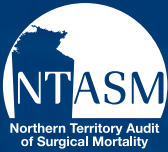




ROYAL AUSTRALASIAN
COLLEGE OF SURGEONS



Queensland Audit of Surgical Mortality



Northern Territory Audit
of Surgical Mortality

LESSONS from the AUDIT

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Introduction

Lessons from the Audit (Volume 10) presents case studies from the Queensland Audit of Surgical Mortality (QASM). It highlights a range of important issues - delays, transfers, communication, and treating elderly patients.

QASM assessors' comments greatly contribute to the lessons outlined in these case studies.

Thank you once again for your persistent support in the completion of QASM surgical case forms and assessment forms. QASM data continues to support the learning and development of Queensland surgeons.

In 2013, the *British Journal of Surgery* will publish an article authored by Queensland surgeons (QASM data 2007-2011). The article is titled, *Analysis of the causes and effects of delay before diagnosis using surgical mortality data*. When this article becomes available, QASM will contact all Queensland surgeons.

In this volume of *Lessons*, *Strangulated hernia – delay in diagnosis* (Case 6) provides an example of the challenges resulting from delays in diagnosis.

I trust this volume will stimulate you to think more about 'best practice' and better patient care.

Yours sincerely

John North

QASM Clinical Director

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.

Shortened forms

AAA	abdominal aortic aneurysm
AF	atrial fibrillation
ASA	American Society of Anaesthesiologists
BP	blood pressure
CK	creatinine kinase
COAD	chronic obstructive airways disease
CNS	central nervous system
CT	computed tomography
ECG	electrocardiogram
ED	emergency department
FFP	fresh frozen plasma
GI	gastrointestinal
GCS	Glasgow Coma Scale
GP	general practitioner
HDU	high dependency unit
ICU	intensive care unit
QASM	Queensland Audit of Surgical Mortality
SVT	supraventricular tachycardia
TPN	total parenteral nutrition
US	ultrasound
VAC	vacuum-assisted closure



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1. History and examination is still important for surgeons.

An elderly nursing-home patient was admitted to the ED with a three-day history of abdominal distension, anorexia and constipation.

Medical history noted aortic regurgitation, cardiomegaly, chronic renal impairment, and dementia. Surgical history noted an open appendectomy over 50 years ago.

The surgical registrar, who initially saw the patient, was unsure of the diagnosis and requested a computed tomography (CT) abdomen. The next entry in the notes was by the anaesthetic registrar (presumably a decision was made to operate). No other documentation was made regarding the diagnosis or treatment but it was noted that the procedure (laparotomy on consent form) carried a high risk. No comment was noted whether post-operative intensive care management was considered.

Later, the consultant surgeon examined the patient comprehensively and explored the incarcerated femoral hernia, resecting a segment of strangulated small bowel.

Post-operatively, the patient had issues with persistent hypotension and oliguria. Approximately 12 hours post-operation, the patient was seen by the medical

registrar for ongoing hypotension, tachycardia and oliguria. At that stage, it was felt that hypovolaemia was the cause and fluid boluses were instituted.

The medical registrar then contacted the intensive care unit (ICU) for consideration of patient monitoring. The patient was reviewed by the ICU specialist. The report from the ICU consultant was that the patient was 'not a suitable candidate for ICU' because of the patient's age and medical co-morbidities.

The patient's next of kin had decided on 'no further active resuscitation'. Renal physicians reviewed the patient who continued to deteriorate and died on day six post-operation.

Comment:

This patient was a high-risk surgical candidate (age, co-morbidities, and acute nature of presenting problems).

Surgical management was expeditious. However, the QASM assessor highlighted an issue with the post-operative management of this patient. Should this patient's post-operative care been performed in a high dependency unit (HDU) or ICU, especially given the difficulty in accurately monitoring the patient's precarious fluid status and its management?

The family had expressed a desire for non-active intervention. This may have "coloured" the decision-making process



regarding ICU transfer and treatment?

