

Royal Australasian College of Surgeons  
Queensland Audit of Surgical Mortality (QASM)

# HOSPITAL ACQUIRED INFECTIONS IN PRIVATE HOSPITAL PATIENTS IN QUEENSLAND

(JULY 2010  
TO JUNE 2017)



ROYAL AUSTRALASIAN  
COLLEGE OF SURGEONS



Australian and New Zealand  
Audit of Surgical Mortality



Queensland Audit of Surgical Mortality

The background of the entire page is a microscopic image of numerous pink, rod-shaped bacteria, likely Bacillus anthracis spores, arranged in various orientations and some in chains. The lighting is soft, highlighting the texture of the bacterial surfaces.

## Contact

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# CONTENTS

Introduction . . . . .	.4
Prevalence of infections . . . . .	.5
Hospital-acquired infections. . . . .	.5
List 1: Infections acquired in hospital (preoperatively) . . . . .	.6
List 2: Infections acquired in hospital (postoperatively) . . . . .	.7
List 3: Infections acquired in hospital (surgical site) . . . . .	.8
List 4: Infections acquired in hospital (other invasive site) . . . . .	.9
Case study . . . . .	10
References . . . . .	11

## INTRODUCTION

Infections are the modern day challenge of all hospital inpatients, especially in vulnerable patients who need surgical care. (Ref: Hicks, 2016)

### Infections in Queensland private hospital surgical patients (July 2010 to June 2017)

Hospital –acquired infections (HAIs) are infections patients can get while receiving medical treatment in a healthcare facility – they are a major, yet often preventable, threat to patient safety. (Ref: CDC, 2017).

Surgeons in Queensland private hospitals report on whether or not the surgical patients under their care died with a clinically significant infection.

The Queensland Audit of Surgical Mortality (QASM) audits all surgical deaths in Queensland hospitals. This is possible because all surgeons are obliged by the Royal Australasian College of Surgeons (RACS) to participate in the audit as part of the Continuing Professional Development (CPD) program.

All hospitals (public and private) in Queensland participate in QASM. The data in this report is from all private hospitals that have surgical procedures in Queensland.

This report covers 993 private hospital patients reported over four years (2013/2014 to 2016/2017 years) to QASM.

#### Qualifiers

- ▶ Not all audit questions were answered.
- ▶ The data is provided by the surgeons who cared for the patients and not from an infection control program.
- ▶ A limitation of the audit is that it does not collect information on the number of days the patient is in hospital prior to confirmation of the presence of infection.
- ▶ This report does not include non-surgical patients.
- ▶ This report does focus on infections acquired during the hospital admission.

## PREVALENCE OF INFECTIONS

### KEY POINTS

- ▶ About one-third (32.1%) of surgically-related deaths were associated with an infective process.
- ▶ One-fifth (20.0%) of patients acquired an infection(s) while in hospital.

A clinically significant infection was present in 32.1% (313/975) of all surgical patients who died in private hospitals in Queensland. This percentage ranged from 29.7% to 34.9% during the 2013/2014 to 2016/2017 period.

These infections were acquired either:

1. before admission to hospital (34.8%; 104/299), or
2. during the hospital admission (65.2%; 195/299)

Not all patients with infections had their infective organisms identified.

## HOSPITAL-ACQUIRED INFECTIONS

This QASM report is most interested in the percentage of surgical patients who acquired their infections once they had been admitted to hospital for surgery.

There are two different times (preoperatively and postoperatively) and two different sites (surgical sites and other invasive sites) that are reported here about hospital-acquired infections.

The time frame of this report is too short and numbers are too low to be able to determine whether this is a trend in the proportion of patients with hospital-acquired infections.

It is clear from the analysis of causative organisms that there are five main types of organisms acquired in hospital that have caused infections in patients who died. Those organisms are:

1. *Escherichia coli*
2. *Staphylococcus aureus*
3. *Pseudomonas*
4. *Candida*
5. *Enterococcus*

There is a mixture of Gram positive and Gram negative organisms causing these infections.

At present, it is not possible to determine the sources of these infections in the patients who died.

