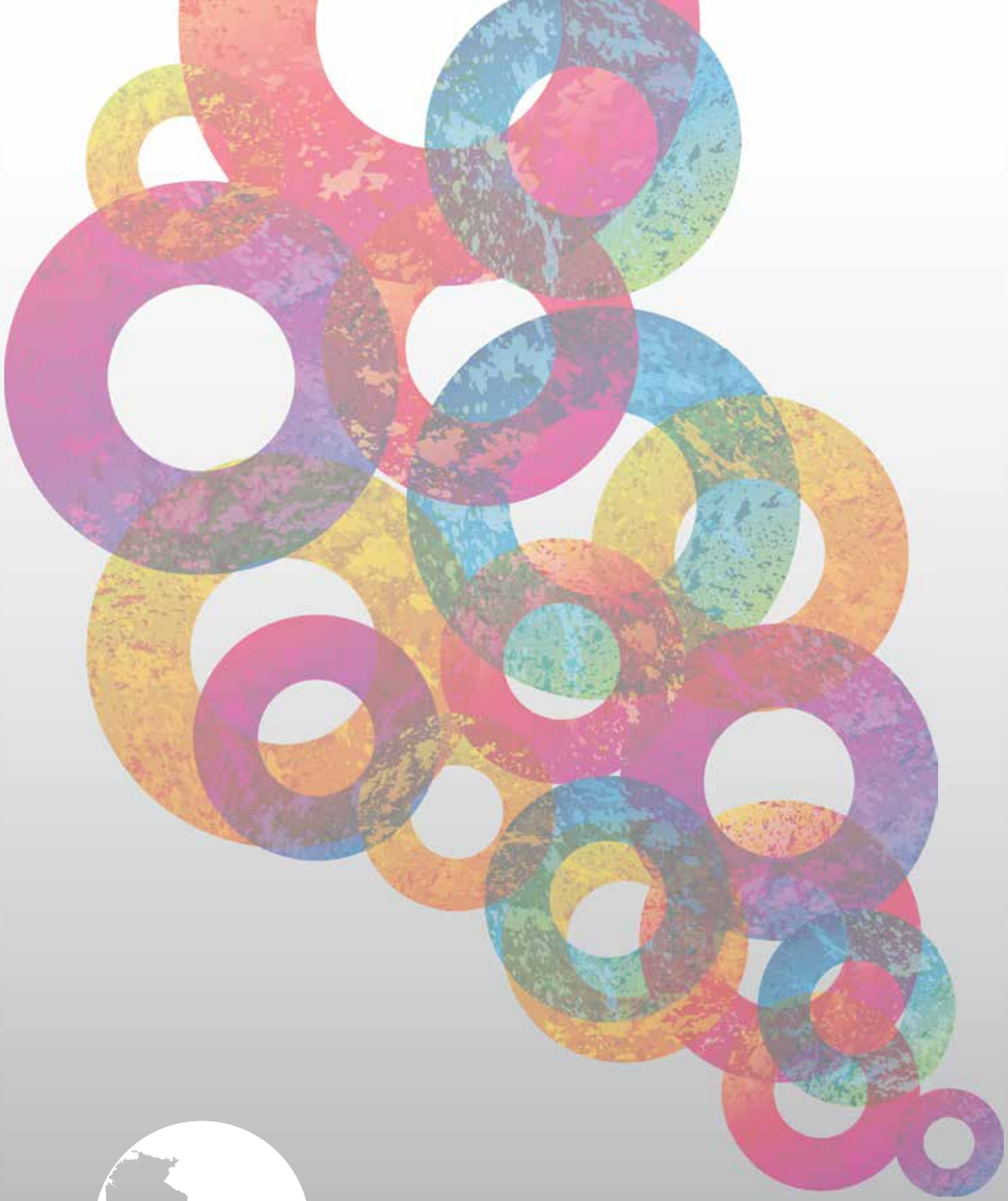

NTASM

Northern Territory Audit of Surgical Mortality

Report 2010 to 2013

Royal Australasian College of Surgeons

Northern Territory Government

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The information contained in this Report has been prepared by the Royal Australasian College of Surgeons Northern Territory Audit of Surgical Mortality Management Committee, which is a declared quality improvement committee under section 7 (1) of the Health Services (Quality Improvement) Act 1994 (Gazetted 26 July 2005).

The Australian and New Zealand Audit of Surgical Mortality, including the Northern Territory Audit of Surgical Mortality also has protection under the Commonwealth Qualified Privilege Scheme under Part VC of the Health Insurance Act 1973 (Gazetted 23rd August 2011).

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Clinical Director's report

The Northern Territory Audit of Surgical Mortality (NTASM), in public and private hospitals, has audited nearly 200 deaths.

I would like to thank all NT surgeons for their persistent and regular input to NTASM. It is particularly pleasing to know that all NT surgeons are now participating.

NTASM online continues to provide access to surgical case forms and first-line assessment forms. Online data entry is a simple and secure data collection tool for surgeons. I thank those who use NTASM online and ask that you encourage your colleagues to follow your lead.

In November 2013, NT surgeons attended our annual Brisbane-based seminar (titled: ***Adverse events—systems or surgeons?***). Seventy surgeons attended and five guest speakers presented (go to www.surgeons.org/NTASM and click on 'seminars'). Challenging case studies were also presented by 'Young Fellows' and valuable audience discussion resulted.

NT surgeons have commented that NTASM has enhanced their mortality and morbidity meetings and that those issues unique to the Territory can be more constructively and forensically examined.

NT surgeons continue to share concerns about road trauma and head injuries, and related costs to the community. Baseline hospital data and NTASM data clearly show significant problems with alcohol use and road traffic accidents.

Mortality involving infections, in patients with diabetes (and often mixed with alcohol use and heavy smoking), account for almost a quarter of NTASM deaths. This is a significant problem in the Aboriginal and Torres Strait Islander population.

Age-related data continues to show significant differences between the NTASM patients and national patients. While the national median age at surgical death was 78 years, the NT median age was 64 years. When comparing non-ATSI and ATSI patients in NT, the average for the former is 69 years (IQR 55-78) and the latter is 53 years (IQR 40-61).

As expected, there is significant distribution of serious comorbidities across NTASM patients. Although approximately one third of non-ATSI patients had a serious comorbidity, this was almost doubled in the ATSI patients.

My sincere thanks to all the NT surgeons who participate and I would like to encourage those surgeons to return their surgical case forms as soon as possible after notification of patients' deaths.

My continued thanks to all NTASM project staff who diligently support this excellent quality assurance activity.

