AF, angina, hypertension and deep vein thrombosis. Ischaemic bowel was suspected.

The plain abdominal x-ray recorded slightly prominent small bowel loops but no disproportionate bowel dilatation or pneumatosis intestinalis. There was no access to the CT films which were done privately. Assuming that the indication was for an ischaemic gut, an arterial phase CT abdomen and pelvis should have been performed, where a significant thrombus or emboli could have been detected. The CT report is based on the portal-venous phase where there was no evidence of bowel ischaemia and the celiac artery and superior mesenteric artery (SMA) were patent.

There was a record of a consultant surgeon reviewing the patient at the peripheral hospital. A decision was made to transfer the patient to a tertiary hospital due to lack of vascular support as well as lack of support from either HDU or ICU. The decision for transfer was made approximately two hours after presentation to the ED but the patient did not arrive at the tertiary hospital until 12 hours later. Observations made during the transfer and on arrival showed deterioration in the patient's general condition.

There does not seem to have been a significant delay between arrival at the peripheral hospital and the commencement of surgery in the tertiary hospital. The decision by two consultant surgeons to not resect the extensive ischaemic bowel was appropriate.

Comment:

Acute SMA occlusion has a high mortality rate. A high index of suspicion, appropriate imaging and timely transfer to a tertiary centre with vascular service may salvage some of these patients.

In this case, the initial clinical diagnosis of an ischaemic gut was apparently not supported by the CT report. However, based on the presenting symptoms an urgent laparotomy was required. There was a delay in transfer between the two hospitals, and documentation regarding the urgency and reasons for the delay in transfer were not evident.

While the outcome for this patient could not have been any different, it is clear that the clinician's assessment and radiological interpretation, together with the urgency involved in arranging for transfer, are very important in the diagnosis and timely management of these situations.

Case study 8: Missed caecal volvulus and handover issues

Case summary

A very elderly patient was admitted to hospital with a three day history of constipation, constant abdominal pain and distension. There was a previous history of a bowel resection (reason not obvious) and pancreatic resection, and more recent admissions for constipation.

Examination revealed generalised abdominal tenderness in an uncompromised patient. The creatinine was significantly raised and an x-ray was interpreted as showing dilated small bowel without air fluid levels but with massive faecal loading. A surgical review in the early hours of the morning came to a similar conclusion, although the tenderness seemed to have subsided. The primary diagnosis was bowel obstruction secondary to gross faecal loading. Aperients were prescribed and a medical admission was organised.

Bowel preparation and fleet enemas were ordered on the morning round but a CT scan later that morning revealed a caecal volvulus. The patient was taken to theatre that evening and a right hemicolectomy with primary anastomosis performed. The patient was transferred to the ICU where their condition deteriorated. The patient died the following day.

Comment:

On admission the patient had cardinal signs of obstruction - pain, relative constipation, abdominal distension and vomiting. Indeed, the presumptive diagnosis was obstruction. Thus the administration of Colonlytely bowel preparation was injudicious. This elderly patient was admitted in the late evening and managed in the ED before transfer to a ward within four hours. It may have been beneficial to consider a transfer to high dependency care. Handover was inadequate, which delayed the surgery; however this did not change the eventual outcome.

Case study 9: Bleeding from staple line leads to death

Case summary

An elderly patient was admitted for an elective laparotomy to remove a tumour that encased the origin of the SMA. Comorbidities included insulin-dependent diabetes, peripheral vascular disease, hypertension, non-dialysed chronic renal failure and hypercholesterolemia.

It appears the clopidogrel was stopped preoperatively and aspirin substituted. While the date of the substitution was unclear, it seems to have been at least 10 days preoperatively. The patient was taking beta-blockers.

The elective surgery was performed by an experienced consultant. An epidural was used. The SMA was clamped proximal to the mass and the length of viable bowel was approximately 1.7m. A small bowel resection with a stapled anastomosis was undertaken. In the surgical case form, the surgeon stated that the anastomotic line was checked to ensure there was no bleeding, but this was not recorded in the operation notes. Postoperatively, the patient went to a general ward.

