



ROYAL AUSTRALASIAN  
COLLEGE OF SURGEONS

Australian and New Zealand  
Audit of Surgical Mortality

**NATIONAL CASE REVIEWS**  
**VOLUME 3 DECEMBER 2012**



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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. Detail that may identify individuals has been changed although the clinical scenarios are based on real cases.



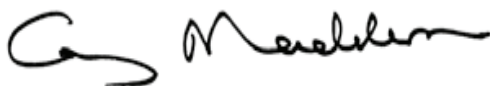
## Chairman's report

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Surgery means a career of lifelong learning. The 3rd National Case Note Booklet of the Australian and New Zealand Audit of Surgical Mortality provides valuable insight into improvements that can be made in the care of our patients. The audit is now across Australia within the public health system with increasing uptake by private hospitals in all states but not yet in Queensland.

The Australian public expects surgical deaths to be analysed and any areas of concern to be addressed and promulgated. The Case Note Review Booklet forms an important component of that educative function. This, linked with workshops on the deteriorating patient, DVT prophylaxis and fluid resuscitation, provides vital relevant information that can affect us all. The cases included in this year's report are accurate reflections of management that occurred to patients under the care of the surgical team. The lessons learnt should not be wasted.

I trust you find this case note review booklet an educational opportunity and welcome any constructive feedback.



Professor Guy Maddern  
Chair, ANZASM Steering Committee



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## ANZASM Clinical Editor's report

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In May 2012 the second national case note review booklet was published with cases from all states and territories. This is part of the feedback process that is seen as essential for quality improvement processes of the audits of surgical mortality. This publication is the third national case note review booklet from ANZASM.

A national booklet is produced to assist smaller states who do not have enough cases to produce a publication which is able to be sufficiently deidentified. The smaller states (including South Australia) do not publish their own booklet. Some of the larger states will continue to publish their own case note review booklets as well as contributing to the national booklet.

As the ANZASM office is in the same building as the South Australian Audit of Perioperative Mortality (SAAPM) office, it seemed logical that the final clinical editing process would be done by the Clinical Director of SAAPM on behalf of ANZASM. I must emphasise that I did not write this booklet. I have merely massaged it into a more readable form. The real authors are the reporting surgeons the first- and second-line assessors and the clinical directors of the various states and territories. To them we all owe a debt of gratitude.

Glenn McCulloch  
Clinical Director, SAAPM  
Clinical Editor, National Case Note Review Booklet, ANZASM



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## Overall recommendations

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- In complex cases, there needs to be clear demonstrable leadership in patient management. There should be regular team meetings with all disciplines involved to ensure the treatment plan is understood by all.
- Communication is one of the most essential points in good patient care. This includes communication between surgeons and their junior staff, between various disciplines and between nursing and medical staff. If you do not tell others what you are thinking or what is happening, everyone will end up functioning in isolation.
- The surgical case form (SCF) record must contain good, accurate documentation. It should be filled out by a team member who was involved in the care of the patient and has sufficient experience to contribute in a useful fashion to the audit process. If a staff member other than the consultant completes the surgical case form, they must be checked by a consultant or the other staff member must be informed in advance on the salient points to record.
- Where clinical deterioration occurs in a patient and where there is no clear cause, it is important to remember that the cause may be related to something outside of your specialty knowledge base.



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# Case study 1: Delay in definitive treatment for strangulated hernia

## Case summary

An elderly patient presented to the emergency department (ED) with a 24-hour history of abdominal pain and vomiting. The night surgical registrar noted the pain was colicky and central, with no bowel action reported for several days. The patient was on Warfarin for atrial fibrillation and was noted to have a history of chronic cardiac failure due to non-ischaemic cardiomyopathy. On examination, observations were stable and the patient was reported to be comfortable and not unwell in appearance. An irreducible right inguinal (later found to be femoral) hernia was described and noted to be tender.

In ED, investigations demonstrated a high white blood cell count, an elevated international normalised ratio and abnormal liver function test. Abdominal x-ray showed multiple air/fluid levels in dilated loops of small bowel. The treatment plan was for admission, reversal of Warfarin, nasogastric suction, intravenous fluids, and surgery the following day. Surgery occurred nearly 24 hours after presentation and almost two days after onset of symptoms. The McEvedy approach was used, and two adjacent segments of infarcted small bowel were resected and a small bowel anastomosis was performed using

a stapling technique. The femoral hernia was repaired by excision of sac and suture. The patient remained hypotensive following surgery requiring inotropic drugs and transfer to the intensive care unit (ICU). Over the next week there was ongoing deterioration, with death nearly a week after the operation. The cause of death was deemed to be multi-organ failure caused by septic shock secondary to gangrenous small bowel in a strangulated femoral hernia.

## Clinical lessons

The main area of concern is the inappropriate delay between the patient's arrival in ED and surgery, nearly 24 hours later. Clearly, the night surgical registrar who assessed the patient should have discussed the case with the consultant. If surgery was felt to be unnecessary overnight, then it should at least have been scheduled for early the next morning.

Was the operative approach (McEvedy) the best for this presentation? The operation notes did not mention whether the remainder of the small bowel was inspected. This can be difficult through a McEvedy approach. When gangrenous small bowel was found, perhaps a formal laparotomy, at which the entire small and large bowel could have been properly examined, might have been appropriate. The presence of another segment of gangrenous bowel may not have been considered.



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## Case study 2: Laparoscopic versus open hernia repair following previous surgery

### Case summary

An elderly patient with significant comorbidities had a recurrent or residual right groin hernia following an open mesh repair of an upper abdominal incisional hernia, resulting from an open abdominal aortic aneurysm (AAA) repair a few months prior. The groin hernia was reported to be highly symptomatic. A laparoscopic extraperitoneal mesh repair was attempted but the balloon used to dilate the extraperitoneal space tore the underlying peritoneum.

The operating surgeon, aware of the risk of bowel injury, inspected the lower half of the peritoneal cavity and, finding nothing amiss, proceeded to perform a laparoscopic extraperitoneal repair and closure of the peritoneal tear with staples.

The following morning the patient was clearly unwell and was returned to the operating room for a laparotomy. A tear in a segment of small bowel adherent to the previous hernia repair was sutured. The clinical course following this procedure was never truly satisfactory. The patient required ongoing parenteral nutrition, *Candida* was grown from blood cultures, and there were significant ongoing clinical and nursing concerns. Enteric content began to leak through

the wound triggering a further laparotomy with formation of an ileostomy. The patient had a very complicated slow recovery, requiring further laparotomies for sepsis. A fall resulted in a fractured neck of femur and ultimately the patient died.

