



Victorian Audit of Surgical Mortality

## Victorian Audit of Surgical Mortality

### Case note review booklet

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Royal Australasian College of Surgeons

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## Introduction

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The Victorian Audit of Surgical Mortality (VASM) audits deaths that occur while the patient is under the care of a surgeon in the public and private hospital sectors. As this peer-review process is intended as an educational exercise, in this report VASM has selected a number of cases that bring out specific clinical issues. The cases do not necessarily relate to the period since the last booklet, and may or may not have occurred in Victoria. They do, however, serve as topical and timely lessons for all surgeons and clinical team members.

All cases selected have gone through a second-line assessment (case note review) by a Fellow of the Royal Australasian College of Surgeons. The cases document critical incidents that are often system issues rather than the responsibility of the treating surgeon alone. The assessments have been edited to ensure that the patient, hospital involved, treating surgeon and assessor remain anonymous. In a few instances, contributions from additional reviewers have been appended.

Qualified privilege prevents us from sending assessment feedback to anybody other than the treating surgeon. This means hospital management only receive indirect feedback on cases of patients who died in their hospital. Where there are obvious system issues, it is important that hospitals are made aware of these issues so that they can be addressed. It is also important that VASM attempts to address emerging adverse trends. The failure to recognise and react to 'clinical deterioration' is such an issue. The Victorian Surgical Consultative Council (VSCC) and VASM held a seminar on clinical deterioration in February 2012. A second seminar on patient transfers will be held in early 2013 and will target hospital, medical and nursing staff.

There are important lessons in this publication and it should be made available to all those responsible for delivering the care that resulted in the outcomes presented. The project recommends that the cases presented here are used as teaching aids. VASM can provide additional copies where necessary or online at [www.surgeons.org/vasm](http://www.surgeons.org/vasm).

The VASM staff members take this opportunity to thank all surgeons and hospitals participating in the audit. We hope you find this publication of value.

## Summary of reviewers' comments on individual cases

### *Case 1: Cerebral hypoxia following cardiothoracic surgery*

There are a variety of different methods of cerebral protection and perfusion. The technique as described is well accepted; however, the detail of the technique cannot easily be assessed. This was a patient with a life-threatening condition. This outcome was a risk of the procedure but was not expected. There is no specific reason for the outcome.

### *Case 2: Ruptured thoracic aorta with late diagnosis*

Although ruptured thoracic aorta is associated with a high mortality rate, earlier diagnosis with appropriate investigations and referral may have changed the outcome for this patient.

### *Case 3: Delay in transfer and lack of senior staff input for a case of cholangitis*

Jaundice, fever and tachycardia require appropriate and aggressive treatment. In this case there seemed to be a lack of appreciation of the potential for rapid deterioration. It seems the problem declared itself six months before but no action was taken by the GP. It also highlights the difficulty rural hospitals face in obtaining an urgent endoscopic retrograde cholangiopancreatography (ERCP) for acute biliary obstruction.

### *Case 4: Trauma with delayed diagnosis of ileocaecal perforation*

Failure to see intraperitoneal gas on the computed tomography (CT) scans gave a false sense of security that there was no bowel perforation or injury, when there may have been either ischaemia of the terminal ileum and caecum secondary to mesenteric injury or a retroperitoneal perforation.

Insertion of the pigtail catheter by the intensive care unit (ICU) staff occurred during the resuscitation period and would appear to have been a futile attempt to drain the septic collection in the hope of buying more time.

### *Case 5: Bowel injury after laparoscopic cholecystectomy*

After a difficult laparoscopic cholecystectomy where the potential for small bowel damage was recognised at the time of surgery, the patient died from sepsis from perforation.

On postoperative day one, the patient had inappropriate pain, tachycardia, hypoxia and hypotension. This should have been a signal that small bowel damage might well have occurred. The patient was transferred to ICU where intubation was necessary. It seems that signs of intra-abdominal issues were present on the first night but no action was initiated until the rapid decline of the patient the following day.

### *Case 6: Delay in diagnosis of strangulated bowel*

It appears that the surgical registrar was unavailable to assess the patient (reason not documented). The fact this occurred at the weekend would suggest a relative lack of backup.

This patient would have been quite difficult to assess given their intellectual disability and psychosis, and the previous episodes of small bowel obstruction that did not require surgical intervention. It is not known what information was actually given to the surgical registrar. One can only assume that the criticality of this patient's condition was not recognised or communicated. The hospital concerned needs to develop some process whereby patients referred from the emergency department (ED) are seen in a timely fashion by a surgical registrar or consultant.

### *Case 7: Poor monitoring after subdural haematoma*

Elderly patients who are operated upon for subdural haematomas while they have mild or no neurological deficits have a reasonable prospect of survival in a good neurological state. Factors that placed this patient at higher risk of deterioration were overlooked, namely the history of anticoagulation, the severity of the head impact, the acuteness of the haemorrhage and the presence of midline shift.

### *Case 8: Subtrochanteric fracture with postoperative deterioration poorly managed by junior staff*

Subtrochanteric fractures of the femur need fixation by members of the orthopaedic team who are experienced in their management. The junior medical staff members need supervision, and direct observation of the patient by a more senior doctor may have allowed for a clearer plan of action.

### *Case 9: A radical surgical treatment for bladder cancer may not be optimal for terminal patients*

This elderly patient with terminal metastatic bladder cancer may have been best palliated with a less invasive procedure than a radical cystectomy and ileal conduit. A discussion in a more formal setting at a multidisciplinary meeting may have raised this and broadened the discussions on the potential treatment options.

### *Case 10: Delay in diagnosis of obstruction in an infant with enterocolitis*

Despite concerns that the abdominal distension was secondary to an ileus, with radiological features suggestive of small bowel obstruction (SBO) and increasing instability, earlier exploratory surgery may have avoided the eventual demise of the patient, although there is no denying that the mortality risk of surgery in this patient was extremely high.

### *Case 11: Repair of ruptured aortic aneurysm despite cardiac arrest*

Inability to contact the on-call consultant led to delay in treatment, but the futility of operating on patients with ruptured abdominal aortic aneurysm (AAA) who have suffered pre-hospital cardiac arrest is a concern.

### *Case 12: Rupture after endoluminal graft for aortic aneurysm*

Unacceptable delays in the management of this patient occurred at every stage - inappropriate triage delayed medical review for hours, the CT scan was not performed for almost 10 hours and, even when the diagnosis was known, transfer to the operating theatre was delayed for more than one hour.

These delays directly contributed to the death of the patient. It would be reassuring to know that the institution involved has conducted an internal review of this patient's poor management. The presence of a previous endoluminal graft for treatment of an AAA does not exclude the diagnosis of a ruptured aneurysm.

### *Case 13: Bleed after angiogram with inability to contact consultant*

The main error in this patient's care was the delay in communicating with the treating consultant because the staff were unable to contact the responsible surgeon. The overuse of Heparin may have been a factor, but the primary reason this patient had a complication was because of the initial high puncture of the femoral artery.