I trust that your perusing this report will encourage you to continue to support NTASM and to use the audit data to deliver better patient care.

John North

NTASM Clinical Director.

Shortened Forms

ABS	Australian Bureau of Statistics
AIHW	Australian Institute of Health and Welfare
ANZASM	Australian and New Zealand Audit of Surgical Mortality
AMI	acute myocardial infarct
ASA	American Society of Anesthesiologists
ATSI	Aboriginal and Torres Strait Islander
CEO	Chief Executive Officer
CIA	Clinical Information Analysis
CI	Confidence Interval
EDMS	Executive Director of Medical Services
FLA	first-line assessment
GP	general practitioner
ICU	intensive care unit
IMG	international medical graduate
IQR	interquartile range
MBA	motorbike accident
MVA	motor vehicle accident
NTASM	Northern Territory Audit of Surgical Mortality
NT	Northern Territory
QASM	Queensland Audit of Surgical Mortality
RAAS	Research, Audit and Academic Surgery
RACS	Royal Australasian College of Surgeons
RR	Risk Ratio
SASM	Scottish Audit of Surgical Mortality
SCF	surgical case form
SET	Surgical Education and Training
SLA	second-line assessment
SPSS	Statistical Package for Social Sciences
SQL	Structured Query Language
SSL	secure socket layers

Executive Summary

Background

The Northern Territory Audit of Surgical Mortality (NTASM) is an external, independent, peer-review audit of the process of care associated with surgically related deaths in the Northern Territory (NT). NTASM started in 2010 and is funded by the NT Department of Health. NTASM has qualified privilege protection under Commonwealth legislation. This report covers surgically related deaths from 1 July 2010 to 30 June 2013.

This audit is designed to provide feedback to surgeons about their performance, and it encourages self-reflection on surgical care and practice.

Reporting conventions

NTASM is notified of surgically related deaths in all NT hospitals. NTASM then provides a surgical case form (SCF) for the surgeon to complete, with clinical events to be reported against the following hierarchical criteria:

- *area for consideration*—where the clinician believes an area of care **could** have been improved or different but recognises that there may be debate about this
- *area of concern* —where the clinician believes that an area of care **should** have been better
- *adverse event*—an unintended "injury" caused by medical management, rather than by the disease process, that is sufficiently serious to:
  - > lead to prolonged hospitalisation
  - > lead to temporary or permanent impairment or disability of the patient at the time of discharge
  - > contribute to or cause death.

The surgeon completes the SCF and highlights what he or she considers were any clinical events that occurred during the process of care.

The completed SCF is de-identified. It is then peer reviewed by another consultant surgeon from the same specialty but from a different hospital (this process is referred to as the first-line assessment). The reviewing surgeon uses the criteria described above to decide whether the case warrants detailed case note review (second-line assessment). Cases are generally referred for second-line assessment if areas of concern or adverse events are thought to have occurred and need to be investigated further. Cases are also referred for second-line assessment if the assessor requires further information in order to make decisions. The detailed review from a second-line assessment can usefully draw attention to lessons to be learned.

NTASM provides the surgeon involved with feedback from both first-line and second-line assessments.

Reported data - summary

Surgeons

- All surgeons in NT are participating in NTASM.
- 91% (172/189) of surgical care forms were returned.

Hospitals

- All NT hospitals (n=3) are participating in NTASM.

Aboriginal and Torres Strait Islander (ATSI) patients

- 36.6% (64/175) of NTASM patients were ATSI patients.
- NTASM ATSI patients were younger than NTASM non-ATSI patients.

All patients

- 189 surgically related deaths were reported to NTASM over the three-year audit period (July 2010 – June 2013).
- 63.5% of cases were male (this is a higher rate than QASM data at 54% and ANZASM data at 58%).
- 77.6% (121/156) of patients had serious comorbidities.
- 54.4% (62/114) of patients were at considerable risk of death before surgery.
- **Clinical Incidents**

  There were 33 clinical incidents* which occurred in 17 NTASM patients (*areas of concern and adverse events).
- **Operative deaths**

  *73.7% (115/156) of NTASM patients had at least one operation.

  *183 operations were performed on these 115 patients (1.6 operations per NTASM patient).

  *1 patient had 10 operations/procedures performed

Trauma

- 31.3% (31/99) of admissions were trauma related.
- 48.4% (15/31) of trauma cases were fall related.
- 29.0% (9/31) of trauma cases were due to motor vehicle accidents.
- 64.5% (20/31) of trauma cases were non-ATSI patients.

Infection

- 37.2% (35/94) of cases reported infections.
- 64.7% (22/34) of infections were acquired before admission.
- 35.3% (12/34) were acquired during the admission.
- All NTASM patients were infection-free at their surgical sites.

Recommendations

Interpretations of and comments on NTASM report data are listed below. These interpretations and comments include comparisons with national ANZASM data.

NTASM patients spend less time in hospital than ANZASM patients. Possibly this is because surgical services in NT are mostly consultant-led and supervised. Further, the postoperative complication rate in NTASM patients is lower than the national average. A consultant-led care plan and process will always produce better outcomes in health care delivery.

The most common postoperative complication in NTASM patients is tissue ischaemia, compared with postoperative bleeding in ANZASM patients. This may relate to NT population bias. This population has more comorbidities, especially in the ATSI population, which leads to tissue death in the surgical patient. Comorbidities challenge surgical practice.

NTASM patients with brain pathologies were the most prevalent diagnosis on admission. Cerebral haemorrhage (including subarachnoid haemorrhage, intracranial haemorrhage, traumatic subdural haemorrhage) plus "severe head injury" was 17% of all NTASM diagnoses. Therefore, a neurosurgeon on the surgical staff in the NT surgical community would be a great advantage. Although complex tumour and cerebral aneurysm patients may need to be sent interstate, an on-campus neurosurgeon would be a valuable resource for training and service delivery. This neurosurgeon would also be able to further up-skill the general surgeons who, when on call, assess and treat such neurosurgical patients.

Skin debridement is the most common operation in NTASM patients, compared with exploratory laparotomy in ANZASM patients. This was seen in both the NTASM surgical patients who survived and the patients who died. NT patients may present late to hospital. Skin loss through trauma, peripheral vascular disease, or comorbidities is clearly more common in this tropical environment where long distances can be a challenge to care delivery.

Locum surgeons in the Territory provide a challenge for continuity of care and for NTASM data collection (especially when the locum has left the Territory). A recognition of such locum-related shortfalls has facilitated a reduction in the reliance on locums in Darwin. As yet, this is not the case in Alice Springs.

