

Queensland Audit of Surgical Mortality (QASM)
Northern Territory Audit of Surgical Mortality (NTASM)

LESSONS FROM THE AUDIT

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of Surgical Mortality



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INTRODUCTION

The *Lessons from the Audit* (Volume 18) presents five short case studies.

These case studies focus on infections and the surgical patient.

As always, I welcome your feedback regarding these case studies.

John North

Clinical Director

Queensland Audit of Surgical Mortality

Northern Territory Audit of Surgical Mortality

SHORTENED FORMS

CPR	cardiopulmonary resuscitation
CT	computed tomography
GP	general practitioner
ICU	intensive care unit
MET	medical emergency team
MRSA	multiple resistant <i>Staphylococcus aureus</i>



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Vascular Surgery

Case study 1: *Where was the consultant?*

The audit assessor stated: “no doubt diabetic foot infections, particularly on a background of comorbidities, represent a high-risk patient group, both for amputation and mortality; however, if they have any chance of surviving then quick and efficient treatment of foot sepsis is vital and clearly this did not happen in this case.”

The patient:

- was male (early 60s)
- had a history of vascular disease
- had type 2 diabetes and ischaemic heart disease
- had previous forefoot and toe amputations
- had undergone (10 years prior) coronary artery bypass grafting.

What happened at the hospital?

- The patient was admitted after a collapse and noted to have right foot cellulitis and a multiple resistant *Staphylococcus aureus* (MRSA) bacteraemia. He was haemodynamically stable and afebrile.
- A renal issue was noted on admission: urea (15.3 mmol/L), creatinine (165

mmol/L) with an estimated glomerular filtration rate of 37 mL/min/1.73m².*

- There was evidence of sepsis in the forefoot with a small area of inflammation and a central punctum. The wound swab grew MRSA. Intravenous vancomycin was started.
- Day 1 post-admission: a forefoot amputation was planned. The patient remained stable but surgery was cancelled.
- Day 2 post-admission: surgery was planned but cancelled.
- On day 3 post-admission: surgery was cancelled for a third time. The patient remained afebrile and haemodynamically stable. Oxygen saturation levels had improved. He did complain of shortness of breath and was noted to have pedal and sacral oedema.
- The patient's renal function deteriorated, with urea rising from 15.3 mmol/L to 25.1 mmol/L, creatinine rising from 165 mmol/L to 211 mmol/L, and potassium rising from 4.8 mmol/L to 6.5 mmol/L.
- Day 5 post-admission: renal review confirmed that the patient was suffering from acute kidney injury along with chronic renal disease secondary to hypovolaemia, hypotension, sepsis and drugs that included angiotensin



converting enzyme inhibitors and vancomycin. Fluid balance was always going to be an issue because of the underlying presence of left ventricular failure (due to the patient's ischaemic heart disease).

- Day 7 post-admission: the patient's renal impairment had improved slightly.
- Day 8 post-admission: the patient's forefoot was amputated. Good bleeding was noted at the time of operation. Postoperatively, the patient was stable.
- On day 2 following the operation, the patient had shortness of breath. Pitting pedal oedema (bilaterally to the groin crease with significant sacral oedema) was noted. The patient became hypotensive with renal function deterioration.
- A medical team review resulted in the patient having a Lasix infusion and 1 L fluid restriction. The patient's weight increased, over 10 days, from 95 kg to 104 kg.
- Day 4 post-operation: the patient had worsening cardiac congestive failure and renal function. The patient did not abide by the 1 L/day fluid restriction.
- Day 6 post-operation: the wound was clean and the drain was removed. The vascular team handed over care to the general medical team.
- The patient's renal failure deteriorated, resulting in the need for dialysis for 10 days.
- Day 15 post-operation: the patient was vancomycin-resistant *Enterococcus* positive.
- Day 16 post-operation: the wound had increasing dehiscence with mild erythema, but no purulent discharge or offensive odour. It was dressed and consideration was given to the use of a vacuum-assisted closure.
- Day 26 post-operation: the patient became hypotensive with ongoing fluid overload.
- On day 27 post-operation the patient arrested, an endotracheal tube was inserted and cardiopulmonary resuscitation (CPR) was commenced. The patient was cyanotic and laryngoscopy showed the endotracheal tube to be in the oesophagus. It was replaced and correct position in the trachea was confirmed. Four cycles of CPR with adrenalin and atropine were given. There was no return of circulation – CPR ceased after 20 minutes.