## Emerging issues

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### Delay in management

This remains an ongoing concern in both the diagnosis and initiation of management of the deteriorating patient. This is a process problem in many instances which involves communication breakdown between referring doctors and tertiary institutions, as well as between different units within the hospital.

### Quality of documentation

Reviewers have commented repeatedly about poor documentation and the poor quality of handwriting. Attention needs to be paid to the medico-legal implications of inadequate and illegible notes.

### Availability of on-call specialists

There have been a few instances of on-call consultants not being contactable, leading to delay in patient treatment and contributing to mortality. This issue, caused by a variety of reasons, needs urgent attention by health organisations so that processes can be put in place to ensure that on-call surgeons are contactable.

### Delay in managing the deteriorating patient

This remains an ongoing issue and will be the continued focus of efforts to improve patient care.

## Cardiothoracic surgery

### *Case 1: Cerebral hypoxia following cardiothoracic surgery*

#### Summary

An elderly patient underwent repair of an aortic valve with a resuspension of the valve (David procedure) and replacement of the ascending aorta and hemi-aortic arch. The operation was performed using deep hypothermia and circulatory arrest. The patient failed to regain consciousness and died a week post-operation. Autopsy showed evidence of cerebral hypoxic changes.

The patient had severe aortic regurgitation and an 8.3 cm ascending aorta. There was total circulatory arrest for 30 minutes, an aortic cross clamp time of 233 minutes and a bypass time of 271 minutes. Hypothermia was established at 18.5°C. The operation was satisfactory but prolonged. The patient was weaned from bypass satisfactorily. There was some 'oozing', and frozen fresh plasma, platelets, cryoprecipitate and Factor 7 (Novo Seven) were given.

The patient had generalised seizures which lasted more than 10 minutes during the transfer to the intensive care unit (ICU). The patient failed to wake over the next few days and was investigated with cerebral computed tomography (CT) and magnetic resonance imaging (MRI). After consultation active treatment was ceased.

#### Comments

It is not possible to positively identify which of the potential causes contributed to the problem and indeed they could all be contributory. The use of Factor 7 is questionable in this situation. It seems little time was given for the regular clotting factors to take effect or for the clotting tests to be checked. There is no proven benefit for Factor 7 use in this situation over and above adequate clotting factor replacement, and there are reports of the occurrence of intravascular thrombosis with its use.



**There are several potential causes for cerebral hypoxia:**

- Inadequate hypothermia prior to circulatory arrest.
- Inadequate perfusion via the right axillary artery.
- Inadequate de-airing before and after cross clamp removal.
- Thrombosis in the cerebral circulation, the risk of which would be increased by the use of Factor 7. There was, however, no thrombosis reported in the cerebral circulation.
- Prolonged hypotension post-cardio pulmonary bypass, but there is no recorded evidence for this.

There is not much information relating to the preoperative investigation as the patient was only admitted to hospital on the day of surgery. Assessment of the cerebral circulation and the adequacy of the Circle of Willis could have been done, but this is not normal practice. An elderly patient undergoing a high-risk procedure should be better assessed with an earlier admission to hospital.

Aortic valve preservation is a reasonable choice in this disease, although this is a longer procedure than aortic valve replacement. Time does not however seem to have been a contributory factor to the outcome. There are a variety of different methods of cerebral protection and perfusion. The technique as described is well accepted; however, the precise detail of the technique cannot easily be assessed. This was a patient with a life-threatening condition. This outcome was a risk of the procedure but was not expected. The use of Factor 7 should be flagged as a practice of concern.

## General surgery

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### *Case 2: Ruptured thoracic aorta with late diagnosis*

#### Summary

A middle-aged patient known to be a heavy smoker presented to the Emergency Department (ED) with a day of severe upper abdominal and retrosternal pain and drowsiness. On admission, the patient's pulse was 83 and oxygen saturation was 93% in room air. Blood pressure (BP) was recorded as 243/153 on the right and 173/100 on the left arm. Past medical history included hypertension, hypercholesterolaemia, obesity and sleep apnoea. Regular medications were recorded as Coversyl and Lipitor.

The patient was seen promptly by an ED doctor who organised a full blood examination, liver function test (LFT), urea and electrolytes, electrocardiogram (ECG), abdominal x-ray (AXR) and requested a surgical review from the General Surgical registrar two hours after arrival. ECG result was recorded as 'no acute changes'. The possibility of an acute cardiovascular event does not seem to have been considered. No chest x-ray (CXR) seems to have been performed. Initial haemoglobin was not provided in medical notes.

Five milligrams of morphine were given intravenously prior to being seen by the surgical registrar and consultant four hours after presentation. At this time, the patient was noted to be 'unwell and grey looking'. Differential diagnosis included haemorrhage into hepatic lesion, acute myocardial infarct or dissection of the abdominal aorta. An urgent CT of the abdomen was reviewed by the radiology and surgical registrars and deemed to be grossly normal.

The surgical registrar, who had not detected any signs of abdominal concern, was concerned that no diagnosis was given and contacted the medical registrar for an opinion. A troponin and CXR were requested. Arterial blood gas now indicated hypoxia, hypercapnia and acidosis. Troponin level was normal. Review of the CXR raised the potential of a widened mediastinum. A request for urgent CT chest to exclude thoracic aortic aneurysm was refused by the radiology registrar who said 'it could be done in the morning'.

There is no record of the medical registrar seeing the patient until a code blue was called eight hours after presentation. Eleven hours after presentation to ED, an electromechanical dissociation (EMD) arrest led to intubation and cardiopulmonary resuscitation (CPR). The cardiothoracic team felt surgery was not indicated given the moribund state. An urgent transthoracic echocardiogram showed 'negligible cardiac output' and pupils were noted to be fixed and dilated. Treatment was ceased.

Retrospective review of the CT of abdomen showed aortic enlargement in the upper slices. Presumed diagnosis of ruptured thoracic aneurysm was made based on this finding. There was no post-mortem.

### Comments

A request for an urgent CT chest in the presence of a newly widened mediastinum on a patient who is 'unwell and grey' should not be denied. This is an error of serious concern. Enlarged aorta noted retrospectively on the CT abdomen was missed on the initial report.

The ED assessment of this patient with multiple cardiovascular risk factors presenting with retrosternal and upper abdominal pain was inadequate. There is no record of this patient being reviewed by the ED team after a surgical referral was made in the late afternoon, until the time of the patient's EMD arrest noted by the ED nurse.

Although ruptured thoracic aorta is associated with a high mortality rate, earlier diagnosis with appropriate investigations and referral may have changed the outcome for this patient.

### *Case 3: Delay in transfer and lack of senior staff input for a case of cholangitis*

#### Summary

An elderly patient, who had a history of atrial fibrillation (on Warfarin), hypertension, renal impairment, stroke complicated by epilepsy and with jaundice was referred to the ED of a rural hospital by the general practitioner (GP). Liver function tests performed six months prior to this admission had been found to be abnormal. Repeat liver function tests were also abnormal and led to ultrasound and CT scan of the abdomen four days prior to referral. A dilated biliary tree was noted and the suggestion of a lesion in the head of the pancreas was made on ultrasound but not confirmed on CT.