1. Introduction

Key points

- NTASM is an external and independent peer review audit of the process of care associated with all surgically related deaths in the Northern Territory.
- This report covers 1 July 2010 to 30 June 2013, as audited on 1 July 2013.
- All NT surgeons are participating in the audit.
- All NT hospitals (n=3), both public and private, are participating in the audit.
- NTASM's main role is to provide feedback to surgeons and to encourage self-reflection on surgical care and practice.

1.1 Background

The project is funded by NT Department of Health and its methodology is based on the Scottish Audit of Surgical Mortality (SASM) (www.sasm.org.uk/).

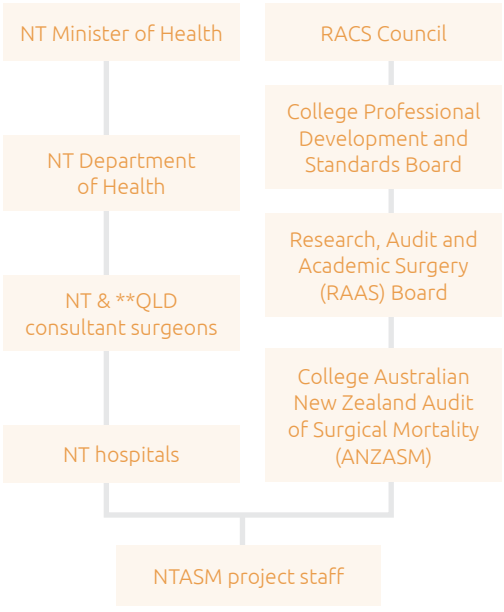
1.2 Project governance

The project governance structure is illustrated in Figure 1.

NTASM, being part of ANZASM, has protection under the Commonwealth Qualified Privilege Scheme, under Part VC of the Health Insurance Act 1973 (gazetted 23rd August 2011).

Currently, all Australian states and territories are participating in the national ANZASM process. Information about each of these audits is available on the College website (www.surgeons.org/ANZASM).

Figure 1: Project governance structure



**Queensland consultant surgeons do assessments for NTASM

1.2.1 Education for Surgeons

NTASM has contributed to surgical education in the Northern Territory. These contributions are listed below:

- 148 first-line assessments sent to NT surgeons
- 15 second-line assessment reports sent to NT surgeons
- 2 volumes of *Lessons from the Audit* sent to:
  i. NT surgeons
  ii. NT surgical Trainees
  iii. International Medical Graduates (IMGs)
  iv. hospital surgical administration departments
  v. hospital Chief Executive Officers (CEOs)
  vi. Executive Directors of Medical Services (EDMSs)
  vii. Intensive Care Units
  viii. Emergency Departments
  ix. Quality Managers
  x. Medical Records Departments
- NTASM annual reports sent to NT surgeons and hospital administrators
- ANZASM case note review booklet sent to NT surgeons
- ANZASM annual report to NT surgeons

One NT surgeon, representing Royal Darwin Hospital, attended a Brisbane-based seminar in November 2012. Seminar title: ***Complex decision making in modern surgical practice.***

1.3 Audit Process

1.3.1 Methodology

NTASM methodology is outlined in Figure 2.

NTASM is directly notified of all in-hospital surgically related deaths via the surgical or medical records departments of NT participating hospitals (see 1.3.3 for NTASM's inclusion criteria).

The consultant surgeon associated with the case is sent a structured questionnaire, called a surgical case form (SCF), to complete. This form is returned to NTASM to be de-identified and then assessed by a first-line assessor. The first-line assessor will be a different surgeon but from the same specialty (peer review). The first-line assessor will either close the case or progress the case to second-line assessment.

Second-line assessors are consultant surgeons from the same specialty as the surgeon associated with the case but work in a different hospital. This reduces conflict of interest issues and ensures, where indicated, that there will be two independent, external reviews of the surgically related death.

Cases may be referred for a second-line assessment if:

- areas of concern or adverse events that warrant further investigation are thought to have occurred during the clinical care of the patient
- an SLA report could usefully draw attention to lessons to be learned, either for the surgeon involved in the case or as part of a collated assessment (case note review book – ***Lessons from the Audit***) for wider distribution
- insufficient information has been provided for the first-line assessment (FLA) to form an opinion on the case.

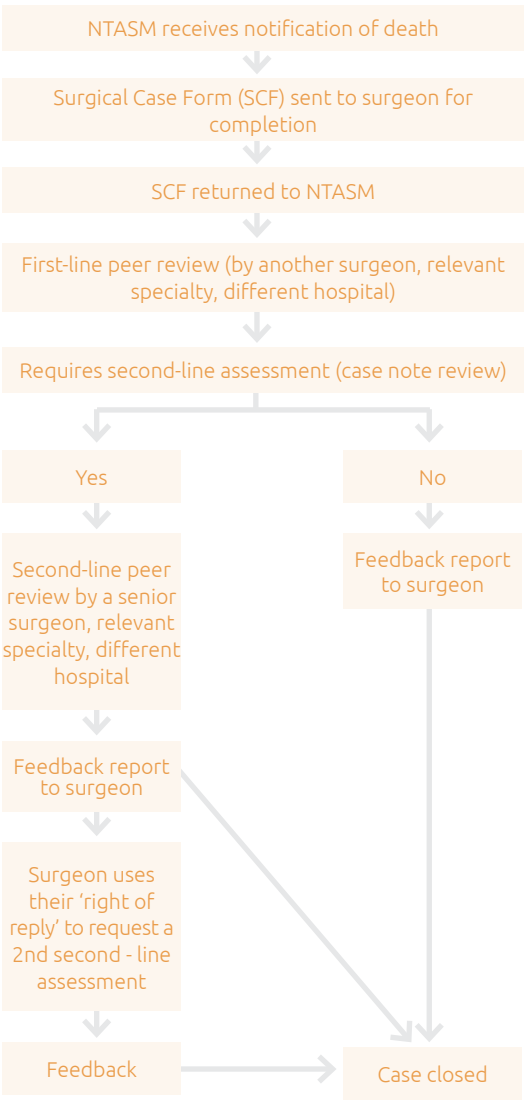
1.3.2 Providing feedback

NTASM's role is to inform, educate, facilitate change, and improve practice by providing feedback.