### Clinical lessons

This patient had a long midline incision from the AAA repair and mesh in the upper abdomen. This made a laparoscopic approach much more difficult and problematic. Although laparoscopic extraperitoneal hernia repair is an excellent method of repairing recurrent groin hernias, it seems likely in this case that the main hernia was pre-vascular, perhaps relating to the previous aortic surgery. This hernia would be very difficult to repair any way other than a pre-peritoneal repair.

Open mesh repair was an alternative, through a transverse suprainguinal incision or through the midline. However, both these approaches would have carried increased respiratory and possibly cardiac risk. On balance, the decision to perform the operation laparoscopically was probably reasonable.

Once a peritoneal tear was identified, inspection of the peritoneal cavity was mandatory. A limited exploration appears to have been done and it is unfortunate that the bowel injury was in fact in the upper abdomen and not easy to visualise through the standard ports that would have been inserted for this operation. It might have been advisable to enlarge one of the lower abdominal ports into a 10 mm port to enable the camera to





be turned upwards to inspect the upper abdomen. This might have identified the bowel injury, although it still could have been missed.

The next day, the complication was identified promptly and a correct decision to perform a laparotomy was made. At that operation, once the bowel injury was clearly identified, there was a choice between repairing the bowel or creating an ileostomy. This patient with multiple medical comorbidities had now had enteric content in the abdomen for more than half a day. The patient was at risk of breakdown of any repair of the small bowel. Depending on the clinical status, oxygen requirements and need for inotropes, consideration should have been given to formation of an ileostomy rather than repairing the bowel injury. It is not clear if this was considered. It is worth noting that had a stoma been performed at this stage, the patient might have recovered uneventfully.

The small bowel repair did break down and a stoma was ultimately required. It is nearly always possible when looking back at notes to suggest that intra-abdominal sepsis could have been diagnosed a little bit earlier than it, in fact, was. It is clear that there was close surgical attention at all times. The remainder of the hospital course is understandable for an elderly person with comorbidities. There are no criticisms of the management.

This case should sound a warning to surgeons undertaking laparoscopic procedures and in particular laparoscopic hernia repair. Bowel

injuries can occur and they can occur 'off screen', so the operating surgeon may be unaware that an injury has occurred. The sooner the diagnosis is made the better, as then there is every chance that a primary repair will be satisfactory. Surgeons should also note that in the event of a delayed diagnosis of a bowel perforation, a live patient with a stoma is infinitely preferable to loss of a life.

## Case study 3: Clot retention can lead to death

### Case summary

An elderly male underwent an elective transurethral resection of the prostate. The procedure was delayed for some weeks to gain admission to a hospital with an appropriate level of care for the known cardiac risk factors. The operation report and the preoperative haemoglobin level were unfortunately not available to the reviewer. The case notes, consisting of entries by resident medical and nursing staff, were adequate to establish the course of events. The preoperative assessments by resident medical and the anaesthetic staff provided an adequate appraisal of the patient's status.

The patient was diagnosed with clot retention shortly after returning from the operating room. The urology resident attempted to wash out the clots but realised this was



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incomplete. The size and type of catheter used were not recorded. Nursing notes indicated ongoing pain consistent with clot retention well into the next day. There appeared to be an idea that catheter traction alone would solve the problem. The patient was then transferred to another ward and hypertension, possibly indicative of persisting pain, was recorded, as were frequent catheter blockages.

In the days following the operation, the patient developed chest pain along with a fall in blood pressure and oxygen saturations. A rise in cardiac enzymes was consistent with a myocardial infarction. A fatal asystolic cardiac arrest occurred that evening.

## Clinical lessons

Postoperative blood loss is difficult to assess without knowing the admission haemoglobin level. Painful clot retention may hold a litre of blood. The management of the chest pain had been timely and appropriate with the involvement of the cardiology registrar. The use of aspirin in this circumstance may have had associated risks, but in view of the proven benefit of aspirin in survival from acute myocardial infarction it should probably have been administered. This would mean that any ongoing prostatic bleeding would have needed to be controlled.

The major area of concern is the failure to resolve the persisting clot retention. Clot retention is dangerous as well as very distressing to patients. Evacuation of all of the clots within the bladder is required to stop ongoing prostatic bleeding

and the formation of more clots. This may be done by return to the operating theatre and evacuation of the clots by cystoscopy under direct vision. An alternative method is to do a manual bladder washout (vigorous) in the bed. For this to be successful a large bore (22-24 French Gauge (FG)) open-ended (whistle-tip) catheter is required. A 22 FG Foley-type catheter that is usually inserted post-TURP does not allow adequate extraction of the clots. Therefore, a change of catheter may be needed and probably should be done with an introducer to ensure accurate placement; hence a urology registrar needs to be involved.

The procedure may take upwards of 40 minutes with the irrigation of several litres of fluid to be sure of removal of all clots. It is probably not a procedure to be delegated to a junior medical staff member without appropriate training and supervision. Once the bladder is free of clots and the return in the syringe is clear, another Foley-type catheter can be inserted and then traction applied to isolate and tamponade bleeding distal to the catheter balloon.

Unfortunately, the postmortem report made no comment about the presence of clots within the bladder at the time of death. The definitive management of this patient's postoperative clot retention may have reduced the likelihood of the myocardial infarction. Complete clearance of the bladder clots may have allowed the use of aspirin with more confidence without worsening the prostatic bleeding.



## Case study 4: A very high risk patient - comorbidities can be critical

### Case summary

This elderly patient with a past history of moderately severe chronic obstructive airways disease and a CVA was admitted to a major hospital for surgery to remove recurrent left tonsillar squamous cell carcinoma which had previously been treated with radiotherapy. The patient had developed a lymph node 18 mm in diameter in the neck contralateral to the primary disease. There was also recurrence in the primary site which was thought to be resectable. On the basis of this information alone, the patient's chances of surviving this cancer apart from the other medical problems was likely to be less than 10 per cent. The patient would have been considered to be at very high risk of surgical complication on the basis of these comorbidities.

The surgeon decided not to reconstruct the primary site but to remove the residual disease via a jaw-split approach and achieve primary closure. Levels I-IV of the neck were dissected bilaterally and the patient was nursed in the ICU with a tracheostomy tube in place and a nasogastric tube. A number of complications occurred during the first night:

- The nasogastric tube became displaced; it was found in the patient's mouth. As feeds had already commenced there

was the possibility that the patient may have aspirated although there was a cuffed tracheostomy tube in place.