On arrival the patient was described as being jaundiced and febrile with tachycardia and hypotension. Liver function tests were grossly abnormal. International normalised ratio (INR) was  $>10$ . A decision was made to transfer the patient to a tertiary institution for endoscopic retrograde cholangiopancreatography (ERCP) the following day, but further enquiries about transfer were made on the day of admission. Antibiotics were commenced and the patient was transferred to a surgical ward. Overnight tachycardia persisted and blood pressure gradually fell. There was no urine output recorded.

It is not until the following morning that the patient had an indwelling catheter inserted. There were no apparent attempts to correct the coagulopathy. Arrangements were then made for transfer to an intensive care unit. Emergency medical assessment was carried out in ICU and the patient was intubated after needing CPR for six minutes. The patient had a further cardiac arrest less than an hour after intubation. It was noted that the pupils were fixed and dilated. Further resuscitative efforts were not employed with the family's consent.

#### Comments

It appears that the record from the initial ED is incomplete and although decisions are clearly spelled out, there is no clear record of who made them, at what time or who was consulted. There was also no record of any other factors considered, such as the hospital accepting the patient but not having a bed available until the next day, or the retrieval

service not being able to transfer the patient earlier. It is not clear what arrangements were actually made.

There appears to be no recognition that this febrile patient with jaundice, hypotension, tachycardia and anuria was at high risk of further deterioration. Very little seems to have been done overnight to correct any of these issues until the sudden and rapid deterioration of the patient in the morning. There seemed to have been no urgency to reverse the patient's coagulopathy, or monitor urine output, blood pressure or central venous pressure in any great detail. There was little in the way of medical notes apart from a review, presumably by an intern, at around midnight. By the morning, the patient was deteriorating badly.

There was a lack of appreciation of the critical nature of this patient's condition on arrival at the initial hospital. An assessment by the admitting surgeon might have been desirable here. If the potential seriousness of the condition had been diagnosed at that time, perhaps anaesthetic and medical opinions could have been sought earlier and a more aggressive approach to treatment commenced.

Clear instructions should be given to junior staff at night to monitor such severely ill patients. Parameters should be given to them and if these are not adhered to then more senior advice should be sought.

The surgical team were dealt a difficult situation in that the patient deteriorated in a relatively short time. This patient's best chance of survival was in the months or at least days prior to admission to the ED and obviously the surgical team involved were not able to control this. We do not have any information on the management by the GP leading up to admission but do wonder what he or she considered the reason for the abnormal liver function tests. It is hard to ignore the possibility of a more favourable outcome if referral had occurred earlier.

## *Case 4: Trauma with delayed diagnosis of ileocaecal perforation*

### Summary

This is a case review of a patient involved in a motorcycle accident who suffered multiple intra-abdominal injuries. The patient was managed conservatively and died on day five after admission with sepsis that appears to have been related to an infected haematoma and probable small bowel perforation of the ileocaecal region.

The patient was admitted to ED in the late afternoon an hour after crashing into a stationary pole at approximately 80km/h. A bystander provided assistance and brought the rider into the ED. Initial examination showed a Glasgow Coma Score (GCS) of 15, BP of 130 and a heart rate of 80. Respiratory function appears to have been satisfactory but there was evidence of guarding and tenderness in the right side of the abdomen. There were also injuries to the right hand.

The CT scans showed a subcapsular haematoma in segment five of the liver, a subcapsular haematoma of the spleen, a starburst fracture of the right kidney, haematoma and stranding around the mesentery, distal ileum and ileocaecal valve. There was no evidence of any free gas.

The patient was admitted to the high dependency unit (HDU) and treated conservatively (analgesia, fasting and intravenous (IV) fluids). Twelve hours after presentation of the patient, there was increasing abdominal pain, tachycardia, bruising in the right flank and abdominal distension. Haemoglobin was noted to have fallen 2 gm. The heart rate had increased to >120 and respiratory rate had also increased. A worsening haematoma in the flank was described and the question of bowel perforation was raised.

A repeat CT scan was performed. There is a written report in the notes which is dated, but no formal report of this scan. Review of the notes made that day suggests the scan was performed because of the risk of bowel perforation and a raised lipase suggested the possibility of pancreatic injury. The written report in the notes states that there was a hepatic laceration with intracapsular haematoma, normal pancreas and kidneys. No comment was made about the bowel.

By that evening, some 20 hours after presentation, the patient was still tachycardic but had become hypotensive. During that night the temperature was elevated ( $>39^{\circ}\text{C}$ ) and oxygen requirements were increasing. IV fluids were increased and a stat dose of Metronidazole was given. Over the following 24 hours Amoxycillin and Metronidazole were given but renal function deteriorated with decreasing urine output noted. An elevated creatine kinase  $>10,000$  suggested the possibility of significant rhabdomyolysis. The patient continued to deteriorate with increased bruising and erythema over the right abdomen and extending down into the right thigh.

A further CT scan performed three days after admission showed an enlarging flank haematoma with gas within it. The CT report comments that there is significant risk of bowel injury associated with these findings. The surgical registrar at this stage recorded a comment to continue with the current conservative management. This appears to have been discussed with the consultant and a CT localised aspiration of the flank requested. A small amount of offensive, anaerobic material was obtained and sent for microscopy and culture. The patient continued to deteriorate and later that afternoon required intubation. Timentin was commenced. Surgical review occurred because of the continued deterioration but, again, no intervention was thought appropriate.

Despite increasing inotropes there was further deterioration, requiring Noradrenaline and Adrenaline and the family were notified. Later that night a profound bradycardia required intensive resuscitation. The patient became profoundly acidotic ( $\text{pH} < 7$ ). It was at this stage that a pigtail catheter was inserted into the right flank to drain the right flank haematoma. The patient died approximately 20 minutes later.

## Comments

The initial management of this patient, with admission to high dependency for analgesia, observation and IV fluids, was quite reasonable and the injuries at the time of admission, although serious, would appear to be survivable. The first CT scan raised the possibility of an ileocaecal injury and this risk was noted several times in the notes. Despite the patient's steady deterioration with increasing signs of sepsis and haematoma formation, and erythema in the right flank, the conservative management plan was maintained.

In light of the patient's steady deterioration, the risk of a significant small bowel injury and the increasing sepsis, laparotomy would seem to have been indicated. A final CT scan, showing a large flank haematoma with gas and questioning whether there was a bowel injury, should have prompted a laparotomy if one had not been performed. The reviewer was unable to determine from the notes why the treating surgical unit persisted with a conservative management plan in a patient with documented abdominal trauma and increasing sepsis. Even after the CT scan demonstrated gas in the retroperitoneal haematoma, a laparotomy may have salvaged this patient.

The failure to see intraperitoneal gas on the CT scans gave a false sense of security that there was no bowel perforation or injury, when there may have been either ischaemia of the terminal ileum and caecum secondary to mesenteric injury or a retroperitoneal perforation.

Insertion of the pigtail catheter by the ICU staff occurred during the resuscitation period and would appear to have been a futile attempt to drain the septic collection in the hope of buying more time.