The QASM assessor could not fault any aspect of the surgical management of this patient.

The assessor did mention the fact that a more comprehensive examination may have led to the earlier discovery of the femoral hernia as the cause of the patient's pathology.

Given this patient's extensive co-morbidities and age, the final outcome may not have been any different even if managed in ICU.



2. A simple fall is often not so simple.

An elderly patient fell resulting in a fracture of the left proximal humerus and a sub-capital fracture of the left femur.

When retrieved by the ambulance, the patient was fully conscious and there was no evidence of a head injury (or other injuries).

The patient was admitted to hospital and operated on (under the same anaesthetic) for both fractures (stabilisation of a two-part proximal humerus fracture with a locked fixation device and a hemi-arthroplasty of the intra-capsular fracture of the left hip). The operation report suggests minimal blood loss and surgery time was not excessive.

The patient had significant medical co-morbidities including chronic renal failure, mild chronic obstructive airways disease (COAD), and previous gastrectomy with associated anaemia, gastritis and congestive cardiac failure. These co-morbidities do not contra-indicate the appropriate surgical stabilisation of these fractures. Indeed, in a patient of this nature it would have been extremely difficult, if not impossible, to manage them without fracture fixation.

The patient had a cardiac arrest on day three post-operation and died. The patient was 'not for resuscitation' as per an advanced health directive.

Comment:

The treating surgeons had little choice but to perform the surgery that was undertaken.

Early internal fixation of multiple fractures is indicated even when multiple co-morbidities are present. This may very well allow for best nursing care and reduced pain, even though a frail patient does not have a long life expectancy.

Although the patient had a difficult post-operative course as a consequence of the co-morbidities, the QASM assessor could not see anything in the medical record to suggest that the post-operative course was compromised by any area of management. There was nothing to indicate excessive intra-operative or post-operative blood loss or other complications of surgery which may have worsened the situation.

Surgery was appropriate in this case, but making certain that relatives understand the risks and the problems associated with any intervention is always essential.

The QASM assessor could see nothing in either the decision to undertake such surgery or subsequent treatment that was undertaken that would have prejudiced this patient's outcome in any way.





3. Unusual cause of peritonitis.

This elderly patient presented to the ED in the late afternoon. The patient was ‘cold and clammy’ with ‘severe abdominal pain’ and was reported being unwell since a fall a week prior. Abdominal examination in ED by the registrar revealed guarding and rigidity.

The patient had significant co-morbidities (chronic atrial fibrillation, congestive cardiac failure, hypertension, hypothyroidism, gastroesophageal reflux disease, osteoarthritis, osteoporosis and depression) and a history of cerebrovascular accidents.

Appropriate investigations were carried out, including blood tests and CT abdomen. The CT revealed non-specific findings, including dilated loops of small bowel and some free fluid.

The patient was referred to the surgical team the following morning. The surgical team noted diffuse peritonitis and the patient had an immediate laparotomy. The laparotomy revealed free pus and a perforation of the mid-ileum. A small bowel resection and peritoneal washout was carried out. Histopathology showed small bowel diverticulitis and a mesenteric abscess.

Post-operatively, the patient was treated in the intensive care unit (ICU) but continued to be septicaemic. Despite appropriate management including inotropic support, the patient died on day two post-operation.

Comment:

The overall management of the patient was, in hindsight, less than appropriate and could easily have been improved by earlier referral to the surgical team.

Despite a provisional diagnosis of bowel perforation or bowel ischaemia by ED, there was a delay of more than 12 hours in referring to the surgical team. This delay could only have had a negative impact on the outcome for this patient.

The patient was noted, on abdominal examination in the ED, to have guarding and rigidity. A written comment was noted that this was “appropriate” for this elderly patient.

Is this, perhaps, an indication for consultant general surgeon assessment in ED for patients such as this?



4. Inter-hospital transfers need a professional approach.

An elderly patient presented with a flu-like illness to the general practitioner (GP). Initial diagnosis was anaemia and pneumonia.