The nursing chart shows that on return to the ward at 19:30, the patient's systolic BP was ~140 mm Hg (preoperatively the patient's BP was ~170 mm Hg). A probable per rectum (PR) bleed was recorded at 02:00. Overnight the systolic BP was documented as progressively falling, such that by 04:00 it was 90 mm Hg. Further recordings at 05:00 and 06:00 report a similar systolic pressure. The pulse remained unchanged (perhaps because of the beta-blockers). The urine output was satisfactory.

On the morning ward round, the systolic pressure was 93/41 mm Hg. The notes record that there had been a "large PR bleed" that was "bright red". Two hours later, the notes record that the patient was "still actively bleeding" and the Hb had fallen from 149 to 93 g/L. The consultant was contacted and felt that the bleeding was from the staple line. In the surgical case form the consultant stated that, in their personal experience, bleeding from staple lines was normally self-limiting and stops spontaneously. The consultant felt that the first step was to correct the coagulopathy with blood, fresh frozen plasma and platelets, and to withhold further heparin. The International Normalised Ratio (INR) was initially 1.5.

The CT angiogram initially considered by the junior staff was countermanded by the consultant who felt that:

1. a trial of corrective medical therapy was required
2. the site of the bleeding was known
3. it would probably stop spontaneously
4. the contrast for an angiogram was contra-indication because of the compromised renal function (urea=13.7 mmol, creatinine 172 mmol).

The patient received two units of packed cells at 10:30 and 11:30, a unit of platelets at 10:45 and one unit of fresh frozen plasma at 13:15. The Hb in the morning was 93 g/L, at 12:50 it was 94 g/L (and this was after the two units of blood) and an hour later it was 87 g/L. Preoperatively, the Hb was 149 g/L. Other observations in the notes record bleeding around the epidural site and blood oozing from the wound.

It was decided to return the patient to theatre, but before that occurred the patient had a cardiac arrest and was declared dead. Notes made retrospectively record that during this time the systolic BP was 100 to 110 mm Hg despite IV bolus of gelfusine. The notes also recorded a "few PR bleeds" with "some clots and new blood". The case was referred to the coroner.

Comment:

This patient had a significant postoperative bleed and died of cardiac arrest. The patient was fully assessed preoperatively and the decision to undertake the surgery was appropriate.

The cause of bleeding was almost certainly the staple line, and although the aspirin may not have been helpful, it was probably not a significant issue. Although the treating surgeon may have been correct in assuming that many, although certainly not all, bleeding staple lines settle spontaneously, in this case events moved fast and the patient arrested just as it was becoming clear that the bleed was not going to settle spontaneously.

The surgeon, quite reasonably, decided that the initial approach should be to correct the coagulation. However, it is clear that while this was occurring the patient continued to bleed. The Hb did not rise despite two units of blood, and then fell further, and the patient had a persistently low systolic BP despite adequate fluid resuscitation. In the face of ongoing bleeding, the source needed to be controlled but the patient arrested before this occurred. It may be that as a vasculopath, the low Hb and BP led to an arrest that would not have occurred in somebody with normal coronary arteries.

Poor communication was an issue in this case. Consideration could have been given to perform a colonoscopy to inject or clip the presumably bleeding anastomotic vessel.

Case study 10: Urgency of endoscopic retrograde cholangiopancreatography can be important but not in this case

Case summary

An elderly smoker with asthma was seen in emergency in the early afternoon with a one day history of epigastric pain radiating to the back. The patient was tachycardic but afebrile and the ED assessment was of sepsis secondary to pancreatitis or cholecystitis. A surgical opinion was requested.

An hour later the temperature was 39°C, WCC 18,000, a raised lipase and abnormal liver function tests (bilirubin 51). Over the next six hours, the patient was resuscitated but remained febrile, tachycardic and the BP labile. In the early evening, a general surgeon assessed the patient and noted the cholangitis and plans for CT, endoscopic retrograde cholangiopancreatography (ERCP) and ICU. There is a note indicating discussions were held with a radiologist who declined a CT and suggested ultrasound the next morning. Following prepresentations by a consultant surgeon, a CT was eventually performed and reported large gallstone with cholecystitis, pancreatitis with peripancreatic oedema and a 9 mm common bile duct (CBD) but no obvious CBD stone. Later that night the gastroenterology registrar suggested 12 hours of IV antibiotics followed by ERCP. Sometime after this the patient was admitted to the ICU.