- There was a lot of swelling in the neck probably as a consequence of surgical oedema. There was a suggestion in the notes that this was progressive swelling but the treating team decided to treat the patient conservatively.

On the second day postoperatively the cuff was deflated but the patient was unable to tolerate this, implying that saliva was being aspirated at that early stage, as would be expected.

On the third postoperative day there was significant oropharyngeal bleeding from the tonsillar fossa which was treated conservatively; however, later that day the patient was found to have a haemoglobin of 69 g/L and was transfused. The patient went into congestive cardiac failure on the fourth postoperative day and had further fresh blood loss from the tonsillar fossa on that day; the post transfusion haemoglobin was still only 85g/L. Heparin was ceased.

On the eighth postoperative day there was more bleeding, a medical emergency was called but the patient was again treated conservatively. A return to theatre, however, occurred later that day and the patient's bleeding site was identified and the bleeding controlled. There was a further blood transfusion of packed cells that day and a return to intensive care.



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On the ninth postoperative day the patient was found to be ventilating poorly and was cyanosed, the lungs were stiff and the tracheostomy tube was misplaced. There were major problems with the tracheostomy tube at this time and the patient was assessed as being in respiratory failure. The patient was readmitted to the ICU and found to have an obstructed tracheostomy tube due to granulation tissue.

The patient's respiratory problems continued, and the patient required supplementary oxygenation at three weeks postoperatively and beyond; pulmonary emboli were excluded but there was pseudomonas aeruginosa in the lungs. Some sort of cardiac event occurred, probably as a consequence of upper airways obstruction following decannulation and respiratory arrest, approximately five weeks postoperatively.

### Clinical lessons

This elderly infirm patient with multiple cardiomorbidities was offered major surgery with an extremely low chance of cure but consented to have the surgery. The assessor doubted there was any problem with the consent process. The postoperation course was perhaps predictably complicated in a number of ways, but ultimately the patient's main problem was of a cardiopulmonary nature which led to death. The assessor did not detect any occasions of inappropriate surgical management, but commented that the diagnosis of upper airways obstruction due to partial tracheostomy tube occlusion was delayed because of an emphasis

on oxygen saturation levels rather than the clinical signs of carbon dioxide retention.

In the assessor's view, it was extremely unwise to commence nasogastric feeds on the first night postoperatively; however, this probably did not contribute significantly to the patients following medical course, if we assume that the cuff on the tracheostomy tube was sufficient to prevent aspiration.

There are occasions in the management of malignant disease of the head and neck where the patient is made aware of the risks of surgery and the low chance of survival, but still elects to have surgery. The assessor could not comment on how well prepared the patient was for surgery, or whether the consent process was appropriate, but with the benefit of hindsight a complicated postoperative course was predictable.

In the assessor's view, there was no evidence that the patient was mistreated surgically, nor did the assessor believe that the decision-making process was irregular. The patient chose to take a chance on the surgery, but unfortunately succumbed to the multiple medical problems which ensued.





## Case study 5: Disastrous abdominal sepsis following elective ventral hernia repair

### Case summary

An elective ventral hernioplasty was performed on this active but obese and hypertensive elderly patient. The next two days were characterised by vomiting, abdominal distension and then in the early hours of the morning of day three, rapid deterioration requiring admission to intensive care and ventilation. Flexible gastroscopy revealed an ischaemic stomach within an hiatal hernia. Laparotomy revealed necrosis of the stomach and strangulation of a knuckle of small bowel in a port site used for laparoscopic repair of the ventral hernia. Resection of the stomach and disconnection of intestinal continuity was required to gain control of the initial abdominal sepsis.

Unfortunately, aggressive sepsis with necrotising fasciitis of the abdominal wall, loss of tissue and subsequent intestinal cutaneous fistulae ensued. Over the next year there were multiple further operations to control abdominal sepsis, resect the necrotic bowel, close cutaneous intestinal fistulae, debride the abdominal wall and rejoin the jejunum to the oesophagus. After many months the patient was transferred to another hospital for further care. The patient seemed to rally and there was consideration and planning for abdominal wall

reconstruction. However, empyema of both chest cavities and sepsis associated with ongoing intestinal fistula developed and contributed to death from multiple organ failure, despite thoracotomy and drainage.

### Clinical lessons

Details of the initial laparoscopic repair of the ventral hernia would have been helpful, but were not available. Strangulation of the small bowel in a large port site is less likely to occur if the fascia is sutured closed on completion of the procedure.

The vomiting the morning after surgery was unexpected. This should have led to investigation with plain x-ray of the chest and abdomen, or computed tomography (CT) scanning, which probably would have alerted the clinical team of the presence of bowel obstruction rather than postoperative ileus. In hindsight, the delay in gastroscopy and subsequent surgery after the initial surgery contributed to necrosis of the stomach in the chest and infarction of the strangulating small bowel.

Once this train of complications was set in motion, the subsequent efforts to control sepsis, and repair the bowel and the abdominal wall, are difficult to fault. Twelve months does seem a long time to manage the problems and then refer the case on to another surgical team. Possibly earlier consultation may have led to a different outcome, but little evidence is present to support this view.



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## Case study 6: Coexistence of sub- dural haematoma and fractured neck of femur in a patient with pre- existent dementia

### Case summary

This elderly patient was admitted through the ED of a regional hospital with difficulty in mobility noted by residential carers. Presentation had been preceded by a fall five days previously and mobility status had subsequently declined. X-rays revealed a left-sided fractured neck of femur. The patient suffered considerable comorbidities including ischaemic heart disease, depression and dementia, and was medicated with multiple cardiovascular medications including Aspirin as an anti-coagulant.

Sensorium was clouded on admission and subsequently during care on the orthopaedic ward. On the day of admission, medical records indicate a lengthy discussion with the patient's next of kin which culminated in a clear 'not for resuscitation' order in the event of cardiopulmonary arrest.

Subsequent nursing and medical notes describe clouding of the sensorium. Operative management of the neck of femur was undertaken on the day after admission under spinal anaesthesia. The anaesthetic record indicates that cerebrospinal fluid (CSF) was obtained prior to intrathecal injection of local anaesthetic and Fentanyl. The American Society of Anaesthesiologists grading is not recorded.

Postoperatively the patient remained somnolent and progressively more difficult to rouse. The patient was unable to take medication and nutrition orally. The head CT examination on the second postoperative day revealed a sub-dural haematoma, and neurosurgical consultation was sought and was provided in a timely fashion.