The patient was referred to a specialist physician at a private hospital. Shortly after admission, the patient became tachycardic and hypotensive, and was transferred to the intensive care unit (ICU). The patient was considered to have septic shock and commenced on inotropes. Four hours after admission to ICU, a surgeon became involved when the patient was pale, tachycardic and diaphoretic with a distended abdomen.

Septicaemia (source unknown) was considered the cause of the patient's difficulties. An aortic abdominal aneurysm (AAA) could not be ruled out.

A blood pressure (BP) of 80mmHg systolic was maintained and ultrasound (US) abdomen showed a normal aorta but a large mesenteric mass (possible haematoma). The patient responded to further fluid resuscitation and CT was performed. This CT showed a large mesenteric haematoma. The patient had been on warfarin for atrial fibrillation (AF) for several years.

At six hours post-admission to the private hospital, the patient's pain was controlled, the patient was anuric, and BP was above 100mmHg systolic with a heart rate of 100

beats per minute. The surgeon considered that transfer to a larger ICU was necessary and arrangements were made to move the patient to a nearby public hospital ICU. Initially no bed was available but the public hospital (despite its heavy load) did arrange a bed within several hours.

While waiting for transfer, the surgeon gave prothrombinex, ordered fresh frozen plasma (FFP) and closely monitored the patient. It took over an hour to access the FFP. As FFP arrived in the hospital, the patient again became tachycardic and hypotensive.

The surgeon decided that urgent laparotomy was indicated and a large mesenteric haematoma was confirmed. The site of the bleeding could not be found. The abdomen was packed, the patient warmed and finally transferred to the public hospital shortly after surgery. Overnight, the patient remained stable. The following day, re-look laparotomy revealed viable small bowel and no further bleeding. The patient remained stable in ICU but unfortunately suffered an ischaemic event six days later and died.

Comment:

There was significant difficulty in obtaining blood and blood products at that private hospital, when the patient was in ICU. This patient needed appropriate care in an appropriate hospital and therefore it was reasonable to arrange transfer to a public hospital for adequate continuing care. The public hospital arranged a bed within several hours despite their patient load.



Supply of blood and blood products to private hospitals via private pathology services must always be available – in this case, it was not. The assessor believed this was not ‘best practice’ or appropriate.

Intensivists and staff surgeons in the public hospital, who had the responsibility for dealing with this very ill patient, were also disadvantaged by the fact that the medical record did not accompany the patient.

For this case, QASM was not able to request medical records for review because private hospitals in Queensland are currently not participating in the audit process.



5. Overdose infarction syndrome: a fatal outcome.

A middle-aged patient was admitted following a suspected polypharmacy overdose.

Clinical history included borderline personality disorder, hypertension, obesity, alcohol abuse and a previous drug overdose.

On admission to hospital, the patient was tachycardic, hypoxic and had a mildly elevated temperature. Glasgow Coma Score (GCS) was 12. The right foot showed advanced ischaemia and the right leg was mildly swollen. There was an area of pressure necrosis on the back of the thigh extending to the popliteal fossa. The left leg was clinically normal.

Laboratory tests revealed metabolic acidosis with acute renal failure, leucocytosis and a highly raised creatine kinase (CK) level. The patient was diagnosed with compartment syndrome of the right leg with rhabdomyolysis and acute renal failure. The patient was transferred to the intensive care unit (ICU) for resuscitation and continued management.

There was an initial disagreement between surgeons regarding who was responsible for this patient. This led to a delay in a surgical decision making while the patient deteriorated further in the ICU.

More than 12 hours after admission, under the orthopaedic team, the patient

underwent a 'through ankle' amputation and a fasciotomy of the right leg. The arteries at the ankle joint level were completely obstructed by thrombus. This raised the possibility of a need for a more proximal amputation.

Vascular advice was sought and it was suggested that below-knee amputation would be appropriate. This amputation was performed after 36 hours of delay. The patient remained intubated, anuric and on inotropic support.