The following morning the patient underwent ERCP. The procedure was difficult due to oedema and swelling, and cannulation of the CBD was impossible. Pus was seen extruding from the papilla and a knife papillotomy was performed. It was suggested repeat ERCP or surgery should be considered. *Escherichia coli* was identified on blood cultures and was sensitive to Tazocin, which the patient was already receiving.

Over the next four days the patient's condition improved with antibiotics and ICU support, although ventilation was difficult due to a left pleural effusion. Liver function tests and inflammatory markers improved and a further ERCP was deemed unnecessary.

On the eighth day following admission, the patient developed fresh PR bleeding. The patient was haemodynamically stable (Hb 92 g/L) and IV pantoprazole was commenced. Later that day there was a further bleed and surgical review suggested it was a diverticular bleed. The patient was transfused two units of blood. On the ninth day the nurse documented melena, however the patient remained haemodynamically stable, was off all inotropes and the Hb remained stable.

On the 10th day the respiratory condition deteriorated, the patient became hypotensive and the inflammatory markers increased. The Hb was 62 g/L and WCC 32,000. A further CT reported cholecystitis, peripancreatic oedema and bilateral basal consolidation. Bronchial aspirate grew *E. coli*. Inotropic support was restarted and requirements increased during the next few hours. Following discussion with ICU, surgery, gastroenterology and the patient's family, it was decided to cap treatment. Support was withdrawn on the 11th day after admission.

Comment:

For patients presenting with septic shock, the 'Surviving Sepsis Campaign'³ urges source control within six hours of presentation. In this case consideration was given to the timing of ERCP and it was suggested that the delay in performing ERCP may have contributed to the poor outcome. A single-blinded cohort study of 250 subjects with moderate to severe ascending cholangitis who underwent ERCP or pancreaticobiliary duct showed hospital mortality was less when biliary drainage was performed within 11 hours of admission, compared with more than 42 hours after admission.⁴ There was no difference between 11 hours and 24 hours after admission in this study. I do not believe there is any evidence to state that an earlier ERCP would have altered the outcome in this case.

³ Dellinger RP, Levy MM, Carlet JM, Bion J, Parker MM, Jaeschke R, et al. International Surviving Sepsis Campaign Guidelines Committee; Surviving Sepsis Campaign: international guidelines for management of severe sepsis and septic shock: 2008. *Crit Care Med.* 2008;36:296-327.

⁴ Mok SRS, Mannino CL, Malin J, Drew ME, Henry P, Shivaprasad P, et al. Does the urgency of ERCP/PBD impact mortality and disease related complications in ascending cholangitis? *J Interv Gastroenterol.* 2012 Oct-Dec; 2(4):161-167.

Case study 11: Delay to ERCP a major contributor to death

Case summary

A very elderly patient with significant comorbidities was admitted as an emergency with general deterioration, right-sided abdominal pain, obstructive jaundice, renal failure and a coagulopathy secondary to CBD stones identified on a CT scan.

The patient was admitted via the ED in the early afternoon at 14:00 and was reviewed by the surgical team just before midnight. A consultant opinion was sought and it was felt that the patient required correction of the coagulopathy and an emergency ERCP. The gastroenterology team was contacted at 22:40 and the gastroenterology registrar advised ERCP was not indicated at that stage.

During the early hours of the next morning, the patient was progressively going into renal failure with acidosis and decreasing urine output. A further urgent review by the gastroenterology team was sought with a view to an urgent ERCP. The exact time of the review was not clear, but the decision by the gastroenterology registrar was that an ERCP should be performed 48 hours later.

It was not clear from the notes at what time the decision was made to proceed with an emergency ERCP, but the patient had an emergency ERCP in the early afternoon, some 24 hours after attending the ED. A sphincterotomy was performed and successful clearance of the CBD was achieved. The patient was admitted to the ICU intubated and on inotropic support. The patient continued to deteriorate with multiorgan failure. An appropriate decision was made to withdraw treatment and death occurred some 30 hours after the ERCP.

Comment:

An emergency ERCP ideally should have been performed on the night of admission. There appears to have been a significant problem with communication, and consultant involvement would have been beneficial in this case.