### This case reveals several issues:

- The clinical presentation, mechanism of injury with high energy blunt impact and CT findings with retroperitoneal gas, suggest a retroperitoneal rupture of the duodenum, distal small bowel or caecum. The explanation that the gas represented an infected haematoma indicates lack of knowledge and understanding of trauma surgery. Conservative treatment was not appropriate and normally a general surgeon would have performed a laparotomy on the basis of the third CT and clinical findings, or at least consulted a trauma surgeon at a major trauma centre.
- The patient should have been transferred to a major trauma centre on either the first or second day.
- The ICU registrar/consultant should not have inserted a pigtail catheter 'blind' without surgical or radiological advice. This procedure is outside the Scope of Practice of an ICU specialist ([www.cicm.org.au](http://www.cicm.org.au)).



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### *Case 5: Bowel injury after laparoscopic cholecystectomy*

#### Summary

An elderly patient was admitted for elective laparoscopic cholecystectomy following an episode of cholangitis requiring ERCP and sphincterotomy eight months earlier. The patient had a significant past history of abdominal trauma requiring a laparotomy 35 years earlier, gastric stapling and a history of adhesions. The patient was not seen by the operating surgeon until the morning of surgery. The increased risk associated with previous surgery was recognised and the patient was counselled accordingly, including the possibility of conversion to an open procedure.

Documentation of the initial procedure is limited. Clearly small bowel adhesions were encountered at the umbilical Hasson port. Further cannulation in the right iliac fossa was performed and the procedure was continued. Cholecystectomy and an operative cholangiogram were performed routinely. There was no mention of possible small bowel injury in the operation report (although the surgeon made mention in the case record form that the small bowel was inspected after the cholecystectomy was performed).

The first postoperative evening the patient was in severe (10/10) right iliac fossa pain. The surgical resident attended and ordered morphine, Buscopan and temazepam. The covering surgical registrar was notified but there was no documentation of further review. The following morning the surgical ward round found the patient in pain with stable observations. There was no further documentation of examination findings.

Nursing notes describe the patient to have confusion, anorexia, nausea and intermittent abdominal pain. There was no further documented medical review of the patient. The surgical ward round on day two noted ongoing abdominal pain with stable observations. The next review occurred later that morning when the patient became hypoxic, tachypnoeic and hypotensive. The patient was transferred to ICU and a decision was made to return to the operating theatre later that day. The patient required intubation three hours after transfer to ICU and was returned to theatre four hours after that.

At the second operation, a laparotomy was performed and a small bowel injury was

identified and repaired. The patient returned to ICU postoperatively but had developed multisystem organ failure with anuria and required inotropic and ventilatory support. The patient's condition failed to improve and treatment was withdrawn the following day.

## Comments

The surgeon raised concerns in the case record form about the difficulties in seeing the patient for the first time on the morning of surgery. Although this is not ideal, it is unlikely to have changed management. The decision for surgery was appropriate and it was reasonable to attempt laparoscopy in the first instance, recognising the increased likelihood of conversion.

It is unclear if the small bowel injury could have or should have been recognised at the time of the initial laparoscopy. Certainly if there was concern about small bowel injury then the procedure should have been converted. It is not inconceivable that the small bowel injury was not recognised and that the surgeon found no reason to abandon the laparoscopic approach.

The patient was clearly 'not right' after the initial procedure. There were multiple warning signs that something was amiss in the postoperative period that were overlooked. It is unclear if the surgeon was accurately informed of the patient's condition or if the surgeon attended the patient in the early postoperative period. Most patients would be expected to have minimal pain, be tolerating diet and mobilising independently the morning after a laparoscopic cholecystectomy. Given the difficulties encountered at the initial surgery, the surgical team should have had a high level of suspicion regarding potential inadvertent injury. Although the patient's final deterioration was rapid and irreversible, earlier recognition may well have led to a different outcome.

This case highlights the importance of early diagnosis of postoperative complications after laparoscopic cholecystectomy. If a patient is not progressing as expected after surgery, then prompt assessment by the surgical team and consideration of potential complications may avoid considerable morbidity and mortality associated with possible bile leak, vascular injury or small bowel injury. There are likely to be multiple cases presented in hospital morbidity and mortality meetings of delayed diagnosis of potentially serious complications in patients who are 'not right' after laparoscopic cholecystectomy.

### *Case 6: Delay in diagnosis of strangulated bowel*

#### Summary

A middle-aged patient with a history of intellectual disability and psychosis was admitted to ED after waking with vomiting after midnight. Hostel staff described the patient as 'hunched forward in discomfort'. A locum attended a few hours later and instructed that if there was no improvement, to call an ambulance. An ambulance was called some hours later. Officers were unable to assess the patient's abdomen as the patient was moving and straining. There was vomiting and diarrhoea. The patient had an altered conscious state and felt not to be behaving appropriately (GCS 10).

Previous history included appendicectomy, inguinal hernia repair and a presentation to hospital with incomplete bowel obstruction three years earlier. The patient was independently mobile but needed full assistance with activities of daily living.

The patient was admitted to ED nine hours after the onset of symptoms. The notes from the ED are sparse but the case was discussed with the surgical registrar around this time. The CT scan recommended by the surgical registrar was performed around midnight and suggested small bowel obstruction, ascites and possible mesenteric ischemia. Blood tests at this time showed the urea and creatinine to be raised. A nasogastric tube was inserted, but was pulled out by the patient, then reinserted and antibiotics commenced. The surgical registrar does not appear to have reviewed the patient for another five hours. Within an hour of this review the patient underwent asystolic cardiac arrest and after resuscitation was transferred to the operating theatre for laparotomy.

At laparotomy strangulated small bowel secondary to a volvulus was found. This was resected without anastomosis and the patient was transferred to ICU postoperatively with the intention to perform a second-look laparotomy. The patient was ventilated in ICU and remained in metabolic acidosis despite aggressive treatment. A second-look laparotomy performed 48 hours later found patchy infarction of the caecum and proximal transverse colon. A right hemicolectomy was performed with a side-to-side anastomosis.

Over the next day the patient continued to deteriorate. A CT scan of the brain showed

a massive subarachnoid haemorrhage and brain death was recorded. Intervention was ceased, allowing the patient to die.

## Comments

There are a number of points of concern. The first is the delay in surgical review of this patient. The surgical registrar did not attend until some eight hours after arriving in ED despite previous discussion with the ED staff. The reason for this delay is not clearly stated and the delay is concerning especially considering the CT scan report. If the surgical registrar was caught up in the operating theatre there would surely have been some opportunity to attend the ED between cases and review the patient. This occurred on a weekend and the surgical registrar may have been the only registrar available. An opportunity should still have arisen for review of the patient.

It is understandable why the surgeon in charge performed a 'damage control' procedure by resecting the non-viable small bowel and leaving the ends presumably stapled off. A second-look laparotomy was an appropriate and acceptable practice with a plan to allow the patient to be adequately resuscitated. At the second-look laparotomy the bowel was found to be non-viable and it was quite reasonable for the surgeon to have resected this and to perform a side-to-side anastomosis to ensure that no third look was required should the patient's condition improve.

