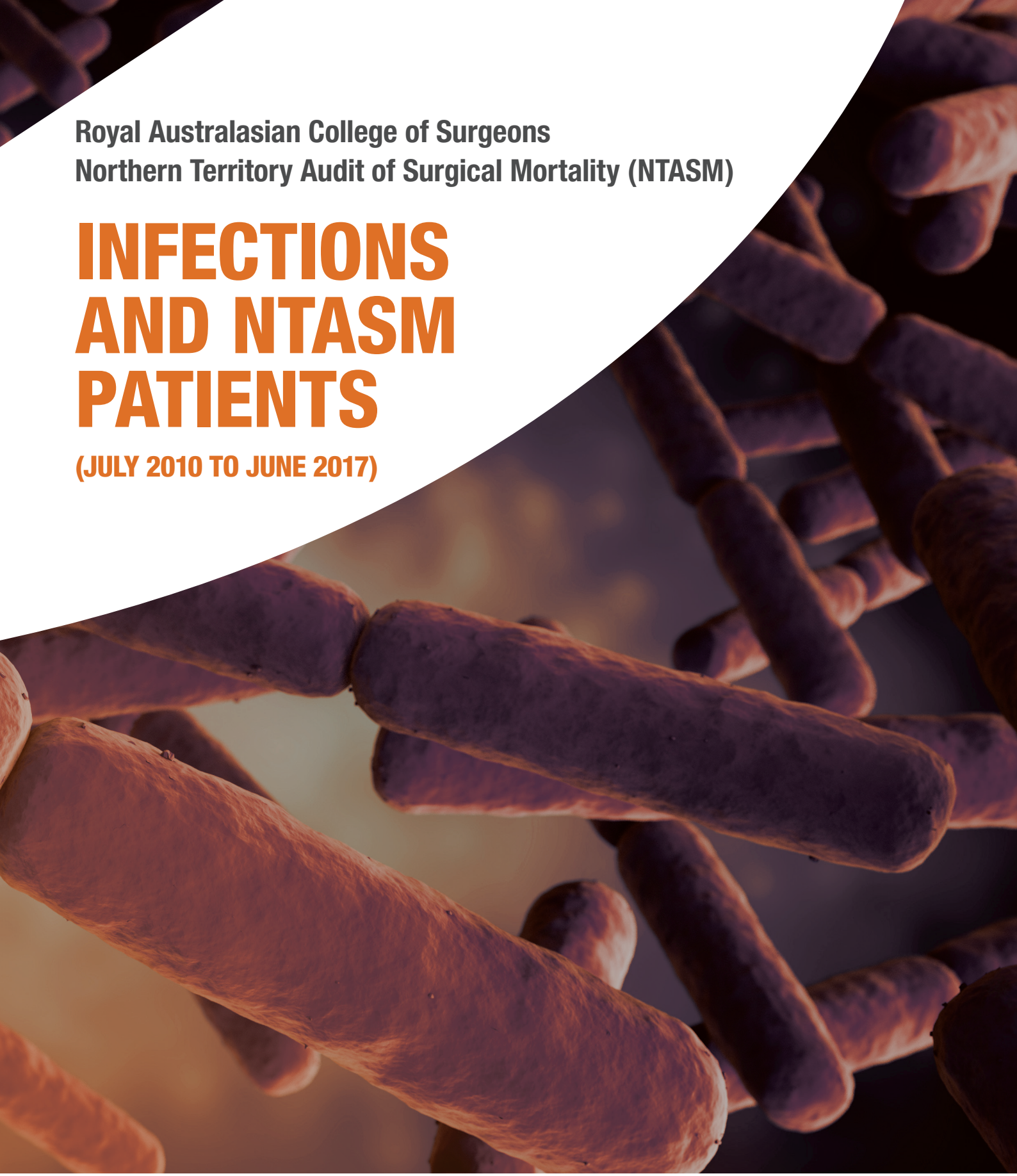
Royal Australasian College of Surgeons
Northern Territory Audit of Surgical Mortality (NTASM)

INFECTIONS AND NTASM PATIENTS

(JULY 2010 TO JUNE 2017)