Case study 12: Delayed endoscopy in a case with upper gastrointestinal haemorrhage

Case summary

An elderly patient with a past medical history of hypertension and diabetes collapsed at home two weeks after an elective total hip replacement. The patient was probably taking aspirin and was taking a COX-2 inhibitor. The patient arrived at a district hospital that had on-call surgical and medical services at 14:00. On arrival the patient was shocked (p>100, systolic BP 70/40 mm Hg), acidotic (base excess 12.4) and the Hb was 72 g/L. The patient was recognised to have an upper gastrointestinal (GI) bleed at 18:00. The patient was given 4.5 L of crystalloid before it was recognised that the active bleeding was continuing. No blood was given until 19:00, some four hours after admission.

The patient was transferred to a tertiary referral unit for an upper GI endoscopy. The patient arrived at the referring hospital at 20:30 that evening, but did not undergo endoscopy until 13:00 the following afternoon.

The patient received two units of blood at the initial hospital and a further two units of blood in the tertiary hospital prior to the endoscopy. During the endoscopy procedure, there was a cardiopulmonary arrest that was thought to be caused by hypovolaemia. After resuscitation, the patient was taken to the operating theatre where a bleeding duodenal ulcer was underrun. The patient subsequently died in the ICU.

Comment:

There have been several scoring systems to predict the risk of mortality with upper GI bleeding. One of the simplest is the Rockall score. On admission this patient had a Rockall score greater than eight, which put the patient at a very significant risk of mortality without treatment. With a Rockall score greater than eight, the patient should have undergone an endoscopy within four hours. There was a delay in the patient having a GI endoscopy, which did not occur until sometime after transfer to the tertiary hospital.

The transfer of this patient was appropriate if the proper facilities were not available at the district hospital. However, I believe that had the patient undergone a prompt upper GI endoscopy with adequate ongoing resuscitation, the outcome may well have been different.

There were no issues with the surgeons who performed the appropriate operation without delay.

Case study 13: Delay with fractured hip not helpful

Case summary

A very elderly patient fell in the morning and was admitted to a metropolitan hospital with a fractured hip. The patient was transferred to a teaching hospital, admitted to the ward late in the afternoon and was booked for theatre the following day. On arrival in the theatre, the patient was turned down by the anaesthetist as the oxygen saturation was low (85% on room air). Death occurred before the patient was deemed fit for surgery, probably from aspiration.

Comment:

The orthopaedic literature makes it very clear that patients are never fitter than on the day of surgery. The literature also makes it clear that surgery should not be delayed unless the patient's general health can be improved to make deferred surgery safer. In this case it may have been better if a physician (the orthogeriatric team) had seen the patient earlier i.e. on the day of admission.

The patient was charted for between one and two IV fluid litres per day, which appears reasonable. However, it was not clear as to what the patient actually received, particularly on days one and two. The reason for the theatre cancellation was decreased partial pressure of oxygen (PO_2), as determined by pulse oximeter and the need for large amounts of oxygen to maintain the PO_2 . Numerous doctors noted the decrease in PO_2 and increased crepitations, and interpreted this as pulmonary oedema. Every entry by each doctor stated that the jugular vein pulse was not elevated. Most entries reported that the patient was clinically dry as were the mucous membranes. The steadily increasing urea, creatinine and sodium over 3 days all suggest dehydration.

There was one entry in the notes suggesting aspiration and a reference of gastroesophageal reflux disease. Whilst I understand that it can be difficult to distinguish between pulmonary oedema and pneumonia, especially if there is heart failure, the usual management is to administer small doses of fluid and small doses of Lasix administered sequentially.

Case study 14: Delay in managing perforation secondary to sepsis

Case summary

An elderly patient was admitted for an elective extended right hemicolectomy. The patient had a complex medical background and a past surgical history of cholecystectomy, appendicectomy and small bowel obstruction secondary to adhesions. After appropriate preoperative assessment, including a CT scan of the chest, the patient was deemed fit for anaesthetic and a major surgical procedure.

An elective extended right hemicolectomy was performed by a consultant surgeon with a senior trainee registrar as the first assistant. There were no apparent intraoperative difficulties. Extensive adhesions requiring adhesiolysis were documented. The bowel was mobilised, and the resection followed by stapled anastomosis. Anaesthetic notes document that the patient was stable when transferred to the nursing observation special area ward.