NTASM provides feedback in the following ways:

- surgeons receive written feedback from assessors on their NTASM cases
- surgeons receive annual reports and de-identified case studies (***Lessons from the Audit*** and ***ANZASM National Case Note Reviews***)
- hospitals participating in NTASM receive specific reports on aggregated, de-identified data comparing their hospital to the averages of the other hospitals
- annual reports are available to the surgical community on the NTASM website: www.surgeons.org/NTASM (go to ***reports and publications***)
- surgeons are able to receive individual reports on their audit data and assessments by logging on to NTASM online at www.collegeasm.org/MortAudit (This site is secure and a surgeon is not able to view any other surgeon's data. Usernames and passwords are available from NTASM@surgeons.org.)

Figure 2: NTASM methodology



1.3.3 Audit inclusion and exclusion criteria

NTASM includes all deaths that occurred in a participating hospital when:

- the patient was under the care of a surgeon (surgical admission), whether or not an operation was performed
- the patient was under the care of a physician (medical admission) and subsequently underwent a surgical procedure

If a case does not fulfil one of the above-listed criteria, it is excluded from the audit by the notifying hospital. If NTASM is notified of a death and decides it does not fall within the inclusion criteria, the death is also excluded.

1.4 Reporting conventions

1.4.1 Reporting clinical incidents

In the SCF, the surgeon is asked to document whether there were any clinical incidents during the care of the patient. The surgeon is asked to:

- report the impact of the incident on the outcome, that is, whether the incident:
  - > made no difference to death
  - > may have contributed to death
  - > caused the death of a patient who would otherwise have been expected to survive
- give their opinion as to whether the incident was preventable, using the following categories:
  - > definitely
  - > probably
  - > probably not
  - > definitely not
- indicate who the incident/event was associated with:
  - > audited surgical team
  - > another clinical team
  - > hospital
  - > other

First-line and second-line assessors are asked the same questions. Therefore, this represents a two-level peer review process. The second-line assessment is more in-depth and more forensic because the second-line assessor has access to the patient's medical records.

1.4.2 Assessor opinion

The areas for consideration, areas of concern and adverse events contained in this report were events ascribed to the patient by either the first-line or the second-line assessor (referred to as "assessors").

The assessors' opinions include: the categorisation of the severity of the clinical incident (consideration/concern/adverse event), the effect on outcomes, and to whom the incident was associated.

1.4.3 Analysis of clinical incidents

NTASM primarily focuses on areas of concern and adverse events. Data regarding *areas for consideration* are collected, but are considered "less serious events" and have little impact on the overall care of the patient. Therefore, they are generally excluded from the analysis.

Some patients were associated with more than one clinical incident. In this situation, where analysis of clinical incidents was reported by patient, the most serious incident was ascribed to that patient.

1.4.4 Data analysis

NTASM audits all deaths occurring in NT hospitals while the patient was under the care of a surgeon. However, patients who are deemed terminal before admission and do not have operations are excluded from the full audit process.

This report covers deaths reported to NTASM from 1 July 2010 to 30 June 2013. Therefore, three years of data collection is included in this report.

Due to the audit process, some cases reported to NTASM during this period will, at the time of analysis, still be undergoing review. These cases will be included in the 2013/2014 annual report.

Data is entered and stored in a specifically designed database, a central Structure Query Language (SQL) server database which includes a reporting engine. Data is encrypted in the database with Secure Sockets Layer (SSL) certificates. All transactions are time stamped and all changes to audit data are written to an archive table, enabling a complete audit trail to be created for each case. Security for this system is high and it is not possible for an unauthorised person to download data. An integrated workflow rules engine supports the creation of letters, reminders and management reports.

Data from surgical case forms is entered by audit staff or directly by surgeons via NTASM online.

To maintain data integrity, all data are routinely checked against the original surgical case forms and assessment forms by the Project Manager or another project officer. Sometimes data is cross-checked and the resources used to do this include: medical record departments, surgeons, coroner's reports, and the NTASM Clinical Director. Data is "cleaned" using logic testing before analysis. Variables are checked for extreme or illogical values and corrections are made to the original data.

Once "cleaned", the data is downloaded again before analysis. A total of 28 tables are downloaded into Excel and then copied to Statistical Package for Social Sciences (IBM-SPSS version 19.0) for analysis. A key variable that is common to all tables can be used to combine tables. Generally, simple frequencies and cross tabulations are used to create the report. Graphs are produced using either SPSS or Excel.

Comparisons against baseline data (all surgical admissions) are only possible because of the cooperation from the NT Department of Health at Alice Springs Hospital.

Qualitative analysis is done using standard techniques. The Project Manager and Clinical Director independently classify all qualitative information into groups. These groupings are then compared and any differences are discussed until consensus is reached.

In the following report, numbers in parentheses in the text (*n*) represent the number of cases analysed. As not all data points were completed, the total number of cases used in the analyses varies. The total number of cases included in each analysis are provided for all tables and figures in the report.

2. Audit

Key points

- 189 surgically related deaths have been reported to NTASM in three years.
- NTASM's process is consistent with all ANZASM audits and allows for independent peer review of all surgically related deaths (see Table 1).

2.1 Overview of NTASM

An overview of NTASM is outlined in Table 1.

- There were 148 first-line assessments completed.
- There were 15 second-line assessments completed.

At the end of June 2013:

- 17 surgical case forms were outstanding
- 3 first-line assessment were outstanding
- 2 second-line assessments were outstanding.

Table 1: Overview of NTASM

(source: NTASM database, n=189)

2010 - 2013	number of cases
total deaths reported	189
closed cases	148
surgical case form complete (awaiting first-line assessment)	3
first-line assessment complete (awaiting second-line assessment)	2
surgical case form not returned	17
Excluded - terminal care	14
Excluded - error	5

2.2 Overview of surgical mortality rates

An overview of NT Department of Health data (2010–2013)* is outlined below:

- 36,328 patients attended public hospitals in the Northern Territory between 2010 and 2013 (financial years) and had a theatre procedure under anaesthesia. Recently, this included a high number of obstetrics and gynaecology patients who are now being covered in the NTASM audit.
- 198 surgically related deaths were recorded in the NT Department of Health data; 189 were reported to NTASM, giving a sensitivity for the audit for reporting of 95.5%.

*source: Clinical Information Analysis (CIA) team, Northern Territory Department of Health (10-Sept-2013).

2.3 Challenges to the Audit

2.3.1 Locum surgeons

Locum surgeons in the Northern Territory continue to be problematic in ensuring accurate surgeon participation in the Territory. Requesting locum surgeons to complete surgical case forms once they have returned to their base hospital is an ongoing issue.