What issues are highlighted by this case?

- There was no documentation to indicate that the responsible consultant ever saw the patient during the admission.
- Renal failure was significantly aggravated by the progressive sepsis related to the patient's pathology and repeated delays to surgery.

*Reference: <http://www.rcpamannual.edu.au/>

General Surgery

Case study 2: *Delayed diagnosis of jaundice leads to death.*

The audit assessor stated: “this case highlights the importance of having a high index of suspicion of postoperative complications in a patient with a recent procedure.”

The patient:

- was female (early 70s)
- had a recent removal of uterine polyps
- had hypertension and hypercholesterolaemia
- had a past history of breast cancer.

What happened at the hospital?

- The patient was admitted with lower abdominal pain on a background of a hysteroscopy and the removal of uterine polyps performed 4 days prior at Hospital A. On day 1 post-procedure, she had worsening lower abdominal pain, anorexia and nausea but no vomiting.
- On admission to Hospital B she was afebrile. Emergency notes state she was sweaty and in pain. On physical examination her abdomen was soft and non-tender. A vaginal examination was not performed.
- Blood tests: elevated bilirubin with mildly deranged liver function tests.

A venous blood gas showed acidosis (pH 7.31) with a lactate of 4.9 mmol/L.

- On x-ray, dilated bowel loops were present (as noted by the emergency registrar). The impression was that there may be ischaemic bowel secondary to a bowel obstruction. An urgent computed tomography (CT) abdomen and surgical review was requested.
- The CT showed cholelithiasis with no dilatation of the biliary tree. The endometrium was contrast-enhancing with heterogenous material and gas present within the endometrial cavity (radiologist reported that endometritis could account for this appearance). The caecum was dilated at 9 cm and malpositioned in the left side of the abdomen (radiologist commented that this appearance could be secondary to a caecal bascule or early or partially obstructing caecal volvulus).
- The patient was given a stat dose of triple intravenous antibiotics.
- The surgical registrar reviewed the patient and a working diagnosis was made of obstructive jaundice secondary to choledocholithiasis.
- It was noted that the patient was now drowsy and had trouble communicating.
- Ultrasound showed a large calculus at the neck of the gallbladder. The



common bile duct was only identified at the porta where it was normal in calibre. There was no intrahepatic duct dilation.

- After the ultrasound, in the emergency department, the patient became tachypnoeic and her Glasgow Coma Scale score dropped to 11. Oxygen saturation was not detectable peripherally. She was moved to the resuscitation bay and intubated (7 hours since admission).
- Urgent surgical and intensive care teams assessed the patient.
- In the intensive care unit (ICU), 30 minutes prior to theatre (and 9 hours since admission), a decision was made for a laparoscopy to be performed by the general surgical team.
- In theatre, prior to laparoscopy, a vaginal examination was performed by the gynaecological team. Copious yellowish discharge was coming out of the vagina.
- At laparoscopy, haemoserous (brown/green tinged fluid) was found throughout the abdomen. The stomach, small bowel and colon were distended but viable. The gallbladder and spleen were normal. The uterus, pouch of Douglas, ovaries and fallopian tubes appeared bulky with no evidence of perforation. The gynaecologist felt that this fitted with endometritis.
- During laparoscopy the patient required multiple vasopressors

and inotropes for haemodynamic instability. Ventilating the patient was difficult. There was a deteriorating mixed metabolic and respiratory acidosis and hyperkalaemia with increasing lactate.

- After laparoscopy the patient was peripherally shutdown with prominent mottling of skin. Haemofiltration commenced.
- Despite maximal therapy, the patient continued to deteriorate and died secondary to her sepsis causing multiorgan failure (acute respiratory distress syndrome, acute renal failure and cardiac failure).
- The coroner concluded that the patient died of septicaemia as a consequence of a *Streptococcus pyogenes* infection.

What issues are highlighted by this case?