Following the below-knee amputation, the patient stabilised in the ICU but multi-organ failure (renal, cardiac, respiratory, central nervous system) required multi-organ support.

The open amputation stump needed further debridement 11 days after surgery but was managed with vacuum-assisted closure (VAC) dressings.

The clinical course of this patient was further complicated by upper gastrointestinal (GI) bleeding which began 10 days after admission. The patient subsequently developed an oesophageal perforation which compounded the concomitant problem of upper GI bleeding and ultimately the patient died as a result.

Comment:

1. Delay of initial operation

It is common surgical knowledge that patients presenting with features of acute compartment syndrome with rhabdomyolysis



need emergency surgical intervention after the initial resuscitation. In this case, there was a delay of more than 12 hours before the initial operation and a further delay of 36 hours before the below-knee amputation.

This delay significantly contributed to the severe multi-organ injury that the patient sustained.

The initial delay seems to have arisen mainly due to disagreement between the orthopaedic and the general surgical teams as to who should perform the operation.

Despite senior clinicians being involved in the discussion and the decision making process, disagreement still occurred.

Communication and collaboration are two essential competencies of the surgeon. The management of complex patients demands both of these competencies from all involved.

2. Choice of the initial operation

In a patient presenting with a history such as this, clinical signs of acute compartment syndrome, a tense calf and a highly raised CK level, a ‘through ankle’ amputation was clearly the wrong operation to choose. Ischaemia involving the calf or thigh muscles can raise the CK levels to a high level.

An urgent below-knee (or even above-knee) amputation may have been considered as adequate in this situation but consideration with respect to appropriate hydration and dialysis were also critical in this complex situation.

The clinical and the laboratory features suggested significant damage to a large volume of muscle and if fasciotomy was considered to be the correct operation, it should have been performed soon after admission through two long separate incisions, to widely decompress all the compartments. The fasciotomy performed through a single lateral incision was an inadequate operation for this case. Remember also that reperfusion of dead muscle can often be a fatal condition before embarking on fasciotomy.

The subsequent clinical course was dominated by upper GI bleeding and oesophageal perforation which ultimately caused the patient’s demise.

Treatment options were limited due the ongoing multi-organ failure sustained due to the initial ischaemic insult in the right leg.

Timely and effective management of the initial problem with the right leg may have had a positive effect on the patient’s outcome.



6. Strangulated hernia – delay in diagnosis.

An elderly patient presented to the ED with two main issues.

1. The patient had possible oesophageal malignancy (with partial obstruction) (no tissue diagnosis had been made), with associated chest pain, dysphagia and weight loss.
2. The patient had an irreducible left groin hernia and associated pelvic pain.

The patient was oxygen dependent from COAD.

The ED medical officer and admitting medical registrar documented the clinical signs of strangulated hernia with tachycardia. The surgical consultation was not requested until the morning after admission.

Nursing notes indicated the patient was deteriorating. Surgical assessment was almost 24 hours after initial presentation to the ED. A CT scan confirmed the diagnosis of strangulated hernia.

Within three hours of diagnosis and after appropriate discussions with the patient, family and ICU staff, the strangulated left femoral hernia was explored under spinal anesthesia. A small bowel resection was required due to the gangrenous changes.

Post-operatively, the patient was in ICU without ventilation. Inotropes were required for hypotension. The nasogastric tube was

difficult to pass due to the oesophageal lesion. The ICU events included acute kidney injury, acute pulmonary oedema, supraventricular tachycardia (SVT) and rapid AF, delirium and ileus. Attempts at oral fluids were unsuccessful.

Regular discussions between the patient, family, and treating staff were documented. These discussions regarded prognosis and levels of care. The ICU discharge to the ward occurred after two days.

In the ward, the patient failed trial of void; had ongoing ileus requiring total parenteral nutrition (TPN); and had septicemia from a presumed pulmonary source complicating the COAD. The patient was readmitted to ICU for supportive care (oxygen, antibiotics and TPN). After discussions with the family and the treating team, the patient was again discharged to ward after two days. On the ward, rapid deterioration occurred and the patient died within a few hours.