2.3.2 Surgeon participation in NTASM online

NTASM online allows surgeons to complete their NTASM forms electronically. It also provides surgeons with a report on their involvement in the audit.

The online system enables all surgeons, especially visiting locums, to complete and submit their forms in the convenience of their office at the hospital (with medical records available).

NTASM online is encouraged because it contributes to more complete data while also eliminating handwriting errors. Online first-line assessments by Queensland surgeons of NTASM cases are steadily increasing. Use of NTASM online by Northern Territory surgeons and assessors is also increasing.

3. Results

3.1 Surgeons

Key points

- 30 NT surgeons are participating in NTASM.
- 13 obstetrics and gynaecology surgeons are now participating
- Locum surgeon involvement in NTASM is an ongoing challenge.

3.1.1 Surgeon participation

Fellows of the College

All of the participating surgeons are Fellows of the Royal Australasian College of Surgeons (FRACS), except two, who are International Medical Graduates (IMGs). Surgeons may participate by signing a participation form or by submitting details about a surgically related death. Fellows of the College are able to participate as first-line and second-line assessors.

Surgeon participation by specialty

Table 2 highlights surgeon participation by specialty.

Table 2: Surgeon participation by specialty

(source: NTASM database)

surgical specialties	Number of surgeons
General surgery	18
Vascular surgery	1
Urology surgery	1
Orthopaedic surgery	5
Otolaryngology head & neck surgery	2
Obstetric & Gynaecological surgery	13
Plastic surgery	2
Oral, maxillofacial surgery	1
Total	**43**

3.1.2 Completion of surgical case forms (SCFs)

By 30 June 2013, 91% (172/189) of all SCFs had been completed and returned.

Of the 172 SCFs returned to NTASM, these cases:

- took a median of 54 days
- covered a range of 0 days* to 372 days

(*The SCF that took 0 days was returned to NTASM the day it was emailed using NTASM online.)

Most surgical case forms were completed by the in-charge consultant surgeon (see Table 3 below).

Table 3: Grade of surgeon completing surgical case forms

(source: NTASM database, n=157)

Grade of surgeon	Surgical case form completion rate (%)
Consultant	86.0%
SET Trainee	7.0%
Service Registrar	4.5%
Fellow	1.9%
IMG	0.6%

3.1.3 Consultant surgeons involvement in operations

In total, there were 183 operations for 115 patients (39 patients had two or more operations).

Consultant input into the surgical management of patients was strong, as would be expected.

- 80.9% (148/183) of operations had consultant surgeons making the decision to operate.
- In 66.7% (122/183) of operations, the consultant surgeon was operating.

3.1.4 Grades of surgeons operating

Table 4 shows the distribution of grades of surgeons and their roles in the operating theatre.

Table 4: Grade of surgeon deciding, operating, assisting or extra in theatre

(source: NTASM database, n=183)

	Deciding	Operating	Assisting	Extra in Theatre
Consultant	80.9%	66.7%	10.4%	22.4%
SET trainee	5.5%	12.0%	19.1%	5.5%
Service Registrar	2.7%	5.5%	10.4%	4.4%
IMG	1.1%	2.2%	2.2%	1.6%
Fellow	0.5%	3.3%	2.7%	1.1%
GP Surgeon	0%	0%	0%	0%

Note: The columns do not add up to 100% because, in many cases, there were multiple surgeons performing and assisting in the tasks. Also, not all of these questions were answered for each operation.

Currently, the grade of surgeon operating is a topic of interest.

As two of the participating hospitals are teaching hospitals, it is expected that Surgical Education and Training (SET) Trainees and service registrars would be "deciding to operate" as well as "performing operations". This is similar to hospital scenarios reported in QASM and ANZASM data.

3.1.5 Specialty of surgeon and number of patients in NTASM

(source: notification of death, n=189)

Table 5 highlights the surgical specialty and number of patients admitted.

Although there are surgeons of various specialties working in NT, the surgically related deaths occurred in three specialties—general surgery, orthopaedic surgery and vascular surgery.

Table 5: Surgical specialty and number of patients admitted

(source: NTASM database, n=189)

Specialty	Number of patients	Percentage of all surgical patients
General	170	89.9%
Orthopaedic	18	9.5%
Vascular	1	0.5%
Total	**189**	**100%**

There were no deaths reported for urology, otolaryngology head and neck surgery, obstetrics and gynaecology, plastic surgery or oral maxillofacial surgical patients.

3.1.6 Specialty surgeon and age distribution of patients

Patients who died after surgery were older in the orthopaedic group than in the general surgical group, as can be seen in Table 6.

Table 6: Surgical specialty and patient age distribution

(source: notification of death, n=189)

Specialty	Median age (years)	Interquartile range (years)
General (n=170)	63.0	47.0–74.0
Orthopaedic (n=18)	69.0	55.3–82.8
Vascular (n=1)	68.0	not applicable

3.1.7 Surgeons' and Assessors' views on management

Table 7 compares assessors' and surgeons' views on management of NTASM patients.

When surgeons considered pre-operative management was a problem, this was supported by the FLAs. However, when surgeons questioned their own decisions to operate, only 60% of FLAs also questioned the surgeons' decisions.

Table 7: Surgeons' and Assessors' views on improvement needed in management

(source: NTASM database)
(note: not all surgeons answered all questions)

Patient management with areas of concern or adverse events	Surgeons' views (n=112)	First-line assessors' views (n=141)	Concordance
Preoperative management	8.0%	7.8%	98%
Decision to operate	10.7%	6.4%	60%
Choice of operation	2.7%	5.0%	54%
Timing of operation	8.2%	3.6%	44%
Intraoperative management	6.3%	6.5%	97%
Grade surgeon deciding	0%	0%	100%
Grade surgeon operating	1.8%	0.7%	39%
Postoperative care	3.6%	2.9%	81%

3.1.8 Duration of operation for surgeons doing each operation

(source: surgical case form, n=183)

Duration of operation is an important predictor of an adverse event in a surgical admission. According to Kable, Gibberd and Spigelman[1], there is an increased risk of an adverse event with increase in duration of operation.

For this data:

- < 60 minutes duration has an odds ratio for adverse event of 0.8 (95% CI 0.6-1.0)
- > 180 minutes duration has an adjusted odds ratio for adverse event of 5.5 (95% CI 3.3–9.2).

There was a wide range of time spent in theatre for the NTASM patients who died in the perioperative period.

- Median = 90 minutes
- Interquartile range (IQR) = 60 to 180 minutes*
- Minimum = <15 minutes
- Maximum = 360 minutes

*One quarter of NTASM cases were therefore at higher risk for an area of concern or an adverse event. There were twelve cases where the operation took >180 minutes.