It is possible the infections became established in surgical patients because of exposure to pathogens in the hospital environment; it is also possible they occurred because of the inherent physical vulnerability of patients experiencing the stresses of surgical procedures. (Ref Turrentine, 2006).

## LIST 1: INFECTIONS ACQUIRED IN HOSPITAL (PREOPERATIVELY)

### SUMMARY

- ▶ n = 33 patients; 11 patients (33.3% had the infective organisms identified).
- ▶ Several patients had multiple pathogenic organisms present.

LIST 1: INFECTIONS ACQUIRED IN HOSPITAL (PREOPERATIVELY)	
Candida; Mucor; Escherichia coli	1
Clostridium difficile	1
Escherichia coli, Serratia	1
Escherichia coli; Serratia marcescens; both scanty growth only from pleural fluid cultures	1
Escherichia coli; Serratia marcescens; both scanty growth only from pleural fluid cultures	1
Fusarium solani	1
MRSA, Escherichia coli,	1
Enterobacter, Candida, Aspergilla	1
Pseudomonas, Escherichia coli	2
Staphylococcus	2
Staphylococcus aureus	1

## LIST 2: INFECTIONS ACQUIRED IN HOSPITAL (POSTOPERATIVELY)

### SUMMARY

- ▶ n = 110 patients; 29 patients (26.4% had infective organisms identified).
- ▶ Many patients had multiple pathogenic organisms present.

LIST 2: INFECTIONS ACQUIRED IN HOSPITAL (POSTOPERATIVELY)	
Bacteroides fragilis Escherichia	1
Candida glabrata	1
Candida; Morganella; Staphylococcus epidermidis	1
MRSA	1
Escherichia coli	5
Enterobacter aerogenes	1
Enterococcus	1
Enterococcus faecalis	1
Extended spectrum beta lactamase; Escherichia coli	1
Influenza B	1
Klebsiella	1
Klebsiella pneumoniae; Candida parapsilosis	1
Klebsiella pneumoniae	1
Multiple organisms at different times	1
Proteus mirabilis	1
Pseudomonas	1
Pseudomonas aeruginosa	2
Pseudomonas; Candida	1
Staphylococcus aureus	2
Candida albicans; Pseudomonas; mixed enteric flora	1

## LIST 3: INFECTIONS ACQUIRED IN HOSPITAL (SURGICAL SITE)

### SUMMARY

- ▶ n = 25 patients; 17 patients (68.0% had the infective organism identified).

LIST 3: INFECTIONS ACQUIRED IN HOSPITAL (SURGICAL SITE)	
Candida albicans	1
Escherichia coli	3
Escherichia coli; Enterococcus	1
Enterococcus; Enterobacter; Candida	1
Gram negative bacillus	1
Escherichia coli; Gram positive coccus; Enterococcus species	1
Mixed enteric	1
MSSA	1
Multiple organisms	1
Multiple enteric organisms	1
Staphylococcus aureus; Stenotrophomonas maltophilia; Pseudomonas aeruginosa;	1
Staphylococcus aureus; Morganella morganii	1
Serratia; Klebsiella	1
Staphylococcus; Enterobacter cloacae	1
Staphylococcus	1
Streptococcus anginosus	1

## LIST 4: INFECTIONS ACQUIRED IN HOSPITAL (OTHER INVASIVE SITE)

### SUMMARY

- ▶ n = 15 patients; 9 patients (60.0% had an infective organism identified).

LIST 4: INFECTIONS ACQUIRED IN HOSPITAL (OTHER INVASIVE SITE)	
Klebsiella	2
Pseudomonas	2
Pseudomonas aeruginosa; Enterococcus faecalis	1
Staphylococcus aureus	2
Streptococcus milleri	1
Candida albicans	1

## CASE STUDY NOT NECESSARILY FROM A PRIVATE HOSPITAL

### 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/1.73m<sup>2</sup>.
- 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 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?**

- This patient had to wait 8 days for an operation. His mild chronic renal failure progressively deteriorated during this time.
- 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.rcpamanual.edu.au/>

- MRSA = Methicillin-resistant Staphylococcus aureus

## **REFERENCES**

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