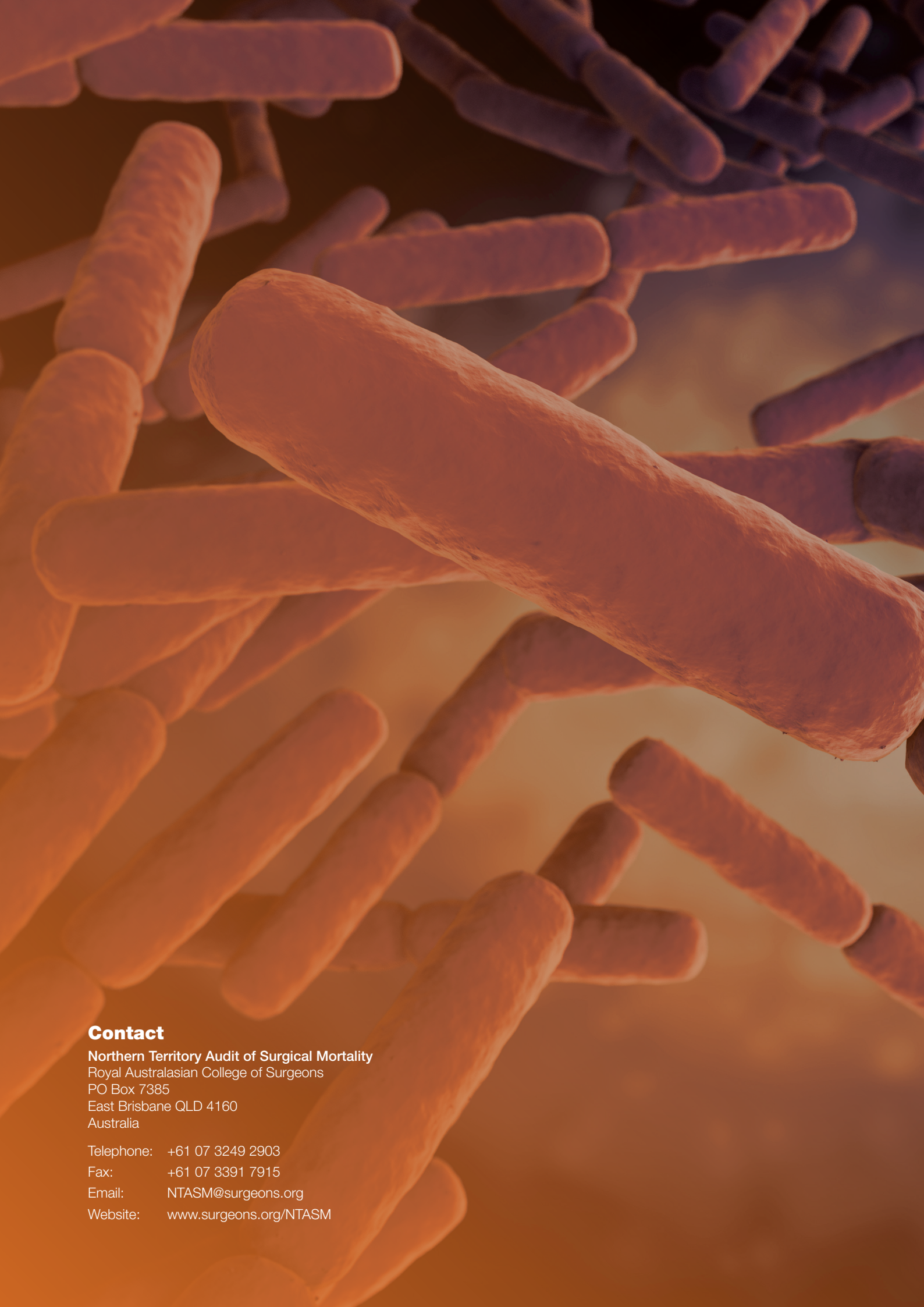


Royal Australasian College of Surgeons

ANZASM
Australian and New Zealand Audit of Surgical Mortality

NTASM
Northern Territory Audit of Surgical Mortality

Northern Territory Government



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CONTENTS

INTRODUCTION

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

Infections in Northern Territory 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 Northern Territory hospitals report on whether or not the surgical patients under their care died with a clinically significant infection.

The Northern Territory Audit of Surgical Mortality (NTASM) audits all surgical deaths in the Northern Territory. 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 the Northern Territory participate in NTASM. The data in this report is from all hospitals in the Northern Territory.

This report covers 465 patients reported over seven years (2010/2011 to 2016/2017 years) to NTASM.

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, although many NT patients did present to hospital with infections.

PREVALENCE OF INFECTIONS

KEY POINTS

- More than one-third (35.8%) of surgically-related deaths were associated with an infective process.
- More than one-third (39.2%) of those patients, whose death was associated with an infective process, had acquired their infection(s) while in hospital.

A clinically significant infection was present in 35.8% (124/346) of all surgical patients who died in Northern Territory hospitals. This percentage has ranged from 20% to 50% during the 2010/2011 to 2016/17 period. This range may be due to low denominators.