Comment:

Delay in recognition: The importance of the strangulated hernia was not understood by the medical unit. Ischaemic small bowel in the strangulated hernia may have been present from the time of admission. Early surgery may have avoided the need for small bowel resection. Any delay in treating ischaemic bowel will be associated with a worsening prognosis. **The strangulated hernia needs surgery.**

Delay in diagnosis: The use of pre-operative CT was unnecessary and further delayed the case. Strangulated hernias can be



confidently diagnosed and treated on the basis of clinical findings alone. There was enough evidence in this case for that diagnosis to occur. Intravenous (IV) contrast would have definitely exacerbated the renal insult.

The diagnosis of strangulated hernia is a *clinical one*.



7. Non-operative management mandates clear communication.

A previously well elderly patient had a colonoscopy which confirmed a lesion at the hepatic flexure. This lesion was biopsied but no attempt to resect was made at endoscopy.

The gastroenterologist also excised several smaller polyps, including one in the caecum, and organised a staging CT. The patient was appropriately consented for “laparoscopic right hemi-colectomy, ascending colon cancer” due to a right iliac fossa mass.

A colorectal surgeon performed a routine lateral-to-medial laparoscopic right hemi-colectomy with stapled functional end-to-end anastomosis (aqueous povidine-iodine 10 per cent skin preparation was used).

At pre-anaesthetic clinic, the patient was rated ASA 3. At the pre-operative check, the patient was rated ASA 2. The patient spent about two hours in recovery with BP 120/65mmHg and with acceptable pain scores. Given that the pre-operative echocardiogram revealed ‘normal LV size and function, moderate AS’, the patient was admitted to the ward rather than HDU or ICU.

On the ward, on the afternoon following surgery, the patient was reviewed. Observations at this time were normal. On the morning ward round the following day, observations had not changed and pain

scores at rest were acceptable. At 1500 hours, code blue was called because the patient had vomited twice.

Despite 15L O₂ / minute, arterial saturations did not exceed 80 per cent. The patient was in AF with ventricular response rate of 100-120 per minute. Electrocardiogram (ECG) showed ST depression caused by ischaemia (BP was around 80mmHg systolic).

Chest x-ray was ordered and demonstrated pneumoperitoneum. The haemoglobin and white cell count were normal. Significant lactic acidosis (lactate 8.5mmol/L) was evident on the blood gas estimation. The patient was transferred to ICU.

There was no record in the chart that this dramatic deterioration had been communicated to the consultant surgeon.

In ICU, the patient remained febrile in ICU (up to 39 degrees Celsius) and was started on TIMENTIN for presumed aspiration pneumonia. The patient was commenced on noradrenaline and BiPAP for pulmonary oedema (chest x-ray showed bilateral pulmonary infiltrates).

The patient was oliguric when reviewed by the on-call surgical registrar who felt “nil input useful at this time”.

The following morning, this unwell patient was reviewed by the on-call surgeon but not the operating surgeon.

The progress notes indicate that because the patient’s troponin was >90ug/L and CK 4800U/L the decision was made “to review again for possible theatre this afternoon

if stable enough". Within an hour, due to worsening fatigue and lactic acidosis the patient was intubated. The patient's abdomen was tender with tinkling bowel sounds. The possibility of anastomotic leak was raised by the ICU registrar but the consultant intensivist later stated "unlikely to be a primary surgical component".

The patient was then seen by the cardiology registrar who discussed the situation with his consultant. An echocardiogram was recommended during the 'next two days'. The patient continued to deteriorate and further management was felt to be futile. The patient died later that day.

Notes: Histology showed no evidence of malignancy in a 25mm sessile polyp, but the death certificate lists 'myocardial infarction in the setting of colon cancer'.

Comment:

This patient died on day two post-operation (right hemi-colectomy for a benign polyp).