This patient would have been quite difficult to assess given their intellectual disability and psychosis and that there had been previous episodes of small bowel obstruction that did not require surgical intervention. There is no record of ongoing communication between the surgical unit and the ED and no record of why the registrar could not attend. We do not know what information was actually given to the surgical registrar. One can only assume that the criticality of this patient's condition was not recognised or communicated. All hospitals need to ensure that there are processes whereby patients referred from the ED are seen in a timely fashion by a surgical registrar or consultant.

## Neurosurgery

### *Case 7: Poor monitoring after subdural haematoma*

#### Summary

This elderly patient had been living alone in a retirement village and had a past history of congestive cardiac failure, chronic obstructive pulmonary disease, epilepsy and recent cataract surgery. Regular medications included Salbutamol and Aspirin. While out walking, the patient fell and struck their head on the road and briefly lost consciousness. An ambulance was called to the scene and the patient presented at the hospital ED in the mid afternoon.

The ambulance officers recorded a GCS of 15, a left eyebrow laceration/haematoma, facial droop and 'reduced movement', but there is no specific mention of a paretic limb. In the ED, a CT of the brain and cervical spine was performed and it appears that the only doctor who formally saw and examined the patient was a junior doctor, working as the overnight surgical ward resident. Shortly before midnight, this junior resident noted: Pupils equal and reacting to light (PEARL). Neuro X 4 limbs and CN exam grossly normal. Some movement limited by pain however, indicating that there were no major neurological abnormalities to be found.

The CT of the brain demonstrated a right-sided (presumably acute) subdural haematoma with a 3.5mm midline shift and a haemorrhagic contusion of the left frontal lobe. The CT of the cervical spine demonstrated no fractures but raised the possibility of an epidural haematoma and ligamentous disruption. A note was made that the neurosurgery registrar had reviewed the CT scans and discussed the management with the resident. The patient was to be admitted to the ward on four-hourly neurological observations and kept nil by mouth with CT scans to be repeated the next day, but there was no mention of the need for an HDU bed or action to be taken if the GCS decreased overnight.

The patient remained in the ED overnight. In the early hours of the morning, the ED recorded the GCS as 15, even though the patient's eyes were closed and there was a query as to whether the patient was orientated. Apart from mild weakness of the left leg, the limb strength was recorded as normal. However, at 2.15am the patient was recorded with a GCS of 12 and severe right leg weakness and no attempt was made to check the pupils. There is no mention of action taken to notify medical staff of the marked deterioration in neurological status. It seems that the patient was not checked by the nursing staff again until nearly 7.00am, when the patient was found comatose and asystolic with evidence of having vomited. A code blue was then called and after prolonged resuscitation, cardiac

output was regained and the patient was transferred to ICU. By then the patient was too unstable to have a repeat CT of the brain or surgery and was declared dead by around midday, less than 24 hours after the initial head injury.

A coroner's autopsy was performed but the result has not been provided. The recognition and management of neurological deterioration in this patient was significantly delayed until the patient was in an irredeemable state and it is reasonable to suppose that if this had not been the case, the patient would have had a reasonable chance of survival.

### Comments

If all the medical and nursing documentation concerning this patient's admission were provided to the reviewer, then they are clearly inadequate. There is no entry from the neurosurgery registrar involved in the patient's initial assessment, nor any indication as to whether that registrar personally saw the patient and the CT scans or merely received a verbal account of the patient and the CT results.

The ED nursing staff totalled up the GCS incorrectly, recording a total of 15 instead of 14 and queried confusion without confirming it one way or another. The only documentation from the nurses were two sets of observations taken more than four hours apart and a retrospectively written entry in the progress notes. Even this limited documentation is poor. The resuscitation and ICU notes were the most comprehensive part of the case notes and by then the patient's death was assured.

### This case reveals several issues:

- From the description of the fall, as well as the evidence of eyebrow laceration/haematoma, brief loss of consciousness and CT findings of a subdural haematoma with midline shift as well as parenchymal bleeding, this patient had a moderate severity closed head injury. The patient presented to the ED fairly quickly and this should be taken into account in evaluating the clinical condition. There is a well-recognised potential for head injured patients on anticoagulants to keep bleeding intracranially, so while the patient might have been neurologically intact early on, there was always a significant potential for deterioration. One presumes that the neurosurgeon had no intention of palliating this patient at the beginning or there would not have been a plan to repeat the CTs the next day. Therefore, it would have been more appropriate to continue one or two-hourly observations throughout the night in a high dependency environment.

- The area of greatest concern is that this patient experienced a significant deterioration in GCS without any medical action being taken until it was too late. One wonders if this was due to inexperience of the nursing staff and/or an inadequate handover from the ED. The normal procedure is for the registrar to be contacted for any fall in the GCS of two or more points or the development of new neurological deficits such as limb weakness.
- Not only was the neurological deterioration in the early hours of the morning not acted upon, but the patient was presumably placed in the non-HDU area of the ward as the patient was not sighted again until the next set of observations were taken, which were more than four hours later. Even if the doctors had not specified nursing in an HDU, the nursing staff should have protocols to admit all patients with moderate or severe head injuries to HDU.
- The final area of concern is the adequacy of neurosurgical assessment in the ED by the nurses and doctors. Inaccurate totalling of the GCS score and glib statements like 'neuro exam grossly NAD, some movement limited by pain' would not have made it any easier for other staff to appreciate a deterioration in the patient's neurological condition.

Subdural haematomas in elderly patients after low velocity injuries are common and there is a tendency to be overly dismissive of them. They are not acutely life-threatening in most cases, and it is reasonable not to operate on them at the time of presentation if the patient has no or mild deficits and is stable. However, unless there is no circumstance under which surgery would ever be contemplated, elderly patients with acute subdural haematomas must be managed in such a manner that acute deterioration will be recognised and acted upon promptly.

This is especially so during the night when the staff on duty may be less experienced and the neurosurgeon or neurosurgical registrar is not constantly onsite. Elderly patients who are operated upon for subdural haematomas while they have mild or no neurological deficits have a reasonable prospect of survival in a good neurological state. Factors that placed this patient at higher risk of deterioration were overlooked, namely the history of anticoagulation, the severity of the head impact, the acuteness of the haemorrhage and the presence of midline shift.



## Orthopaedic Surgery

### *Case 8: Subtrochanteric fracture with postoperative deterioration poorly managed by junior staff*

#### Summary

An elderly patient was admitted to hospital with a fractured right subtrochanteric neck of femur. The patient had previously been admitted to another hospital for assessment of increasing confusion, agitation and aggression prior to the fracture. The patient sustained an unwitnessed fall the day prior to the admission and underwent surgery the following day, where a right cephalomedullary femoral nail was inserted with additional cable fixation. The patient suffered a relatively rapid decline post surgery and passed away approximately thirty hours after the procedure.

In the period from surgery to death, the patient was seen several times by junior medical staff with concerns regarding the patient's condition, in particular, the urine output, low haemoglobin and respiratory function.