The decision was made not to intervene operatively due to the severity of the patient's comorbidities. The patient progressively lost consciousness and died nearly a week following admission.

### Clinical lessons

The level of comorbidity and particularly pre-existent cognitive deficiency may have contributed to the masking of an evolving sensorial abnormality which was subsequently found to be due to a sub-dural haematoma.

A decline in patient mobility was correctly identified as due to a fractured neck of femur and documentation by medical staff in the ED and in the orthopaedic service was comprehensive. Despite intercurrent dementia, the intracranial diagnosis was made radiologically three days following presentation and this was not an unacceptable delay given the circumstances.

Management of the hip fracture was timely and orthopaedic management decisions throughout were appropriate. The patient was under regular medical review, and changes to mental state and physical status were identified contemporaneously.



The patient's next of kin were counselled comprehensively and the request that the patient not undergo resuscitation manoeuvres is clearly marked at several locations in the medical notes. The mortality of neck of femur fracture in patients referred from nursing homes is at 50% or greater within twelve months of the inciting event, and I believe that this is not an unexpected death given the age of the patient, extensive comorbidities, the multiplicity of the injuries and the pre-morbid status.

## Case study 7: Benign jaw tumour surgery in elderly patient

### Case summary

This elderly patient was seen at an Oral and Maxillofacial clinic. The assessment was by an Oral and Maxillofacial Registrar who diagnosed a left anterior mandible lesion. It was noted that the patient had gastro-oesophageal reflux, for which the patient was taking Somac, and had been a heavy smoker for some fifty years. There was no history of alcohol intake and past history included a tracheostomy for a cyst.

The examination notes of the outpatient attendance describe an expansile left anterior lesion with normal inferior dental nerve sensation and left sublingual fullness. The recommendation was 'review by the consultant in a week for possible biopsy or en bloc

resection with workup including chest x-ray, basic bloods'.

The review took place approximately one week later, confirming that there was a left mandibular cyst and an open biopsy was to be undertaken under local anaesthetic. The review was to be two weeks post-open biopsy and the patient was to have a CT scan and an Orthopantomogram (OPG) performed.

The next outpatient entry was fourteen days later and had only the letters 'R/V' recorded. The clinical notes are then somewhat deficient in that they do not include the objective report of the surgical procedure. Several descriptions suggesting that the surgical procedure of partial mandibulectomy and iliac crest bone graft proceeded uneventfully have been documented.

However, the Coroner's report does indicate that the induction of anaesthesia was difficult and that nasal intubation even via fibre-optic visualisation was not possible and that an oral tube was used. Extubation was accompanied by respiratory distress almost immediately and required reintubation.

The patient was then admitted to intensive care in an unplanned manner. Soon after the patient required formal tracheostomy and a revision tracheostomy some days later. The patient continued to have issues with postoperative bleeding, including a leak around the tracheostomy tube; hence the need for revision.



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The patient's general condition continued to worsen and there was a sudden further deterioration some thirteen days postoperatively which led to death.

The overall findings were those of a significant pulmonary embolism. However, there was a background of deteriorating general health in the leadup, mainly due to respiratory failure, acute pulmonary oedema and pneumonia. There are findings of acute respiratory distress syndrome. There was also a background of severe coronary atherosclerosis.

### Clinical lessons

The major areas of consideration in this case are at the preoperative level and also relate to the immediate perioperative management. The scanty nature of the outpatient notes suggests that there was little in the way of multidisciplinary workup in the decision-making process. Certainly the multidisciplinary Head and Neck clinic at this major hospital was not involved in the decision-making.

The full assessment of comorbidities has not been well documented and, with a background of the removal of a benign tumour in an elderly patient, is certainly another area of consideration. There also seems to have been no definite preoperative anaesthetic assessment: the anaesthetic at the time of surgery was quite complicated and difficult, and the perceived need for perioperative tracheostomy was obviously not anticipated. This effectively led to the patient requiring reintubation, perhaps suffering aspiration of

blood and then going through a period of urgent tracheostomies and tracheostomy revision. Another area of consideration was the level of thromboembolic prophylaxis; there were only scant records regarding this.

This case highlights the problems with single department decision-making in major surgical resection for non-life threatening diseases in major hospitals where multidisciplinary teams exist for this purpose. This patient may well have been managed differently if the input of other specialties had been sought and certainly the assessment of all potential comorbidities prior to major non-urgent surgery would have been better.

Some of these investigations may have been undertaken externally, but there is little in the way of records to support this. Likewise, the assessment by an experienced Head and Neck anaesthetist preoperatively may have raised the need for a tracheostomy intraoperatively, rather than encountering the airway issues postoperatively that necessitated reintubation and ultimate tracheostomy with a subsequent revision.

All these factors contributed to a prolonged stay in intensive care which ultimately would have been the cause for the patient developing a deep vein thrombosis and then a pulmonary embolus. The lack of documentation of deep vein thrombosis prophylaxis is also an area of concern, given the fact that none of this was well documented.





## Case study 8: Delayed diagnosis of ruptured AAA

### Case summary

An elderly patient was brought to the ED with lower abdominal and left flank pain. The patient was assessed in the ED and reviewed by a resident medical officer (RMO). No significant past history was revealed and, apart from some abdominal tenderness, no significant other findings were recorded. Routine blood tests were essentially normal.

A diagnosis of renal colic was made, although the RMO had documented that an AAA needed exclusion and arranged for a KUB x-ray and a CT scan. The scan confirmed a diagnosis of ruptured AAA and the patient then had extra intravenous lines inserted and blood taken for cross match. The vascular surgical team was contacted with some delay and not until nearly midnight. Prior to the commencement of surgery the patient became profoundly unstable. The patient underwent surgical repair of a complex ruptured AAA.

The patient initially recovered well and was extubated. However, on the second postoperative day the patient developed respiratory failure and required re-intubation. E. coli was grown in the blood. The patient became increasingly unwell, requiring inotropic support. A week postoperatively, a CT scan was performed which demonstrated free intra-abdominal fluid and abnormal bowel. The patient underwent a laparotomy and a

perforated necrotic sigmoid colon was found. A Hartmann's procedure was performed. The patient did not improve and the patient's family elected to withdraw treatment after they had been informed that the patient had a very poor prognosis.

### Clinical lessons

This case highlights three important issues.