These infections were acquired either:

1. before admission to hospital (60.8%; 73/120), or
2. during the hospital admission (39.2%; 47/120)

Not all patients with infections had their infective organisms identified.

The NTASM data pattern, where more patients had acquired their infections before being admitted to hospital (60.8%), is the reverse of the Queensland Audit of Surgical Mortality (QASM) data pattern. In QASM data, only 42.0% of patients with infections had acquired their infections before being admitted to hospital.

For the NT patients, this reveals a statistically significant higher risk for having clinically significant infections before admission compared with Queensland patients (Risk Ratio of 1.45 to 1.69) at 95% confidence levels).

Of those patients who died with a clinically significant infection present, Aboriginal and Torres Strait Islander (ATSI) patients had a statistically significant higher risk of having acquired their infections before being admitted to hospital than non-ATSI patients (Risk Ratio of 1.67 (1.28 to 2.18) at 95% confidence levels.

HOSPITAL-ACQUIRED INFECTIONS

This NTASM 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 four main types of organisms acquired in hospital that have caused infections in patients who died. Those organisms are:

1. *Multiple resistant Staphylococcus aureus*
2. *Staphylococcus aureus*
3. *Streptococcus pneumonia*
4. *Klebsiella species*
5. *Enterobacter coli*

These 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 = 9 patients; 5 patients (55.5% had the infective organisms identified).
- Several patients had multiple pathogenic organisms present.

LIST 1: INFECTIONS ACQUIRED IN HOSPITAL (PREOPERATIVELY)	
Multiple organisms including MRSA and Pseudonomas	1
MRSA; fungus; E.coli	1
Klebsiella pneumoniae	1
Klebsiella	1
Candida albicans	1

LIST 2: INFECTIONS ACQUIRED IN HOSPITAL (POSTOPERATIVELY)

SUMMARY

- N = 26 patients; 13 patients (50.0% had infective organisms identified).
- Many patients had multiple pathogenic organisms present.

LIST 2: INFECTIONS ACQUIRED IN HOSPITAL (POSTOPERATIVELY)	
Stenotrophomonas	1
Staphylococcus aureus	1
Pseudomonas aeruginosa	1
Pneumocystis jirovecii - Chlamydophila pneumoniae - Pseudomonas aeruginosa	1
Multiple resistant - Staphylococcus aureus - mixed Coliforms	1
Moraxella - Haemophilus influenza - Enterobacter	1
Gram negative bacillus	1
Escherichia coli - Klebsiella pneumoniae - Pseudomonas aeruginosa - mixed anaerobes	1
Extended spectrum beta lactamase (ESBL)	1
Enterococcus faecium (VRE)	1
Enterococcus	1
Escherichia coli	1

LIST 3: INFECTIONS ACQUIRED IN HOSPITAL (SURGICAL SITE)

SUMMARY

- N=2 patients; 1 patient had the infective organism identified.

LIST 3: INFECTIONS ACQUIRED IN HOSPITAL (SURGICAL SITE)	
Multiple resistant Staphylococcus aureus	1

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

SUMMARY

- N=6 patients; 3 patients (50.0%) had an infective organism identified.

LIST 4: INFECTIONS ACQUIRED IN HOSPITAL (OTHER INVASIVE SITE)	
Multiple resistant Staphylococcus aureus	1
Klebsiella	1
Escherichia coli	1

LIST 5: ALL IDENTIFIED ORGANISMS

All Identified organisms in individual NTASM patients.

	Urine	Blood Culture	Sputum	Fluids (abdominal, peritoneal, ascitic, pleural)	Wound	Not Stated	Total
Methicillin-resistant Staphylococcus		2	2		1	9	14
Staphylococcus aureus					1	10	11
E.coli	2					7	9
Gram negative bacilli						8	8
Pseudomonas aeruginosa				1		6	7
Pseudomonas species		2	2		1	1	6
Candida species						5	5
Group A beta-haemolytic streptococcus						4	4
Klebsiella species						3	3
Candida albicans		1				2	3
Stenotrophomonas maltophilia			2			1	3
Mixed aerobic				1		2	3
Mixed anaerobic						3	3
Gram positive cocci						3	3
Staphylococcus species						2	2
Klebsiella pneumonia						2	2
Haemophilus Influenzae						2	2
Streptococcus pneumoniae						2	2
Vancomycin resistant enteroccous						1	1
Staphylococcus epidermidis						1	1
Enterococcus species						1	1
Enterobacter species						1	1
Enterobacter cloacae						1	1
Proteus mirabilis						1	1
Streptococcus species						1	1
Acinetebacter species						1	1