- The postoperative patient always needs to be physically examined and investigated with appropriate imaging to exclude a postoperative complication.
- A significant delay in diagnosis occurred in this case because the jaundice was erroneously attributed to a biliary cause rather than correctly recognised as a complication of sepsis.
- The correct diagnosis was made 9 hours after admission when the vaginal examination was performed, prior to laparoscopy, in theatre.

Orthopaedic Surgery

Case study 3: *The obese surgical patient and infection.*

The audit assessor stated: “this case highlights the need for awareness of hospital acquired infection, of the risk factors and of prophylactic measures to minimise wound infection. The operative risk factors include spinal surgery with the implants during an operation of more than three hours duration.”

The patient:

- was female (late 50s)
- was diabetic and morbidly obese
- had a history of nephrectomy for renal cell carcinoma.

What happened at the hospital?

- The patient presented to hospital with pain and leg weakness.
- She had a CT and magnetic resonance imaging scans of the spine. These showed multilevel degeneration with severe spinal canal stenosis in the lower lumbar spine.
- Day 11 postadmission she had spinal decompression at two levels and a single level fusion with pedicle screws. Prior to surgery, 1 g of intravenous Cephazolin was given without complication.
- The night before discharge, nursing staff noted that the wound looked inflamed with a small amount of wound discharge. A swab was taken for culture.
- The following day the patient was discharged to the care of her general practitioner (GP).
- After 1 week, the GP noted the wound was infected. Treatment with flucloxacillin was deemed appropriate. The GP was not aware that the pre-discharge wound swab had grown MRSA.
- Two weeks after discharge she was readmitted to hospital with pus draining from the surgical wound.
- In hospital, she had five surgical washouts and debridements. During the third procedure the metal work was removed from her spine.
- Her health deteriorated and she was admitted to the ICU with pulmonary oedema and signs of sepsis. In conjunction with the family members it was decided that palliative care was the appropriate pathway.
- The cause of death was an extradural abscess and sepsis, which occurred as complications of surgery for degenerative spondylosis (with severe spinal stenosis).



What issues are highlighted by this case?

- This patient was in hospital for 10 days prior to operation and was probably colonised by hospital-acquired organisms. Prophylaxis was directed towards MRSA. Cephazolin was probably a poor choice under the circumstances.
- The GP is not necessarily the best qualified person to manage late postoperative complications. When a major complication occurs after major surgery, an instruction to notify the surgeon immediately would be more prudent than the GP continuing to treat the patient.
- Any wound that is red and inflamed with a discharge should be considered infected and appropriate measures followed.
- Results of cultures in hospital should be sent to GPs on or after discharge of patients.

General Surgery

Case study 4: *The renal surgical patient and infection.*

The audit assessor stated: “this case illustrates the importance of a patient being treated by the appropriate speciality and in an appropriate space. Though she was a renal patient, her acute problem was a surgical site infection.”

The patient:

- was female (late 50s)
- had end-stage renal failure due to systemic lupus
- had comorbidities (bronchiectasis, tubular acidosis, hyperlipidaemia, gout, recurrent urinary tract infections).

What happened at the hospital?

(first admission)

- This patient was admitted as a day patient for removal of a Tenckhoff catheter. Her peritoneal dialysis catheter had failed because she had developed a prolapse. A permacath had been placed for haemodialysis and she was awaiting the formation of an atrioventricular fistula. Her catheter was removed, seemingly without any untoward event.
- She was discharged home the same day for follow up by the renal team.

What happened at the hospital?

(second admission)

- Four days later she was admitted as an emergency patient by renal physicians. She was complaining of increasing redness and pain at her surgical site (offensive discharge). She had fever and rigors. She had also noticed a decrease in urine output. She was febrile, but cardiovascularly stable. Abdomen appeared normal. Her white blood count was raised.
- A diagnosis was made of surgical site infection with recurrent bacteraemia. She was started on parenteral antibiotics.
- An ultrasound confirmed an abdominal wall collection.
- The renal physician asked for a surgical review and for the permacath to be removed in case it was infected.
- Day 1 post-admission: she was reviewed by surgeons. Her wound was opened and a “large volume of pus expressed”. The wound was washed out.
- Day 2 post-admission: she was admitted to ICU after medical emergency team (MET) calls for septicaemia. Permacath was removed. The operation site grew *Enterococcus faecalis* and all other cultures were negative.