Thereafter, the patient made satisfactory progress with a plan for discharge on the sixth postoperative day. However, the patient was not cleared by the physiotherapist who wanted improved mobilisation prior to discharge and later that day a decline in the level of consciousness was noted when an intern tried to place a cannula (postoperative day six).

After excluding obvious causes, an initial impression of a urinary tract infection was entertained. On postoperative day seven, the intern recorded that the patient was confused, unwell and with generalised lower abdominal pain. There was a tachycardia with an irregular rhythm and no documentation of urine output (due to incontinence). Within one day, the patient had raised inflammatory markers (WCC from 16,000 to 2,600; CRP: 140 to 340). Tenderness in the flanks with mild erythema and poor urine output was noted by the trainee registrar during afternoon rounds. A diagnosis of bilateral pyelonephritis was made and antibiotics were commenced. There was a MET call 2.5 hours later.

The MET team documented the patient as hypotensive, tachycardic and hypoxic. The abdomen was mottled and distended. After resuscitation, the patient was transferred to the ICU for ventilation and inotropic support. In view of increasing inotropic requirements and worsening lactic acidosis the patient was taken back to theatre (by a consultant) for laparotomy less than two hours after the MET call. There was gross faecal peritonitis and an obvious defect at the anastomotic site was noted. The anastomosis was taken as a specimen and an ileostomy was fashioned after adequate washout.

The patient developed full-blown sepsis with multiorgan failure. The poor anticipated outcome was discussed with the family and a decision was made to withdraw inotropic support and dialysis. The patient died the next day.

Comment:

The decision for surgery, comorbidities notwithstanding, was appropriate. The procedure by an experienced colorectal surgeon took about three hours (as per the anaesthetic charts). As per the operation note, an appropriate technique was used, with stapled anastomosis and suturing of the trouser leg. The patient was recovering well until day five or six postoperatively. There was a delay in recognising an anastomotic leak which led to peritonitis, and ultimately sepsis and multiorgan failure.

Case study 15: Delay managing an obstructed (incisional) hernia I

Case summary

An elderly patient presented overnight with small bowel obstruction on a background of an incisional hernia following previous surgery for a gastric perforation. Comorbidities included obesity, AF on warfarin, congestive cardiac failure and pneumonia. Initial assessment noted the symptoms of small bowel obstruction, a tender incisional hernia and an abdominal x-ray demonstrating small bowel obstruction. Initial management with nasogastric insertion, IV therapy and analgesia was instituted. The patient required morphine and tramadol for increasing pain overnight. However, the next morning the patient was passing flatus and the abdomen was soft and non-tender. There was a need for an increased dose of tramadol.

On day two, the NGT was draining faeculent fluid and a CT abdomen was arranged. The CT report was not documented in the progress notes but the discharge summary states "SBO within hernia sac. Oedematous and poorly enhancing small bowel loops are concerning for ischaemia".

The documented plan was to administer vitamin K and octreotide until surgery, group and hold blood and obtain anaesthetic review. The next day the INR was elevated and vitamin K was given. On day four of the admission, the abdomen was soft and non-tender, the nasogastric output was faeculent and surgery was planned for the following day. However, the next day the nasogastric output had decreased and the surgery was cancelled. A percutaneously inserted central catheter was inserted for total parenteral nutrition.

Over the next three days the patient was passing flatus, clear fluids were commenced and the bowels opened. Gastrografin was given and the subsequent two x-rays demonstrated dilated small bowel loops containing contrast. The NGT and indwelling catheter were removed, warfarin was commenced and the patient progressed to nourishing fluids. On day nine, the patient was given a soft diet. This resulted in vomiting and abdominal distension and the NGT was reinserted. IV transfusion, proton pump inhibitors and octreotide were commenced. Warfarin was withheld.

An opinion was sought from an upper GI team who discussed the case with the plastic surgeons. The conclusion was that there was no surgical option for the massive incisional hernia or the small bowel obstruction, and that maximal supportive care was appropriate.