The cause of death was said to be a myocardial infarct without an attempt at excluding an intra-abdominal cause, pulmonary thrombo-embolism or acute pancreatitis. The fact that this occurred in a tertiary referral hospital is of concern.

The gastroenterologist could have prevented the need for surgery by at least attempting a colonoscopic resection given that there is nothing in the procedure notes to indicate this would not have been possible.

A description of polyp morphology was deemed 'unresectable' but the polyp

site was 'not tattooed'. Given that the decision for right hemi-colectomy seemed established, it remains unclear as to why a caecal polyp was removed risking caecal complications?

The consent form states the surgery was for 'cancer' even though the colonoscopic findings were not conclusive and the biopsies showed high grade dysplasia only.

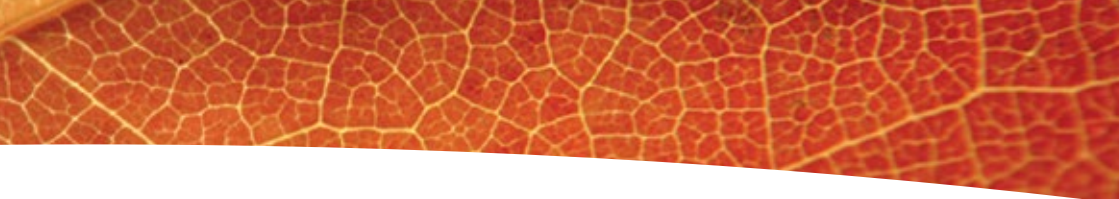
The surgeon did not reconcile the discrepancy between their clinical finding of a right iliac fossa mass, small polyp seen at colonoscopy and a CT which did not show advanced malignancy.

The surgical team prescribed a bowel preparation prior to right hemi-colectomy which is not consistent with current literature.

The surgeon seems not to have taken any interest in the patient's post-operative recovery.

The cardiology team felt the patient was not unwell enough to warrant urgent investigation – when acutely deteriorating triple-organ failure was clearly present. It was felt an echocardiogram was not necessary as it would not change treatment. Echocardiogram would distinguish regional from global cardiac dysfunction confirming the cause of shock is either cardiac or non-cardiac. No mention is made of whether coronary angiography +/- percutaneous intervention or aortic balloon pump was even considered or appropriate.

The surgical team failed to provide an explanation for why this patient was febrile.



The cause of ‘vomiting with tinkling bowel sounds’ and ‘lactic acidosis’ was never established. The registrar involved failed to keep the consultant informed.

At no stage was a serious attempt made to search for an intra-abdominal catastrophe.

The death certificate (and presumably the information provided to the coroner) was simply not correct. Not only did the patient not have a malignancy, but aspiration pneumonitis and pulmonary oedema are not listed despite the patient receiving specific treatment for these.

It remains unclear why the ICU team did not intubate earlier and at least perform an abdominal CT scan to look for evidence of intra-abdominal catastrophe.

Cardiac output monitoring (either non-invasive or Swan-Ganz) was not considered in an attempt to try to confirm the clinical suspicion that the only post-operative complication was an isolated myocardial infarct.

In this case, non-operative management needed to be considered; an alternative explanation for the patient’s deterioration needed to be explored; communication with the operating surgeon needed to take place; and the death certificate needed to be correct.





Notes





ROYAL AUSTRALASIAN
COLLEGE OF SURGEONS



Northern
Territory
Government



Queensland Audit of Surgical Mortality

Telephone: 07 3249 2971

Facsimile: 07 3391 7915

Email: qasm@surgeons.org

Post: PO Box 7476
East Brisbane QLD 4069

Web: www.surgeons.org/qasm



Northern Territory Audit
of Surgical Mortality

Telephone: 07 3249 2973

Facsimile: 07 3391 7915

Email: ntasm@surgeons.org

Post: PO Box 7385
East Brisbane QLD 4069

Web: www.surgeons.org/ntqasm