#### Comments

##### **This case reveals several issues:**

- It is unclear from the available information as to whether the consultant orthopaedic surgeon was present at the time of surgery. The procedure took 2.5 hours anaesthetic time, although the surgical time listed in the VASM notes was approximately an hour. Given the difficulty of fixation of subtrochanteric femoral fractures, it is considered that these surgeries need to be performed under the direct supervision of a consultant orthopaedic surgeon or a senior registrar with experience in fixation of these fractures. It is unclear from the initial case notes whether this occurred.
- It appears that the supervision of the junior medical staff was minimal. In the period from the surgery to the patient's eventual death, the patient was reviewed by the surgical intern five times. The medical registrar was spoken

to on each of these occasions, but never attended the patient. The patient had two further MET calls during this period of time; it is unclear who attended the patient at these times. There were ongoing issues regarding the patient's fluid balance in particular, and this does not appear to have been addressed by a senior doctor (or at least this was not documented clearly in the patient record). It is my opinion, from the notes available, that the junior medical staff were lacking in clinical support in managing a difficult and complex postoperative patient.

- There is a lack of documentation regarding not for resuscitation (NFR) status. There appears to be no formal documentation in the case notes of the NFR status, apart from one entry in the admission note, stating NFR or for MET call. It would be best practice for these potential end-of-life decisions to be well documented on an independent form to allow timely, reasonable and rational decisions to be made at times of patient difficulty.

### The assessor recommended:

- Subtrochanteric fractures of the femur need fixation by members of the orthopaedic team who are experienced in their management.
- The junior medical staff members need supervision and direct observation of the patient by a more senior doctor which may have allowed for a clearer plan of action.
- Documentation of NFR status needs to be clear and readily available to all staff members.

## Urology surgery

### *Case 9: A radical surgical treatment for bladder cancer may not be optimal for terminal patients*

#### Summary

This elderly patient, who was a lifelong smoker with advanced metastatic bladder cancer causing urinary frequency, urgency, pelvic pain and haematuria, was admitted for a palliative cystectomy. The diagnosis had been made on a previous transurethral resection of a bladder tumour and CT scan of the chest. Surgery had been discussed with the patient and at a urology meeting. The patient underwent a radical cystectomy and formation of ileal conduit following which the patient was admitted to the ICU. Overnight there were issues with bleeding and hypotension requiring transfusion. The patient then developed worsening renal failure and pulmonary function, and died.

#### Comments

The case notes are adequate. Preoperative assessment of the patient shows the patient was cachectic (weight 41kg, albumin 29), in extremely poor health American Society of Anesthesiology (ASA) IV, pressure sores and at risk of chronic renal failure (bilateral hydronephrosis and creatinine of 111). It was ascertained that the patient was at extremely high risk of perioperative death and a perioperative anaesthetic assessment was requested. There was no record of a formal assessment until the day of surgery. Preoperatively the case was discussed with other urologists and radiologists, but it would appear from the medical notes that it was not discussed with clinical oncologists, palliative care and radiation oncology. The patient was admitted to hospital distressed and in severe cancer-related pain.

The records suggest a surgically competent cystectomy following which the patient was briefly admitted to the ICU. The patient was then discharged to the ward. Subsequently the fall in urine output was treated with repeated boluses of crystalloid. It is not clear from a record if the patient still had a central venous pressure line inserted at this time. It would appear that there was acute renal failure with pulmonary oedema (raised jugular vein pulse,

mismatch in fluid input/output) rather than a pneumonic illness. The patient was not overtly septic (normal temperature and blood pressure) despite having a significant neutrophilia. By this stage, however, death was inevitable and palliation was the best option.

A major area of concern in this case was the decision for a radical cystectomy when palliation with an ileal loop diversion with or without radiotherapy and appropriate analgesia would have been more appropriate. Involvement of other uro-oncological specialties in a multidisciplinary forum would undoubtedly have resulted in the patient being offered other options than simply a radical cystectomy. This patient was at enormous perioperative risk of death. It does not appear that the patient underwent a formal preoperative assessment by an anaesthetist who would have been able to quantify this in real terms to the patient before undergoing surgery. The management postoperatively appears appropriate, although I wonder whether the early discharge from the ICU was somewhat premature.

This elderly patient with terminal metastatic bladder cancer may have been best palliated with a less invasive procedure than a radical cystectomy and ileal conduit; discussion of the case in a more formal setting at a multidisciplinary meeting may have raised this and broadened the discussions on potential treatment options. It may have also raised questions regarding the patient's nutritional status and chronic renal failure, and the patient's further management postoperatively including the early discharge from the ICU.

### **A couple of issues deserve further elaboration:**

- This case occurred some years ago. It is now standard practice at all hospitals where major surgery is carried out, city or rural, that the patient attends the Pre-Admission Clinic, and has a thorough assessment, including anaesthetic, and if necessary cardiology or other review. If that facility were not available, one would have to question the wisdom of performing such major surgery at that site.
- Despite the presence of metastatic bladder cancer, any procedure less than removal of the bladder would not have provided adequate palliation.

## Paediatric surgery

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### *Case 10: Delay in diagnosis of obstruction in an infant with enterocolitis*

#### Summary

This two-month-old infant, ex-end second trimester gestation was transferred to a tertiary paediatric surgical centre with necrotising enterocolitis (NEC). The neonate was septic with a distended discoloured abdomen and associated respiratory instability requiring ventilation. AXR confirmed signs of NEC with a suggestion of perforation. A laparotomy was performed with confirmation of NEC with offensive purulent-free fluid, but no apparent perforation was seen. Formation of a double-barrelled ileostomy 90cm from the duodeno-jejunal flexure was undertaken.

The baby was slowly weaned off ventilation and inotropes, but developed acute renal failure and a persistent ileus requiring total parenteral nutrition. Oral feeds were slowly introduced two weeks later but were poorly tolerated with large bilious aspirates. The AXR showed dilated proximal small bowel loops in the left upper quadrant and a barium meal showed no passage of contrast through distended proximal loops. Feeds were ceased but subsequently the ileus resolved with output from the stoma.

Feeds were slowly reintroduced but unfortunately high stomal losses precluded full enteral feeding. A distal stomogram four weeks later appeared to exclude a distal obstruction with contrast reaching the rectum, and the baby underwent stomal closure and incisional hernia repair two weeks later. Intraoperatively it was noted that there were moderate adhesions around the stomal ends that were divided, but it is unclear from the operative notes how much of the remainder of the small bowel was inspected at the time of operation and no distal lavage of the small bowel was performed intraoperatively.

Postoperatively the baby had a persistent ileus for a week but this appeared to resolve with decreased nasogastric losses and stool passed per rectum, so feeds were recommenced one week following stomal closure. The baby had a few mucus vomits associated with mild abdominal distension and an AXR showed dilated loops suggestive of a SBO. There were also episodes of bradycardia and desaturation, with increased abdominal distension that

necessitated reintubation. The baby had increased nasogastric losses and was not passing stool. Septic screens were negative.

A repeat AXR showed increased dilatation of small bowel loops with fluid levels but no diagnostic features of NEC, which was considered clinically. A possibility of a distal NEC stricture and obstruction was raised in the radiology report and the option of performing a contrast study suggested. The baby needed high frequency oscillatory ventilation by the next day and the abdomen was noted to be erythematous prompting surgical review, but no change in management was suggested. A Barium study was not performed as the baby was too unstable to be moved.