Over the next two days the patient was short of breath with a productive cough, and the INR was increasing despite warfarin being withheld. CXR showed acute pulmonary oedema and furosemide was given. Anaesthetic and medical reviews concluded that the patient was unstable with coagulopathy, acute kidney injury and congestive heart failure. Further investigations were requested.

On day 13, the patient had increasing pain requiring morphine. The WCC increased and the patient became increasingly septic and a MET call instituted. Active treatment was limited as the patient was not for surgery. The patient died the next day.

Comment:

There was a delay of two days before the CT and, once performed, the findings were consistent with obstructed incisional hernia with possible small bowel ischaemia. This was an indication for urgent surgery.

Documentation throughout the admission was overly brief, and the daily clinical status and plans for management were not clear. The outcome may not have been any different but there was no clear documentation of a proper management plan.

Case study 16: Delay managing an obstructed (inguinal) hernia II

Case summary

A very elderly patient was admitted with an incarcerated inguinal hernia. The patient had pain in the groin and abdomen associated with vomiting. The groin was not tender at the time the surgeon examined the patient. The patient had a number of cardiac comorbidities.

Imaging included a CXR that revealed a large hiatus hernia and a moderately prominent cardiac outline. The abdominal x-ray showed subacute small bowel obstruction. The blood investigations included a WCC of 27.50 and venous lactate of 1.9.

It seems the theatre was functioning to 23:00 but surgery was deferred until the next morning. There was no mention of an NGT insertion. The segment of small bowel in the hernia was dusky but viable.

The postoperative period was one of gradual deterioration in the face of the patient's age and comorbidities. At various stages the patient had acute pulmonary oedema and bibasal crepitations. A CXR suggested infective changes, and although transferred to the HDU the patient developed acute renal failure and died.

Comment:

On admission the patient was diagnosed with an incarcerated hernia and small bowel obstruction. The decision was to operate, however there was a delay to theatre. It was fortunate that the bowel was still viable after a 9-hour delay. Consideration should have been given to insert a NGT, due to the large hiatus hernia on CXR and features suggestive of small bowel obstruction. It seems likely that the patient aspirated into the left lung.

Case study 17: Lack of antiplatelet agent may have been important

Case summary

An elderly patient was admitted for elective aortic surgery. The chest CT scan showed a bilobed fusiform aneurysm (68 mm) of the aortic arch, a dilated descending thoracic aorta (40 mm) and abdominal aortic aneurysm (56 mm). The patient was referred by a vascular surgeon to a cardiothoracic surgeon for elective debranching of the arch vessels on to ascending aorta. The referral letter does not detail any future planning but it is presumed that the intention was to stent the arch and proximal descending thoracic aorta.

The patient background included coronary artery disease treated by a drug-eluting stent three months prior to the aortic surgery. The patient was taking aspirin and clopidogrel. Clopidogrel was withheld five days prior to surgery. The abdominal aortic aneurysm was stented one month prior to the planned aortic surgery.

The patient underwent an uneventful elective debranching. This was performed on the beating heart without the use of a cardiopulmonary bypass machine (operating notes do not mention the use of cardiopulmonary bypass). The patient was transferred to the ICU. The first hour drainage was 175mL. One unit of pooled platelets was given.

On postoperative day two, the patient was transferred to the ward. Clopidogrel was reintroduced the same day. On postoperative day three, the patient developed fast rate AF and a systolic BP of 90. Metoprolol 50mg was administered as per phone order. One hour later, the patient was reviewed for dyspnoea and passed away. The telemetry recorded a bradycardia of 48.

Comment:

It is difficult to make an assessment from the notes as no preoperative angiography or echocardiogram reports were provided. In the absence of the angiography report, it is difficult to comment on whether the bypass grafts were necessary and whether or not performing them contributed to mortality.

Clopidogrel was stopped five days prior to the surgery and started only on postoperative day two. With a patient history including drug-eluting stents just three months earlier, the omission of clopidogrel could have played a role in acute stent thrombosis (myocardial infarction was listed as a cause of death on the certificate). There should have been an overlap with a short acting antiplatelet agent prior to surgery. Consideration should have been given to the need for the drug-eluting stent to the left anterior descending artery, as the artery could have been easily bypassed during surgery, eliminating the need for clopidogrel. Although the cause of death was declared to be myocardial infarction, the limited telemetry capture provided does not show any ST-T changes on the electrocardiogram (ECG). Troponins were not requested. Telemetry showed significant bradycardia after administration of metoprolol. With systolic BP of about 90, a large dose of metoprolol would be cause for terminal haemodynamic instability.