- Two days after ICU admission she returned to the ward. She continued to get daily fevers and complained of pain at her operation site. The area of infection appeared to be extending.
- Four days after the ICU admission she had formal debridement of her wound in the operating theatre. All lines were changed at that time. Following this she showed persistent signs of continued sepsis.
- Five days after the debridement she had a fall. This was followed by a MET call.
- At this time she had a haemoglobin of 36 g/L. She lost consciousness and was intubated. CT showed a large retroperitoneal bleed (embolised).
- While being weaned off the ventilator she developed a pneumothorax, necessitating an intercostal drain.
- She showed marked impairment of cerebral function and a CT confirmed an intracerebral bleed.
- In view of her poor prognosis, and after discussions with her family, it was decided that palliative care should be instituted.

What issues are highlighted by this case?

- The importance of source control in the management of sepsis.
- This patient had severe comorbidities and was immunocompromised. In these patients, removal of all sources of sepsis as they occur is mandatory.

General Surgery

Case study 5: Pre- and post-operation antibiotics.

The audit assessor stated: “there was unavoidable extra-contamination due to bowel disruption that occurred during a difficult dissection. Postoperative antibiotics should have been given also. Recent chemotherapy and a urinary infection would have also made her more prone to sepsis. There is no evidence of antibiotics in the treatment orders.”

The patient:

- was female (mid 50s)
- had iron deficiency anaemia
- had a right-upper abdomen mass.

What happened at the hospital?

- Biopsies confirmed a moderate to poorly differentiated adenocarcinoma.
- The patient’s cultured epithelial autograft was high. CT scan of the abdomen confirmed a large mass in that region but showed no other metastases.
- CT of chest and brain were clear.
- She was initially managed with a combined course of chemoradiotherapy. The treatment was completed with no complications, apart from a urinary tract infection (which was treated).

- At laparotomy, after a right ureteric stent was inserted, a large mass was found involving the right colon, adherent to her abdominal wall. There was no other pathology noted in the abdomen.
- The malignant mass was resected and there was disruption of the bowel, with inevitable peritoneal contamination.
- A primary anastomosis was performed and the operation concluded.
- Post-operation, the patient’s progress was reasonable with her bowels working by the end of the week. During this time her white blood cells were raised consistently and her haemoglobin fell. For this she was transfused.
- On day 7 post-operation she became unwell with nausea, vomiting, raised temperature and fast pulse. She had no abdominal pain. Chest x-ray was normal. Blood results showed high white blood cells and low potassium. At that stage, in the patient’s notes, it was documented that she was not for antibiotics. According to these notes she did not receive pre- or postoperative antibiotics.
- Day 8 post-operation: she remained unwell and deteriorated. She collapsed and was transferred to ICU. She was given intravenous antibiotics



but failed to respond to resuscitation and died later that morning.

- A subsequent postmortem showed peritonitis with no abscess or collection, and an intact bowel anastomosis. A *Streptococcus* species was isolated from her peritoneal cavity. Bilateral adrenal haemorrhage and some bronchopneumonia were also seen.
- Cause of death was given as “*septicaemia with peritonitis following surgery for colon cancer*”.
- Histology showed no residual viable cancer cells after chemotherapy.

What issues are highlighted by this case?

- The importance of using antibiotics pre- and post-operation in a situation where septicaemia is more likely.
- The importance of recognising impending septicaemia earlier from the clinical state, and initiating appropriate treatment earlier before irreversible septic shock and adrenal failure occur.



Contact details

Queensland Audit of Surgical Mortality (QASM)

Telephone: 07 3249 2971
Facsimile: 07 3391 7915
Email: qasm@surgeons.org
Post: PO Box 7476
East Brisbane QLD 4169
Web: www.surgeons.org/qasm

Northern Territory Audit of Surgical Mortality (NTASM)

Telephone: 07 3249 2973
Facsimile: 07 3391 7915
Email: ntasm@surgeons.org
Post: PO Box 7385
East Brisbane QLD 4169
Web: www.surgeons.org/ntasm