The cases with extended time in theatre had four areas of consideration, one area of concern and one adverse event.

3.1.9 In retrospect

Surgeons were asked if, in retrospect, they would have done anything differently with these patients who died in the perioperative period.

- In 18.5% (27/146) of cases, surgeons answered that they would have done something differently.

In retrospect, surgeons would have made changes in all areas of admission:

> better preoperative care
> performed a different operation
> earlier operation
> no operation
> less time in theatre
> better postoperative care.

Examples of comments from surgeons included:

> "Renal team involved earlier"
> "Not have done the operation"
> "Got a second opinion"
> "Palliated the patient earlier"
> "Insisted on pre-procedure team meeting".

3.2 Hospitals

Key points

- 3 hospitals participate in NTASM.
- Most patients in NT were not transferred between hospitals.
- 7.7% (12/155) of cases were delayed or had an error in obtaining the main surgical diagnosis. This is similar to ANZASM data (8.2%).

3.2.1 Hospital participation

Staff from the surgical and medical records departments of the Northern Territory Hospitals notified NTASM of all surgically related deaths. Each hospital is aware of NTASM's inclusion criteria (see 1.3.3).

There are three hospitals participating in NTASM.

Note: 76.2% (144/189) of surgically related deaths occurred in one hospital.

3.2.2 Hospital admissions

(Note: Differences in denominators occur because, in some cases, surgical case forms have not yet been returned.)

- For all the hospital admissions, 92.7% (139/150) were emergency admissions and 7.3% (11/150) were electives admissions.
- All elective admission patients had operations.
- 69.8% (97/139) of emergency admissions had operations.

3.2.3 Delays or errors in main surgical diagnosis

Delays and errors in diagnosis are important factors contributing to deaths in perioperative care.[2]

- In 7.7% (12/155) of cases, there was a delay in obtaining the main surgical diagnosis.

Delays were associated with:

- a medical unit (four patients)
- a surgical unit (two patients)
- inexperienced staff delaying diagnosis (three patients)
- an incorrect test being done (one patient)
- unavoidable causes (five patients)

Some delays or errors had multiple associations.

3.2.4 Surgical diagnosis

The most frequent surgical diagnoses on admission, for surgical patients who died, were:

- Cerebral haemorrhage—intracerebral, subarachnoid, traumatic subdural (n=17)
- ischaemic bowel and/or intestinal obstruction or perforation (n=14)
- peripheral vascular disease (n=11)
- severe head injury (n=9)
- necrotising fasciitis (n=5)
- fractured neck of femur (n=5)
- septicaemia/septic shock (n=5)
- bleeding oesophageal varices (n=3)
- deep pressure sore (n=2)
- multiple injuries (n=2)
- abdominal aortic aneurysm (n=2)
- cholecystitis (n=2)
- pancreatitis (n=2)
- haematemesis (n=2).

Note: For each of the other 76 diagnoses, n=1.

The most prevalent group of patients were those with head injuries: cerebral haemorrhage (subarachnoid haemorrhage, intracranial haemorrhage, traumatic subdural haemorrhage) and severe head injury (n=26).

3.2.5 Cases with operations

- 115 patients had operations.
- 183 operations were performed.
- 33.9% (39/115) of NTASM patients had more than one operation. This compares with 25% of patients who had more than one operation in the national ANZASM data.
- 73.2% (115/157) of NTASM patients had had operations (42 had no operation and there was no data on 32 cases).

The most common operations in patients who **died**, in order of frequency, were:

- debridement of skin or muscle
- exploratory laparotomy
- re-opening of laparotomy site
- gastroscopy
- above-knee amputation
- changing of dressings.

The most common operations in patients who did **not die**, in order of frequency, were:

- excisional debridement of soft tissue exploration
- incision and drainage of abscess of soft tissue
- fibre optic colonoscopy to caecum
- endoscopy to duodenum
- suction curettage of uterus
- emergency lower segment caesarean section.

This distribution is a reflection of the recent inclusion of obstetrics and gynaecology patients in the audit.

As the most common operation is debridement of skin, which often requires repeat operations, it may explain the higher rate of return to theatre in NTASM patients.

3.2.6 Cases with postoperative complications

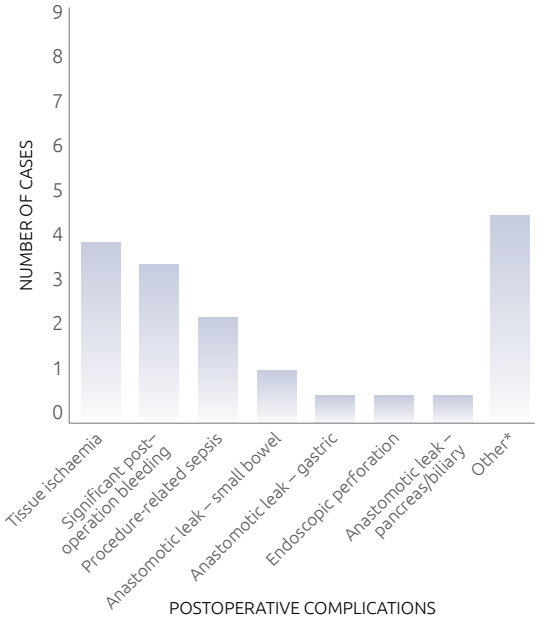
Postoperative complications are strong predictors of death.[3] Of the 115 NTASM patients who had operations, 26% (30/115) had a postoperative complication. This compares favourably with ANZASM data: 33% (2481/7563).

The most frequent complications are listed below (see Figure 3).

- Tissue ischaemia—23% (7/30)
- Significant postoperative bleeding—20% (6/30)
- Procedure related sepsis—13% (4/30)
- Anastomotic leak—13% (4/30) (This includes small bowel, gastric and pancreatic/ biliary).

Figure 3: Postoperative complications in NTASM

(source: NTASM database, n=30)



*"Other" consisted of various causes of complications, including AMI (x2), aspiration pneumonia, failure to heal, lung collapse and infection, prolonged ileus and respiratory failure.

3.2.7 Use of intensive care units

Intensive care units are essential contributors to surgical care.[4]

- 71.1% (81/114) of patients received care in an intensive care unit (ICU) postoperatively.
- However, in seven cases, assessors felt that patients should have received ICU support but did not.
- In one case, both the surgeon and the assessor felt that the patient should have been treated in an ICU.