Case study 18: Postoperative haemorrhage might have been better managed by washout

Case summary

A patient was admitted for elective resection of a caecal carcinoma and insertion of an Infusaport. This case review relies entirely on the hospital notes; the preadmission documentation was not available. It would appear that the patient was asymptomatic although liver secondaries were present, and there was significant pressure to operate from the family despite some hesitation on the part of the surgeon. The patient lived independently in a supervised environment with a few medical conditions including treated thyrotoxicosis, controlled hypertension, reflux and arthritis.

Insertion of a right subclavian Infusaport and a laparoscopic right hemicolectomy with excision of the contiguous tumour on the abdominal wall were performed. The surgery took 1.5 hours and one litre of fluid was administered. It would appear that the operation was very straightforward. However, the operative record consisted of 16 words, seven abbreviations and four numbers.

Postoperatively, the patient was transferred to the ICU. Preoperatively, the Hb was 100 g/L, but 15 hours postoperatively it was only 72 g/L. Total transfusions were one litre intra-operatively, a second litre immediately. Crystalloid was then reinstated.

The patient was returned to the ward 24 hours after surgery. Normal diet was instituted at about 72 hours. The Hb remained subdued but all clinical observations were within acceptable limits. From around the fourth postoperative day, the patient's progress could best be described as slow. Bilious vomiting commenced. A NGT was inserted but only to 12 to 15 cm and only minor volumes were aspirated. Significant volumes were drained later and perhaps it was of benefit that this patient had gastric reflex, as the NGT was almost certainly in the oesophagus rather than in the stomach. The abdomen remained distended. Despite this, the patient was significantly independent, pain-free and tolerated nourishing fluid. Although bowel sounds were present, flatus had not been passed by postoperative day five.

On postoperative day six, a CT scan suggested a holdup at the anastomosis, some pelvic blood associated with abdominal free fluid, pleural effusions and atelectasis. There was no leak. The patient continued to vomit and there was no spontaneous nasogastric drainage. On postoperative day eight, the patient developed rapid AF reverted with amiodarone. Over the next couple of days the patient seemed settled, tolerating diet and fluids. On postoperative day 12, another CT was performed. There was increased abdominal fluid, the obstruction had resolved and there was no suggestion of leak or abscess.

The patient redeveloped AF and on postoperative day 14 digoxin and warfarin were commenced aiming for an INR of over two. After two doses the INR was 4.5 and no further warfarin was given. Over subsequent days the INR varied widely: 5.3, 5.1, 4.9, 8. Vitamin K was administered and the INR fell to 5.6, and further vitamin K was given. No further INR was measured. The Hb over this time remained relatively constantly in the 80s. On postoperative day 22 there was an order by telephone for three units of packed cells by the surgeon, as the Hb had fallen to around 70.

The INR remained markedly elevated. The photocopied notes rendered some of the entries illegible but around this time a plain abdominal and chest film showed pleural effusions and multiple air fluid levels in the abdomen. A CT scan conducted on postoperative day 21 suggested the blood in the pelvis had increased, when compared with the CT scan on postoperative day 12. It was now walled off and although there were multiple foci of gas suggesting an abscess, there was no obvious communication with the GI tract. The patient was clearly deteriorating clinically, antibiotics were instituted and the decision was made to place drains in this collection under ultrasonographic control. Colloid resuscitation commenced and drains were inserted with difficulty on postoperative day 22. A heavy growth of anaerobes was obtained from the collections.

Not for resuscitation orders were signed following discussions with the family. A further CT on postoperative day 26 showed improvement following drain insertion, but still a significant collection. The patient passed away on postoperative day 27.

Comment:

The root cause of this patient's death was a postoperative intra-abdominal bleed (Hb 100 to 70 g/L postoperatively). A CT scan postoperatively on day one may have been helpful. It may have also been beneficial to return the patient to theatre for a washout, even though the patient was apparently stable. The haematoma inevitably delays bowel recovery and even in the absence of an anastomotic leak the blood, as here, often becomes secondarily infected. The development of postoperative AF in this setting was strongly suggestive of an abdominal sepsis as was the development of a toxic INR after two-thirds of a loading dose of vitamin K but this also further discouraged surgery.