- Delayed diagnosis and treatment. This patient had a typical presentation of a ruptured AAA with a contained haematoma. The treating RMO did comment that an AAA required exclusion; however, there was a significant delay in obtaining the appropriate investigations. This led to the patient becoming unstable prior to surgery and would have contributed to the patient's poor outcome. The diagnosis of AAA should be considered in any patient with abdominal or flank/back pain. Blaming renal colic for this type of pain is quite common. In the absence of a history of renal colic or definite haematuria, a diagnosis of AAA should be considered first and urgent investigation is warranted. The RMO should also have inserted two large bore intravenous cannulas and arranged crossmatched blood much earlier. Ongoing education of emergency staff personnel is warranted.
- The second area of concern is the delay in diagnosis of the ischaemic and perforated bowel. Sigmoid colon ischaemia is a



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common problem following ruptured AAA. This patient had the very typical presentation. The patient who initially recovers well but then deteriorates and required inotropes should raise the suspicion of ischaemic bowel. An earlier diagnosis and intervention may have saved this patient's life.

- The issue with the ischaemic bowel highlights the difficulties of patient handover. Not knowing the patient's previous condition and progress does make ongoing assessment and treatment more difficult, particular if there has been a change in the patient's condition at the time of handover.

In summary, the delay in diagnosis of a ruptured AAA is not uncommon. When there is a suspicion of the diagnosis, urgent investigation and treatment is required. Patients with a ruptured AAA who survive to hospital have a window of opportunity for repair. Any delay can severely jeopardise the patient's chance of survival.

The presence of ischaemic bowel post-AAA repair should always be considered and excluded if the patient is not responding as expected.

## Case study 9: Buttock pressure sores can be fatal

### Case summary

This obese elderly patient was admitted as an emergency patient.

The history included worsening of buttock ulcers (present for greater than six months) and a swollen left leg. Past medical history included a previous myocardial infarct, left below-knee amputation, diabetes, infective endocarditis, pulmonary embolism and chronic renal failure. The ulcers on the buttock appeared to be extensive, with involvement of the labia. Blood tests revealed a creatinine of  $110 \mu\text{mol/L}$ , a white blood cell count of  $14.1 \times 10^9/\text{L}$ , albumin  $29 \text{ g/L}$  and sodium  $126 \text{ mmol/L}$ . Initial treatment was by antibiotics and wound dressings.

There was concern over the nutritional state of the patient, noted on a number of occasions, and a dietician reviewed the patient repeatedly and recommended a supplemented diet. The surgical team noted they had discussed the case with the plastics unit at another hospital and were advised to debride the ulcers in their local hospital prior to referral. A number of delays are noted in planned debridement due to lack of an emergency or elective theatre spot.

The patient was then reviewed by an anaesthetic registrar who, after discussion with a consultant, requested an echocardiogram prior to theatre and thus the planned debridement was again delayed. The echocardiogram report notes an ejection fraction of 67%, moderate stenosis and regurgitation of the mitral valve, and marked elevated right ventricular systolic pressure. On induction, the patient became severely bradycardic, which responded to atropine. Rapid debridement was carried out due to cardiac concerns.



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Postoperatively the patient was transferred to ICU. The admission notes comment on intraoperative Ventricular tachycardia (VT), haemoglobin (Hb) of 84 g/L, and an overall impression of severe sepsis and underlying significant cardiac problems due to mitral valve disease. A dopamine infusion was commenced and the issue of whether the patient should be resuscitated discussed, which at that stage the family and patient appear to have requested to occur.

Subsequent ICU notes mention an intraoperative myocardial infarct, although no troponin level is noted. A further discussion with the patient noted no wish to be resuscitated. The patient was weaned from inotropes and nearly a week into the ICU stay, the cardiac situation deteriorated and the patient died.

## Clinical lessons

The patient appeared to have died from a cardiac cause following an intraoperative event. Contributing factors were numerous pre-existing problems, including mitral valve disease, possible pulmonary hypertension (from previous pulmonary embolism), renal impairment, malnutrition and anaemia.

The case illustrates a number of typical problems in dealing with complex patients, including:

- the effect of delays to theatre
- the issue of dealing with complex patients on an emergency list
- the difficulty in liaising with multiple teams
- the difficulties of not having all services on site, in this case plastics.

There are a variety of things that could have been done differently such as:

- earlier debridement on an elective list
- transfer to a centre with plastics skills
- more detailed cardiology preoperative assessment
- preoperative transfusion.
- All these alternative approaches are controversial and it is doubtful they would have significantly altered management.

## Case study 10: Delay in managing small bowel obstruction following orthopaedic surgery

### Case summary

A very elderly patient, with a significant history of chronic obstructive airway disease, hypertension, peripheral vascular disease and hypothyroidism, presented with a fractured neck of femur following a fall at home. There was also a past history of abdominal surgery. The patient was managed with an intramedullary nail the next day. The surgery appears to have been uncomplicated.



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The patient developed nausea and vomiting on day three postoperatively. Abdominal x-ray revealed multiple distended small and large bowel loops consistent with an ileus, which was managed with intravenous fluids and nasogastric decompression. Over the next two weeks the postoperative course was mixed, with occasional bowel motions but ongoing abdominal distension and vomiting. The general surgical team was asked to review the patient nine days after the orthopaedic surgery. The initial assessment appeared to be of a tender rigid abdomen suggesting peritonitis, but much of the pain resolved following catheter insertion and it was felt that the findings were related to urinary retention.

Nearly two weeks postoperatively, increasing right iliac fossa pain was noted. Paroxysmal atrial fibrillation was also a problem. The patient remained afebrile but further abdominal x-rays revealed distended small bowel loops. It appears that no further investigations were undertaken until a surgical registrar review three days later. A CT scan on the abdomen/pelvis revealed distended proximal small bowel loops with collapsed terminal ileum. Moderate pelvic fluid, as well as a few locules of free gas, was reported. The patient proceeded to surgery.

At laparotomy, multiple ileal adhesions with a segment of perforated ischaemic terminal ileum and caecum were noted. This was resected but intraoperatively more small bowel appeared dusky, and an additional length was resected and an end ileostomy formed.

Histopathology revealed ischaemic necrosis of the terminal ileum and caecum without evidence of mesenteric thrombus.

The patient remained ventilated in the ICU for the next two days but on extubation promptly developed respiratory failure; bilateral pneumonia was present on chest x-ray. On discussion with the family, a decision was made that the patient would not undergo re-intubation or further invasive treatment and the patient passed away shortly thereafter.