3.2.8 Unplanned issues with patients

Rates of unplanned returns to theatre are higher for NTASM patients when compared with the ANZASM data.

- 21.5% (23/107) of cases who had operations and who died in the perioperative period, had an unplanned return to theatre.
- 16.0% (1745/10907) of ANZASM cases had unplanned returns to theatre.
- The difference between NTASM and ANZASM data is not statistically significant (RR 1.34 [95% CI 0.93-1.93]) and numbers are still too low for definitive comparisons.
- There were 20.4% (22/108) of NTASM patients who had unplanned admissions to the ICU.

Unplanned returns to theatre and unplanned admissions to ICU are each strong predictors of death in surgical patients.[5-7]

3.2.9 Days in hospital before death

The length of stay for surgical patients is determined by many factors.[8]

In Australia, the average length of stay for overnight acute surgical separations was 3 days (see Table 8).

Most NTASM patients had been in hospital for a short time (see Table 8).

- 26.3% (50/190) of NTASM patients had been in hospital for one day or less.
- The median time in hospital for surgical patients who died was five days (IQR 1–15 days).
- the minimum time in hospital was <1day.
- the maximum time in hospital was 125 days.

Table 8: Average length of stay for surgical separations

(source: NTASM database, n=189 and AIHW database: n=1,019,670)

	NTASM	ANZASM	All surgical patients* in Australian public hospitals**
Median (days) (IQR)	5 (1–15)	7 (3–17)	3
Minimum (days)	<1	<1	N/A
Maximum (days)	125	327	N/A

*All surgical patients includes patients who did not die

**AIHW 2013; Australian hospital statistics 2011-12. Health services series 50. Cat. no. HSE 134. Canberra: AIHW.

3.3 Patients

Key points

- NTASM patients are younger than those reported in ANZASM data.
- NTASM patients had similar characteristics to ANZASM data in the following areas: significant comorbidities; emergency admissions; gender distribution (more males than females).

3.3.1 Overview

For the three years of the audit:

- 189 cases were reported to NTASM
- 14 cases were excluded "terminal care"
- 5 cases were excluded due to "error"*
- 153 cases audited or are being audited
- 78.3% (148/189) cases are closed
- 183 operations/procedures were performed
- No obstetrics and gynaecology cases were reported

*An "error" in reporting occurs when a case is notified to NTASM which does not fulfil the inclusion criteria and therefore cannot be included in the audit. See 1.3.3 for inclusion criteria.

3.3.2 Gender

Table 9 compares the gender distribution in NTASM with other regions in Australia.

Table 9: Gender distribution

State	Males	Females
NTASM	63%	37%
QASM	58%	42%
All states	54%	46%

3.3.3 Ages of patients (who had operations) in the Northern Territory

- The median age of NTASM patients was considerably younger than the comparable population in other Australian states (see Table 10).
- The median age of the population in Australia is 37 years. The median age of the population in Northern Territory is 31 years. (Ref ABS website www.censusdata.abs.gov.au/census_services/getproduct/census/2011/quickstat/7 accessed 09/12/2013)

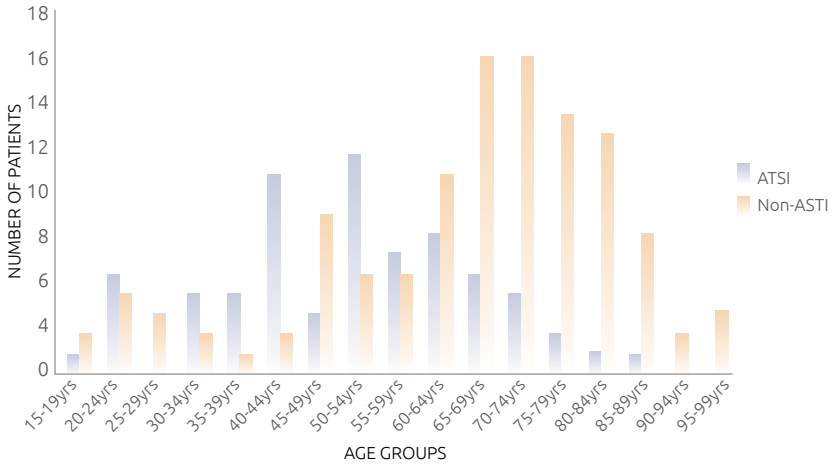
Table 10: Age distribution of surgical patients who died in NTASM compared with ANZASM national data

	NTASM (n=189) ages in years	ANZASM (n=19,092) ages in years
Median	64	78
IQR	49–74	66–85
Minimum	16	0
Maximum	99	105
Mode	68 and 78*	84

*bimodal distribution

- The NTASM patient age distribution is seen in Figure 4.
- In the age groups above 60 years, the patients were predominantly non-ATSI and 31% were ATSI.
- In the age groups below 60 years, 75% were ATSI.
- There were no ATSI patients older than 90 years.
- The median age of the surgical patients who died (64 years) was older than the median age of all surgical patients (39 years).

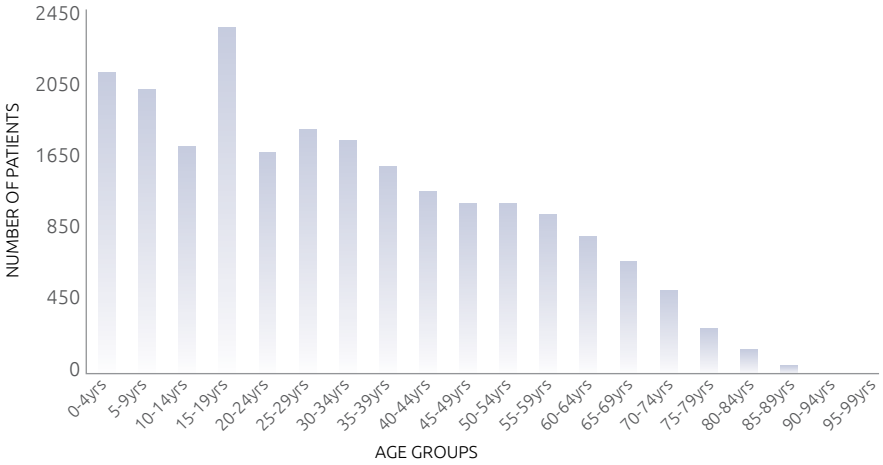
Figure 4: Comparison of 5-year age group distribution of patients in NTASM—non-ATSI (n=111) and ATSI (n=64) (source: NTASM database, n=189)



The distribution of all hospital patients by age in NT 2010-2013 is seen in Figure 5.