Urine output dropped, requiring dopamine. Repeat AXRs showed progressively increasing distension of bowel loops with a radiological diagnosis of probable SBO, and became more cardiovascularly unstable. The baby was again seen by the surgical team and theatre was booked for a laparotomy the next afternoon.

The baby's clinical state rapidly deteriorated in the early hours of the morning with hypotension and tenderness with palpation over the left upper quadrant. A laparotomy was performed in the neonatal ICU a few hours later. The baby was found to have a small bowel obstruction secondary to adhesions and a terminal ileal NEC stricture, and an ileostomy was formed. Postoperatively the baby progressively deteriorated requiring increasing inotropic support, but despite this urine output remained poor. The baby deteriorated further and became unresponsive. Treatment was withdrawn three days after the laparotomy and the baby died.

## Comments

It is unclear from the progress notes why the surgical team did not proceed to laparotomy two weeks prior to the eventual procedure. They may have been swayed by the patient's previous prolonged ileus. Despite concerns that the abdominal distension was secondary to an ileus, with radiological features suggestive of SBO and increasing instability, earlier exploratory surgery may have avoided the eventual demise of the patient, although there is no denying that the mortality risk of surgery in this patient was extremely high.

## Vascular surgery

### *Case 11: Repair of ruptured aortic aneurysm despite cardiac arrest*

#### Summary

An elderly patient with a history of ischaemic heart disease presented to hospital with a ruptured AAA. The patient had presented in extremis to the ED, having been pulled out of car by staff unconscious - CPR commenced. Collateral history of right lower abdominal pain was given. The patient was given Thiopentone and Suxamethonium to facilitate intubation, which took 15 minutes due to a difficult airway. Adrenaline was needed for inotropic support.

The patient was promptly seen by the covering general surgical registrar, who was unable to contact the first and second on-call vascular surgeons, and subsequently contacted the vascular surgeon who was not on call, but ultimately operated on the patient. Predictably, a difficult operation with major blood loss ensued, and despite a graft repair being undertaken, the patient demised shortly after being taken to the ICU postoperatively.

#### Comments

##### Two issues warrant comment:

1. Availability of on-call surgeon.
  - The conditions of employment and expectations for on-call surgeons vary greatly across the public hospital system. Method of contact and expected time to return calls or attend the hospital are not always clearly stated, and there is currently a reliance by many hospitals on the goodwill of surgeons in many disciplines to forgo private non-urgent commitments to deal with hospital emergencies, even when not on-call.
  - Without the presence of full-time staff of surgeons across many disciplines, immediate attendance by surgeons is not a realistic expectation in most hospitals during normal working hours.
  - The surgical registrar acted appropriately by contacting the operating surgeon, even though they were not on-call.

2. Possible futile treatment of a ruptured aneurysm in a patient after cardiorespiratory arrest.
  - In the subject case, particularly in light of the highlighted problems and staff distress associated with availability of the on-call surgeons, the decision to take the patient to theatre was quite reasonable. The decision not to take the patient back to theatre from ICU for further exploration was also reasonable.

The actions of the reporting surgeon, surgical registrar and emergency physicians all seem reasonable in the circumstances of the case, in which the patient only had a slim chance of survival in any event.



## Vascular surgery

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### *Case 12: Rupture after endoluminal graft for aortic aneurysm*

#### Summary

An elderly patient awoke with abdominal pain. As the pain persisted the patient called an ambulance just after lunchtime, when the patient was transported to the ED. The patient was assessed by the triage personnel soon after arriving at the ED, but was not seen by a doctor for more than five hours after calling the ambulance. At that time the patient's history consisted of constant left iliac fossa pain, leg pain, nausea and loose bowel action. Routine blood tests were ordered and an IV cannula inserted. A surgical referral was made.

The patient was assessed by the surgical registrar - the time is not recorded. A similar presenting history was obtained but in addition a past history of a left femoropopliteal bypass and an endoluminal repair of an abdominal aortic aneurysm performed five years prior were obtained. The BP was 100/70 at the time the registrar saw the patient. An abdominal CT scan was ordered and performed just after midnight. Shortly afterwards, the radiologist reporting the CT rang the ED doctor to report a ruptured left iliac aneurysm with massive retroperitoneal haemorrhage. The surgical registrar contacted the vascular surgical registrar.

At just before midnight on the day of admission, the patient's BP was recorded as 120/95. The next recorded BP measurement was taken just before the CT scan and measured <80mmHg. At 1.40am, the BP was unrecordable. A dose of 500ml of Gelofusine was administered and this was followed by a further 500ml at 2.20am. At 2.25am, the patient was transferred to the operating theatre. This was more than 13 hours after the patient had sought emergency assistance and 12 hours after arriving in the ED.

On arrival in the operating theatre, the patient was unresponsive, bradycardic with agonal breathing. A decision was made that surgical intervention would be futile, and the patient died.

## Comments

The case notes are scant but adequate. However:

- This was an avoidable death. Had treatment been undertaken during the period of haemodynamic stability, the patient would likely have survived. The decision not to proceed with operation when the patient was moribund is not questioned. The delays in the management of this patient presenting to the ED compounded the lack of experience and knowledge of the assessing clinical staff.
- There is a lack of understanding apparent in this ED with respect to a patient with an endoluminal aortic repair that is probably common to most EDs. Endoluminal abdominal aortic aneurysm repairs do not cure the aneurysm, they merely control it. Thus a patient with unexplained abdominal and/or back pain should be assumed to have a complication of the endoluminal repair until proven otherwise.

There were unacceptable delays in the management of this patient at every stage - inappropriate triage delayed medical review for hours, the CT scan was not for almost 10 hours and even when the diagnosis was known, transfer to the operating theatre was delayed for more than one hour. These delays directly contributed to the death of the patient. It would be reassuring to know that the institution involved has conducted an internal review of this patient's poor management.

It would be reasonable to consider promulgating the concept that endoluminal repair of an abdominal aortic aneurysm does not cure the aneurysm and that rupture can still occur. Any patient with a history of an endoluminal repair of an abdominal aortic aneurysm who presents with unexplained abdominal or back pain should be considered to possibly have a complication of their endoluminal repair and urgent abdominal CT scan should be arranged.

## Vascular surgery

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### *Case 13: Bleed after angiogram with inability to contact consultant*

#### Summary

This case is of an elderly patient who underwent a diagnostic angiogram for an embolising popliteal aneurysm complicated by postprocedural bleeding requiring two laparotomies. This patient was on therapeutic doses of Clexane and there was a significant delay between the initial exploration and the second one due to a failure in communication. The initial cause of the haemorrhage was a high puncture just above the inguinal ligament, but at the second laparotomy it was felt that it was due to retroperitoneal bleeding from small vessels. As a consequence of the extensive blood loss, the patient suffered multi-organ failure leading to death on day five following the initial angiogram.