### Clinical lessons

The predicted mortality for a very elderly patient with a fractured neck of femur is high. It appears that the patient developed an adhesional small bowel obstruction in the first few days following orthopaedic surgery. Radiology and the clinical circumstances initially pointed to ileus, but the presence of previous abdominal surgery and the protracted course should have suggested mechanical obstruction earlier than the diagnosis was made.

It appears there was some delay between development of persistent right-sided abdominal pain and further investigation. Such circumstances suggest that a CT of the abdomen should be ordered in cases of ileus persisting beyond a few days, and certainly with the development of persisting abdominal pain and tenderness. It is impossible to say whether earlier diagnosis and laparotomy may have altered the outcome, as clearly the predicted mortality for a patient of this age





with other comorbidities and recent fracture is high.

It is likely that the patient developed ischaemic perforated gut, probably related to the obstruction. While the mode of death was respiratory failure, deconditioning due to long hospital admission and sepsis may have contributed.

## **Case study 11: Death after colonoscopy - failure to recognise deterioration after colonoscopic perforation**

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### **Case summary**

An elderly patient was admitted with bleeding per rectum. A colonoscopy found 'severe diverticulosis through the left colon'. At the hepatic flexure there was a bleeding (sessile) polyp on a difficult fold. A biopsy was taken and the polyp was removed using the snare technique. The patient was classified as ASA grade 3.

The surgeon was concerned about the possibility of a perforation and the patient was placed on clear fluids. The patient had severe abdominal pain that night, but the surgeon was not called. The nursing notes contained the following comments: 'Pt. complained of abdominal pain. Analgesia was given.' Some forty minutes later the patient was 'grunting' in pain and had a small vomit. The observations were unremarkable, but the abdomen was tender to the touch and distended. The surgeon was not called.

The surgeon reviewed the patient on a routine ward round the next day and appreciated the problem. At laparotomy there was a leak from the polypectomy site. There was gas in the mesentery and extending into the retroperitoneum. There was no actual faecal leak into the peritoneal cavity itself. A right hemicolectomy with a defunctioning ileostomy was performed. The patient's condition deteriorated after the operation and death occurred eight days later.

### **Clinical lessons**

It is a matter of concern that the surgeon was not notified about the patient's deteriorating condition. The problems listed by the attending nursing staff suggest that there was sufficient evidence to call the surgeon. A painful distended abdomen is not normal after colonoscopy. The nursing staff failed to link these findings with the surgeon's written concerns about a perforation. The problem was not a failure to call the surgeon when the problem was recognised, but rather a failure of the nursing staff to appreciate that there was a problem.

## **Case study 12: Aortic dissection is associated with pregnancy**

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### **Case summary**

The case concerns an eight-month-pregnant woman with an acute type A aortic dissection. She presented with central chest pain and a diagnosis of



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aortic dissection was made via transthoracic echocardiography. An emergency Caesarean section was performed to deliver a live baby. She then went on to have repair of the type A aortic dissection, which was a prolonged operation due to bleeding and coagulopathy. She was returned to the ICU with an open chest; however, she was noted to have fixed and dilated pupils with CT brain demonstrating large right-sided cerebral infarct. Treatment was withdrawn and she passed away on postoperative day two.

There are two important aspects in this case:

#### **The timing of the procedure**

The patient presented to the ED in the early afternoon with a typical story of central chest pain. Coupled with the fact she was pregnant and the known association of pregnancy and aortic dissection, a diagnosis should have rapidly been made. It has been noted from the case records provided that the patient was assessed by the cardiothoracic registrar in the early evening and was eventually operated on later that night. This was eight and a half hours after initially presenting. The 'rule of thumb' of aortic dissection is that every hour delayed is equal to an increase in mortality of 1%. So this delay increased the mortality of the operation by close to 10%, in an operation that already carried a mortality of around 25 to 50%. It is unclear why and at what level the delay occurred, although taking six hours for the registrar to see the patient after presentation is an issue.

#### **Massive right cerebral infarct**

The likely mechanism of this was malperfusion to the brain during bypass. The patient had arterial cannulation via the right axillary artery, which can also be used for cerebral protection during an operation. One must assume the true lumen was cannulated and flow was checked and found to be adequate. However, in the event of massive right-sided stroke there must have been an issue somewhere to cause lack of blood flow to the brain. A postmortem may have been useful to determine if there was a dissection flap causing malperfusion. Also, antegrade cerebral protection was said to be used during the period of circulatory arrest, but it is unclear the exact way this was employed (e.g. continuous, flow rate, adequacy of backflow noted).

### **Case study 13: Anastomotic leak causing death**

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#### **Case summary**

This elderly patient had a history of squamous cell carcinoma (SCC) of the vocal cord, cardiac arrhythmias and a possible diagnosis of epilepsy. The pathology which required the operation was synchronous cancers of the mid-descending colon, which had serosal involvement, and a large cancer at the transverse colon just proximal to the splenic flexure, again with serosal involvement. There were bulky nodes in the mesentery and omental involvement. The operation



itself was a sub-total colectomy and ileorectal anastomosis. Of concern was the fact that the inferior mesenteric artery and vein were ligated; however, the sigmoid colon was then used to construct the ileorectal anastomosis. The anastomosis itself was performed using staplers constructing what was described as a functional end-to-end anastomosis. The histopathology indicated two synchronous adenocarcinomas with direct involvement of the omental fat, with 26 out of 46 lymph nodes involved on a background of hyperplastic polyposis.

Postoperatively the patient was managed in the high dependency unit with an epidural in place. It was noted that there was significant hypotension in the postoperative period with diastolic blood pressures of 40 or 50 mm Hg for a period of 24 hours. This was attributed to the epidural block. Following this the patient progressed in a satisfactory manner until the third day postoperatively, when the patient was noted to be mildly febrile and had moderate tenderness in the left iliac fossa. A mid-stream urine was sent off to exclude urinary tract infection at this point. On the fifth postoperative day the patient began to feel nauseated and had generalised tenderness with guarding in the descending abdomen. The patient was afebrile with a heart rate of 80 and a blood pressure of 110/60. Abdominal xrays were performed. However, later that day the patient's oxygen saturation decreased, and the pain in the abdomen increased and was

associated with increased nausea and then vomiting. The surgical intern noted that the patient looked grey and the intern had difficulty in taking bloods. The intern described the possibility of taking the patient back to theatre.