Case study 19: Fulminant pseudomembranous colitis following elective inguinal hernia repair

Case summary

A very elderly patient underwent surgery for a painful right inguinal hernia with at least one previous episode of incarceration. The medical comorbidities included ischaemic heart disease, deteriorating obstructive airways disease, tricuspid incompetence and frailty. A decision was made to proceed with surgery at a private hospital under spinal anaesthesia. The patient took aspirin up until the day prior to surgery.

An open right inguinal mesh hernia repair was performed under spinal anaesthesia with no intraoperative complications. Postoperatively, the patient developed a groin haematoma with bleeding from skin edges and this was managed by suturing on the ward and pressure dressing.

The day after surgery, the patient developed right scapular pain, shortness of breath and altered mental state. The medical team considered that an acute coronary syndrome was unlikely based on clinical assessment, CXR, ECG and blood tests. The patient settled quickly and IV fluids were reduced to 50 mL per hour due to the propensity for fluid overload in a setting of right heart failure. Echocardiogram showed severe tricuspid incompetence and right ventricular overload.

On postoperative day four, the patient became hypotensive (81/40), hypoxic (saturation 84%), confused and complained of abdominal pain. After transfer to a cardiac monitoring bed, a possible urinary sepsis was diagnosed and treated with ceftriaxone. The patient initially improved and was transferred back to the ward. Two days later the patient developed increasing dyspnoea, abdominal pain and diarrhoea. The WCC was elevated (18) and an abdominal x-ray showed multiple fluid levels that the surgeon initially diagnosed as pseudo-obstruction. An ultrasound showed marked ascites and metronidazole was commenced for a possible *Clostridium difficile* infection. The abdomen became very distended and oedematous. A CT scan showed an oedematous right colon consistent with colitis and the possibility of caecal perforation was raised. Stool culture confirmed *C. difficile* and oral vancomycin was commenced. The patient continued to deteriorate. A laparotomy was never really an option and palliation commenced after discussion with the family. The patient died 15 days after surgery and the case was referred to the coroner.

Comment:

In this case there was a background of recurrent incarceration. However, it is of concern that the patient's general health was apparently deteriorating in the lead-up to surgery. In retrospect, it may have been wise to obtain a preoperative assessment from a general physician to see whether there were issues, such as treatment for cardiac failure that could have been optimised. In many hospitals, a preoperative medical assessment is routinely offered in high risk patients being considered for surgery. Inguinal hernia in elderly or frail patients can be safely managed under spinal or local anaesthesia.

Postoperatively there appears to have been an issue with fluid overload in managing hypotension on a background of tricuspid incompetence. Ideally, this type of problem should have been managed with inotropic support in an HDU or ICU setting to avoid the need for excessive IV fluid administration.

The final clinical insult was pseudomembranous colitis from *C. difficile* in an already compromised patient. Presumably the empirical use of broad spectrum antibiotics contributed to its development.

WAASM comment:

Over the last few years WAASM has recorded a small but steady number of patients dying as a direct result of *C. difficile* infection. Surgeons need to maintain a high index of suspicion.

SHORTENED FORMS

| | |
|-----------------|--|
| AF | atrial fibrillation |
| BP | blood pressure |
| CBD | common bile duct |
| CRP | C-reactive protein |
| CT | computed tomography |
| CXR | chest x-ray |
| ECG | Electrocardiogram |
| ED | emergency department |
| ERCP | endoscopic retrograde cholangiopancreatography |
| FOB | Faecal Occult Blood |
| GI | Gastrointestinal |
| Hb | Haemoglobin |
| HDU | high dependency unit |
| ICU | intensive care unit |
| INR | international normalised ratio |
| IV | Intravenous |
| MET | medical emergency team |
| NGT | nasogastric tube |
| PO ₂ | partial pressure of oxygen |
| PR | per rectum |
| RACS | Royal Australasian College of Surgeons |
| SMA | superior mesenteric artery |
| WAASM | Western Australian Audit of Surgical Mortality |
| WCC | white cell count |