#### Comments

Hospital records provided were adequate and documented all relevant events leading up to the demise of this patient. This elderly patient was initially seen by the vascular unit. The patient had three weeks of ischaemic change in the right leg and had an ultrasound confirming a popliteal aneurysm with possible embolic complications. The patient was a non-insulin-dependent diabetic and hypertensive with no history of ischemic heart disease or cardiac issues. Furthermore, there was a history of idiopathic thrombocytopenia and the patient was on Prednisolone and Persantin. On examination there were pulses present bilaterally apart from a dorsalis pedis on the right and a palpable aneurysm was present in the right popliteal fossa. According to the nursing record of medications administered, 70mg of Clexane had been given subcutaneously twice-daily on the day of the angiogram as well as another dose of 60mg at 2.25pm on the same day. It was also noted that the 70mg dose was to commence after the angiogram, so there is some confusion about the actual timing of the dose the patient received.

In another nursing note, the nurse was instructed to withhold the 70mg dose until just before midnight when it was definitely administered; the only Clexane the patient received was the 60mg dose at 2.25pm and 70mg on the day of the angiogram. The patient's weight

was estimated at 70kg on the admission nutritional assessment. There is further confusion about the anticoagulation timing as in the admission notes it stated that therapeutic anticoagulation should be given but on the admission prescription medicines the date of commencement was recorded as the day after. However, in the section of the nursing notes where the drugs are administered it was noted that the Clexane had been given together with all the other medications from the morning. Also on the postoperative orders for the angiography, notes had been made to 'continue Clexane'.

Just before midday, the patient underwent a right femoral angiogram with the puncture being made in the right common femoral artery under ultrasound guidance. This revealed that there was a popliteal aneurysm present with probable embolic occlusion of the posterior tibial artery from its origin. The pre-angiogram intention was to treat this by endoluminal stent grafting, but it was then planned that the patient would undergo a bypass after the angiogram. Groin pressure was applied to control the puncture site. Nursing observation showed that there was no change in the patient's haemodynamic condition, but despite a normal pulse and blood pressure it was noted that the leg appeared cool and pale. At around 4.00am a MET call was made because the patient became hypotensive with a drop in BP to 70mm systolic and there was a mass palpable in the patient's right lower quadrant.

It was felt that the patient had had a bleed into the retroperitoneal region and a CT abdomen confirmed this. The haemoglobin was 9.5 and the surgical registrar had been contacted. The patient remained in the ward until transfer to ICU. Further Clexane was withheld. The patient required intensive fluid replacement including blood transfusions, but became unresponsive and acidotic with a haemoglobin now of 7.7. The patient had been seen by the vascular surgeons at noon and was taken directly to the operating theatre, where the cause of bleeding was found to be a high puncture from the angiogram together with a large retroperitoneal haematoma. The haematoma was evacuated and the puncture site in the external iliac artery was repaired with a suture. The patient received five units of packed cells together with other blood products intraoperatively.

On return to the ICU the patient was still grossly acidotic with a pH of 7.15. The patient had not passed urine since returning to ICU and required inotropic support to keep BP up. Just before midnight it was noted that the abdomen was distended and that wounds were oozing and a probable coagulopathy was present. Despite blood transfusions the haemoglobin

continued to fall. An attempt was made to contact the vascular surgeon shortly thereafter with no response, so a message was left to contact the ICU.

Just after midnight the surgical registrar was contacted and another CT scan of the abdomen was obtained. This revealed further right retroperitoneal haemorrhage. Again the original vascular surgeon was uncontactable so another consultant was informed. The patient's haemoglobin had continued to drop despite repeated blood transfusions, so the patient had a repeat laparotomy.

At this time there were numerous bleeding vessels in the retroperitoneal region, which were clipped, and were thought to be the cause of the ongoing bleeding. Two packs were placed and the abdomen closed and the patient returned to the ICU. Over 20 units of cells had been transfused together with other blood products. Although the bleeding had now been controlled, the patient progressively developed multi-organ failure with ongoing worsening acidosis over the next 24 hours and it was felt that no further active management should be undertaken. The patient died shortly thereafter.

There were a few major problems in the management of this patient. Initially, there appears to have been a possible over-anticoagulation following the angiogram. This would probably not have been an issue if there had not been a high puncture of the femoral artery (despite using ultrasound guidance for the puncture). The high puncture was the cause of the initial bleed. There also appears to have been a significant inability to contact the vascular surgeon at multiple points during the crisis. After the MET call, when the haemorrhage was first diagnosed, it was decided to leave this patient in the ward in the early hours of the morning.

This patient would have been much better managed in a high dependency or ICU setting. Once the retroperitoneal bleeding had been diagnosed in an anticoagulated patient, aggressive surgical repair should have been undertaken, as the first note of vascular surgeon seeing this patient was at 12 noon. Again when the patient was re-bleeding, it was quite obvious that despite the best efforts of the ICU, no vascular surgeon could be contacted, so again there was delay in performing the second laparotomy. The delay resulted in such massive blood loss that the patient became coagulopathic and this provided the setting for multiple organ failure and death of the patient.

The main error in this patient's care was the delay in communication with the treating consultant because the staff could not contact the responsible surgeon. The overuse of Heparin may have been a factor, but the primary reason this patient had a complication was the initial incorrect puncture of the artery and the adverse outcome was directly because of delays in its surgical repair.

Postoperative haemorrhage occurred requiring surgery, which was delayed resulting in a coagulopathic state. This event was avoidable and the adverse outcome was the result of multifactorial issues. High punctures of the femoral artery are not uncommon and are well known to cause retroperitoneal bleeding. The recommended treatment of this complication is early surgical repair when diagnosed. The chief issue was the inability to contact the vascular surgeon involved in the patient's treatment. The delays in treatment of the different phases of this patient's complicated course are quite extreme and should be addressed as a matter of utmost urgency. They were the cause of this patient's demise from a potentially easily correctable complication of an angiogram.

## List of shortened forms

<b>AAA</b>	abdominal aortic aneurysm
<b>ASA</b>	American Society of Anesthesiology
<b>AXR</b>	abdominal x-ray
<b>BP</b>	blood pressure
<b>CPR</b>	cardiopulmonary resuscitation
<b>CT</b>	computed tomography
<b>CXR</b>	chest x-ray
<b>ECG</b>	electrocardiogram
<b>ED</b>	Emergency Department
<b>EMD</b>	Electromechanical dissociation
<b>ERCP</b>	endoscopic retrograde cholangiopancreatography
<b>GCS</b>	Glasgow Coma Score
<b>GP</b>	General Practitioner
<b>HDU</b>	High Dependency Unit
<b>ICU</b>	Intensive Care Unit
<b>INR</b>	International normalised ration
<b>IV</b>	intravenous
<b>LFT</b>	liver function test
<b>MET</b>	Medical Emergency Team
<b>MRI</b>	magnetic resonance imaging
<b>NAD</b>	neuroaxonal dystrophy
<b>NEC</b>	necrotising enterocolitis
<b>NFR</b>	not for resuscitation
<b>PEARL</b>	pupils equal and reacting to light
<b>SBO</b>	small bowel obstruction
<b>VASM</b>	Victorian Audit of Surgical Mortality
<b>VSCC</b>	Victorian Surgical Consultative Council

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