A CT scan was then organised and reviewed by a consultant radiologist and a surgical registrar. It was reported that the anastomosis looked intact but there was free gas adjacent to the ileorectal anastomosis and free fluid above the liver and the left flank. In contrast to the intern's assessment, the examination performed stated the abdomen was soft with minimal tenderness. The diagnosis of aspiration pneumonia was made. Over the next two days the patient's clinical condition gradually deteriorated to the extent where increasing hypoxia and continuing abdominal distension and tenderness was reported. On day eight the patient's clinical condition deteriorated so a further CT scan was performed; again it did not show any evidence of anastomotic leak. There was increasing fluid and gas within the abdomen and the patient was then taken to theatre. An ischaemic anastomosis was identified with ischaemia on the lateral wall of the colon associated with necrosis and breakdown of the colonic wall. Interestingly, when this was divided it was noted that the colonic or perhaps rectal stump appeared healthy with a bleeding edge. The small bowel was viable. There were findings of gross faecal contamination in the abdomen with small bowel content within



all four quadrants. The patient was then transferred to a further hospital with ICU support where the care seemed entirely appropriate. Despite maximal intensive care and also excellent ward care at this hospital, the patient did not survive and died about two weeks postoperatively.

### Comment

The assessor thought there were two significant issues with this case. The first is a technical issue where the blood supply to the sigmoid colon was taken yet the distal sigmoid colon was used for the anastomosis with an almost inevitable outcome of anastomotic breakdown secondary to ischaemia. This is a significant technical mistake that has been made by the operating surgeons. In addition, the first 24 hours of hypotension probably contributed to the ischaemia and was a factor to be taken into account in deciding to reoperate.

The second issue is with the postoperative management. With an ileocolonic anastomosis the contamination with small bowel content rather than faeces is rather more subdued than with a leak from a colo-colonic anastomosis. Therefore, the presentation is always going to be slightly more subtle. On day five it was apparent that the patient did have an anastomotic leak. In fact the intern who reviewed the patient wrote that the patient possibly should go to theatre at that time. The radiology was not helpful in that the report suggested that the changes were secondary to residual postoperative fluid and gas. If there was concern about the

anastomosis, the patient could have easily had a flexible sigmoidoscopy and the anastomosis viewed at which point the ischaemia at that area would have been recognised and the patient taken to theatre. Failure to do this led to a further 48-hour delay with the result that the patient became increasingly septic. Eventually, despite maximal support, the patient died after a further 10 days of intensive medical therapy.

When the inferior mesenteric artery is ligated, any anastomoses in the residual sigmoid colon should be avoided and preferably the upper rectum should be used in the anastomosis. In addition, the use of endoscopy to view anastomoses should be considered if there is concern in regard to a patient's postoperative course to exclude ischaemia. Lastly, no one is ever criticised for performing a relook laparotomy that is normal.

## Case study 14: Poor communication regarding clinical observations

### Case summary

This patient was elderly with a history of breast cancer requiring chemotherapy, frequent falls (cause not certain), type II diabetes, congestive cardiac failure and early dementia (stated to be due to alcohol abuse). The patient had a fall at a nursing home several hours prior to admission to the metropolitan hospital, and hit their head with



no loss of consciousness but a scalp laceration. The patient was taking a number of medications for their hypertension, diabetes and heart. Of significance (but not mentioned in the case summary) was that the patient was also on aspirin.

Initial examination showed that the patient was conscious and oriented with a Glasgow Coma Scale (GCS) of 15. A CT scan done in the ED showed multiple extra-axial collections of blood of varying ages with small right temporal and bi-frontal collections with no mass effect. The patient was seen in the ED by the neurosurgical registrar, who suggested stopping the aspirin, a repeat CT scan in 48 hours and a general medical review but not admission under neurosurgery.

The patient was also seen by the general physicians and a very thorough clinical evaluation made with the request that for the first 48 hours the patient be under neurosurgery. This appears to have been done but the decision on the frequency of neurological observations (four-hourly) was made by the medical team.

The morning after admission, the patient was noted to be confused and by late that evening the GCS had deteriorated to six. A repeat CT scan showed a large acute right sub-dural haematoma. The patient underwent emergency surgery with neurological improvement, but over the next few days had a worsening chest infection and a decision was made to palliate. The endotracheal tube was removed and the patient died shortly after.

## Comment

The questions raised by the first-line assessor were:

- Were there medications or medical conditions that may have put this patient at a higher risk of developing a clinically significant haematoma?
- Were there less than adequate neurological observations that may have contributed to the death patient with a GCS of 15?

The answers to these questions are:

The patient was on low dose aspirin. This information was not included in the case summary but should have been.

The four-hourly observations ordered by the medical team were inadequate. However, it is not certain that this contributed to the death of the patient.

The morning after admission, the patient was noted on a consultant ward round to be confused but no decision was made to investigate further or consider surgery. The reason for this is not clear – possibly it was due to the patient's generally poor state and other comorbidities. Operation was precipitated by the severe deterioration about 36 hours after injury. There was neurological improvement but the respiratory complications were responsible for the decision to cease active treatment.

Nevertheless, as a general principle a patient on aspirin with head trauma with evidence of intracranial blood is at high risk of expansion of the intracranial haematoma and



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should be on frequent neurological observations (as a minimum, hourly). The decision to conduct four-hourly observations was an area of concern. This decision should have been made by the neurosurgical team. In this case, however, the second-line assessor did not think that it was a significant factor in the death of the patient.

## Case study 15: Possible pulmonary embolism even with prophylaxis

### Case summary

This case involved an elderly patient who was admitted directly from the outpatient clinic with an asymptomatic infrarenal aortic aneurysm 10 cm in diameter. The patient had the usual cardiovascular profile being hypertensive, a former smoker and having had two previous myocardial infarctions.

The patient underwent a satisfactory preoperative workup which included an exercise stress test and echocardiogram. During this time the patient was on a low molecular weight heparin as deep vein thrombosis (DVT) prophylaxis. The patient had what appeared to be a routine open repair of the aneurysm using a bifurcated graft because of bilateral common iliac aneurysms. The patient received 5000 units of intravenous heparin at the start procedure and a further 2000 units an hour and a half later. Postoperatively low molecular weight heparin was withheld

because of a fall in platelets. This was recommenced three days later.

The patient then made a slow but steady recovery until the patient arrested and died six days postoperatively.

### Comment

The decision to operate was appropriate. A 10 cm aortic aneurysm would be expected to rupture within months or even weeks if left untreated. No mention is made of whether a stent-graft was considered; however, because of the size of the aneurysm and the presence of common iliac aneurysms, it is highly likely that a stent was not possible.