	Urine	Blood Culture	Sputum	Fluids (abdominal, peritoneal, ascitic, pleural)	Wound	Not Stated	Total
Proteus species						1	1
Vancomycin resistant enterococcus faecium					1		1
Extended Spectrum Beta-Lactamases (ESBL - organism not stated)						1	1
Bacteroides ureolyticus						1	1
Acinetebacter baumanni			1				1
Burkholderia pseudomallei		1					1
Moraxella species						1	1
Anaerobic gram positive bacilli						1	1
Pneumocystis jiroveci						1	1
Chlamydophila pneumoniae						1	1
Fungal						2	2

CASE STUDY

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^2.
- 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 largyngoscopy 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/*

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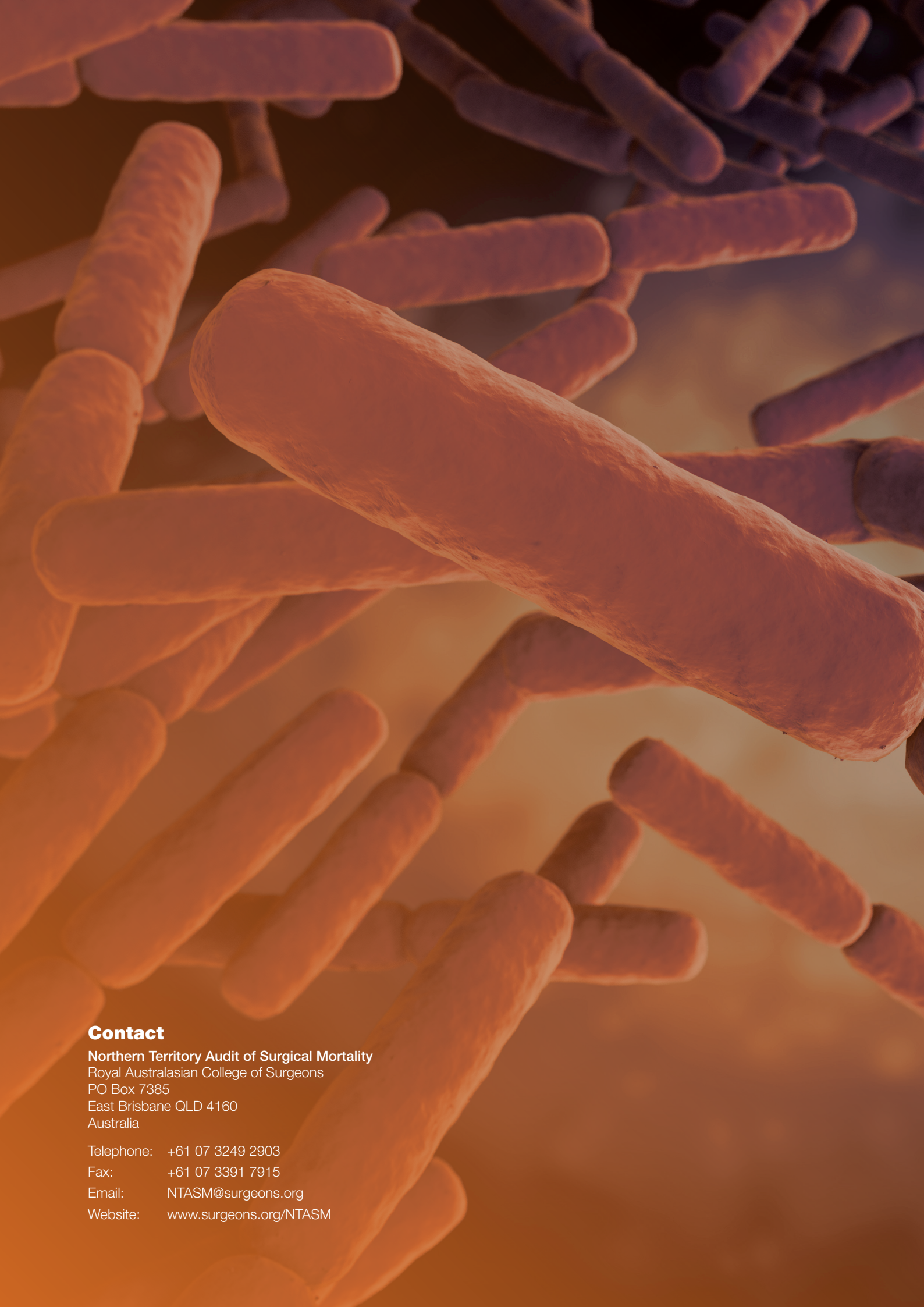

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