There is no issue with the preoperative workup. These patients all have a history of hypertension and cardiac issues. The stress test and echocardiograph would not have been normal but would have indicated that the patient could tolerate the proposed operation.

The DVT prophylaxis was appropriate. Patients undergoing vascular procedures are fully heparinised at the time of greatest risk of development of DVT, i.e. during the procedure. Anti-embolic stockings are contraindicated in vascular patients who generally have impaired peripheral vascular supply. Their use has been associated with limb loss in the past. The suggestion that intermittent calf compression should have been used does not make sense in this case. They are designed to be used intraoperatively, a time during which the patient was fully anticoagulated.



There is no autopsy report and therefore the cause of death is unknown. It is much more likely that the patient died of cardiac insufficiency than a pulmonary embolus. Even if the latter were the case, there is no issue which should have been addressed. Primary embolus following aortic aneurysm repair is highly uncommon and if it occurs, it is not due to propagation of a calf vein thrombosis, but more likely from compression of or intraoperative damage to the iliac veins.

## Case study 16: A case of balanced risk taking with disastrous outcome

### Case summary

An elderly patient presented with hypertension, osteoporosis, Non-Insulin Dependent Diabetes Mellitus, rheumatoid arthritis, possible chronic obstructive pulmonary disease and previous abdominal surgery, including cholecystectomy, and pelvi-ureteric junction obstruction. The patient was also awaiting knee replacements.

After a diagnosis of lower oesophageal carcinoma was made, the patient was deemed unsuitable for either operation or curative chemo/radiotherapy. At a multidisciplinary team meeting, palliative radiotherapy was proposed supported with a radiologically inserted gastrostomy (RIG). The patient was admitted with severe dysphagia, weight loss, vomiting and

dehydration. The patient weighed 42 kg. Dehydration was corrected and plans made for an RIG the following day.

The RIG was inserted in the mid-afternoon the following day using a 'direct stick technique' under local anaesthesia and sedation, with an anaesthetist present.

On the first postoperative day, the patient was reviewed by the responsible surgical team twice, the medical oncology unit and the dieticians. An initial proposal to start RIG feeding was delayed because of concerns about abdominal pain and possible gastrostomy leakage. After a surgical review was requested, feeding through the RIG commenced that evening.

On the second postoperative day, increasing confusion suggested cerebral metastases and a CT scan of the head was arranged. A discussion with the family during the afternoon determined that care would involve 'no CPR [cardiopulmonary resuscitation], no inotropes, no ventilation'. In the early evening, while in the radiology department, the patient apparently attempted to vomit and was noted to have a tachycardia and to be hypotensive. The patient complained of severe abdominal pain. Approximately two hours later, a significant amount of blood was aspirated from the RIG. Resuscitation involved a MET call, transfusion and further surgical review. Recognising that endoscopic assessment was impractical, plans were made for an emergency laparotomy. It was noted 'NOT FOR CPR – NOT FOR ICU'.



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Later that evening, the surgical element of the operation began. There was gastric wall necrosis associated with the RIG, and subsequent erosion and leakage. There was a band adhesion causing small bowel ischaemia requiring a small bowel resection. The remaining bowel (>200 cms) also had patchy areas of ischaemia. There was no anastomosis, accepting the need for further laparotomy at 48 hrs, if the patient survived. The patient was sent to intensive care.

It became obvious that the patient would not survive and after discussion with family, active support was withdrawn and the patient subsequently died.

## Comment

### PEG or RIG – associated with an adverse event

Radiologically inserted gastrostomies have been used since 1995.<sup>1</sup> Their general use<sup>2-5</sup>, use in head and neck surgery<sup>6-9</sup>, use in upper gastro intestinal surgery<sup>10</sup>, use in other clinical settings<sup>11,12</sup> and their complications<sup>8,13</sup> have been documented.

A recommendation that RIG should be used in this setting was reasonable. It is recognised that there is a higher risk of peritonitis with RIG compared with percutaneous endoscopic gastrostomy (PEG)<sup>6,8</sup>.

### Delay in diagnosis – associated with an area of concern

This matter is confounded by the dual pathology found at laparotomy, which could be linked in aetiology. An

earlier diagnosis of leakage from the gastrostomy and an ensuing earlier operation may have prevented the small bowel complication. However, if the small bowel complication was not related to the gastrostomy and if it were to develop subsequent to the earlier laparotomy, the diagnostic challenge would then possibly have occurred again in a post-laparotomy setting rather than in a post-gastrostomy setting.

The complications from the RIG could potentially have been handled with the patient's survival. The patient's death was ultimately determined by the small bowel pathology and, by the time of operation, was probably unavoidable. In this context, delay was critical and may have contributed to the patient's death.

There were clinical indicators for concern on postoperative day one. Abdominal pain was prominent and caused concern by senior medical staff. The 'concluding pegogram', and possibly a lack of awareness of a higher risk of leakage with RIG, led towards inactivity. A pegogram at this point might have been diagnostic of leakage.

Throughout postoperative day two there were continuing features for concern, with tachycardia and confusion recognised early and hypotension without action from midday. An operation performed twelve hours earlier than it actually was may have salvaged the situation in regard to both leakage and small bowel ischaemia.



## Areas of consideration

### Communication

Early and effective communication between with the responsible consultant and the resident staff during the events and decisions of postoperative days one and two may have been productive.

### Operative decision making

The possibility of doing nothing at the time of the second operation must have been considered. The procedure performed, however, followed a reasoned and acceptable path.

### Conclusion

The patient was admitted in a parlous state and any procedure was fraught with risk. The management plan followed 'a reasonable care pathway' but a significant delay in diagnosing a lethal complication made death inevitable. A higher index of suspicion and judicious investigation may have allowed earlier intervention, possibly salvaging the situation. An adverse event and two areas of concern were identified.

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## Shortened forms

AAA	abdominal aortic aneurysm
ANZASM	Australian and New Zealand Audit of Surgical Mortality
CPD	Continuing Professional Development
CPR	cardiopulmonary resuscitation
CT	computed tomography
DVT	deep vein thrombosis
ED	emergency department
GCS	Glasgow Coma Scale
ICU	intensive care unit
MRI	magnetic resonance imaging
PEG	percutaneous endoscopic gastrostomy
RACS	Royal Australasian College of Surgeons
RIG	radiologically inserted gastrostomy
RMO	resident medical officer
TURP	transurethral resection of the prostate

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