Figure 5: Distribution of all hospital patients by age in NT 2010–2013

(source: CIA team, NT Department of Health, 10-Sept-2013, n=36,328)



3.3.4 ASA grades

The American Society of Anesthesiologists (ASA) grade is an internationally recognised classification of perioperative risk.[9] ASA grades range from 1 (normal patient) to 6 (brain-dead patient). An ASA grade is assigned to an NT hospital patient before an operation by the assisting anaesthetist.

- 85.5% (130/152) of NTASM patients had an ASA grade of 3 (severe disease) or worse before going to theatre (see Figure 6).
- This is lower than the national rate (90%) for patients who had the same ASA grade before operations.

ASA grade definitions

ASA 1: A normal healthy patient.

ASA 2: A patient with mild systemic disease.

ASA 3: A patient with severe systemic disease which limits activity, but is not incapacitating.

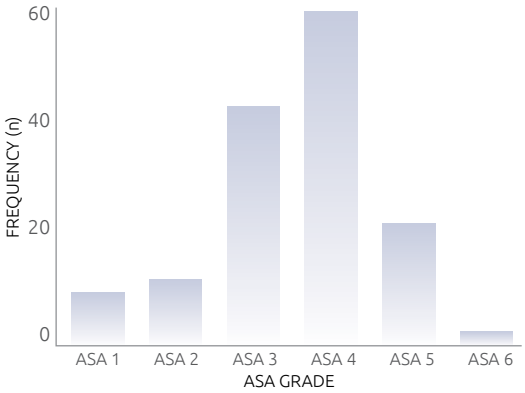
ASA 4: A patient with an incapacitating systemic disease that is a constant threat to life.

ASA 5: A moribund patient who is not expected to survive 24hrs, with or without an operation.

ASA 6: A brain dead patient for organ donation.

Figure 6: Distribution of ASA grades over all patients in NTASM

(source: NTASM database, n=152)



The ten patients who had an ASA grade 1 (healthy patient) and who died in the perioperative period were documented as having:

- a massive bleed from a stab wound
- ruptured visceral and multiple fractures (MVA)
- a severe traumatic head injury (MVA)
- left subdural, subarachnoid haemorrhage, right haemopnuemothorax (MVA)
- severe head injury with diffuse axonal injury (MVA)
- multisystem trauma—intoxicated pedestrian versus car
- Severe closed head injury single vehicle (MBA)
- Severe traumatic brain injury—single vehicle (MBA)
- Severe cerebral ischaemia due to self-harm
- Spontaneous massive subarachnoid haemorrhage

3.3.5 Malignancy

Metastatic malignancy is a predictor of death in surgical patients.[10]

- Malignancy was present in 22.3% (35/157) of NTASM patients.
- In non-ATSI patients, 25.5% (25/98) had a malignancy present, and in 72% (18/25) of these patients malignancy was considered to have contributed to their death.
- In ATSI patients, 16.9% (10/59) had a malignancy present, and in 70% (7/10) of these patients, malignancy was considered to have contributed to their death.
- The comparison of the prevalence of malignancy in the two groups is not statistically significant.

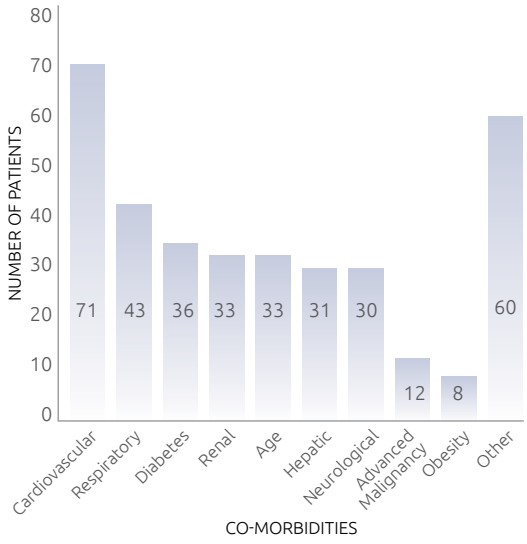
3.3.6 Comorbidities

(source: NTASM database, n=157)

- It is considered by McNicol et al. that patient factors (comorbidities) are stronger predictors of mortality than the type of surgery.[4]
- In 77.6% (121/156) of all patients, there were serious comorbidities (most patients had more than one serious comorbidity present).
- The most frequent comorbidities present in patients were (see Figure 7):
  - > cardiovascular disease (59%)
  - > respiratory problems (36%)
  - > diabetes (27%)

Figure 7: Distribution of comorbidities present in surgical patients who died

(source: NTASM database, n=121 patients with co-morbidities).



The most common "other" comorbidities were:

- alcohol abuse
- vascular disease
- mental health/dementia
- coagulopathy
- heavy smoking
- malnutrition
- hypertension

3.3.7 Risk of death before surgery

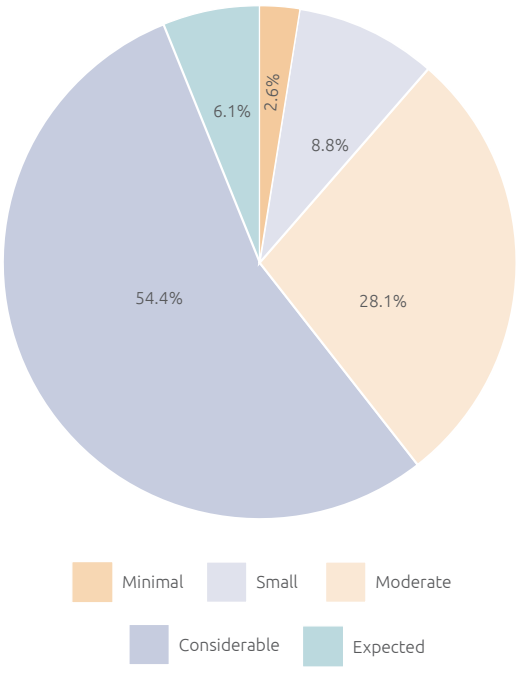
The risk of mortality with surgery, in general, is low. However in certain circumstances, some patients are at higher risk of death.[11]

Surgeons were asked to rate the overall risk of death (before any surgery) for each NTASM patient (see Figure 8).

- 88.6% (101/114) of cases were considered to be at least at a moderate risk of death before surgery.
- 54.4% (62/114) of cases were at considerable risk of death before surgery.
- 6.1% (7/114) were expected not to be able to survive surgery.

Figure 8: Distribution of risk of death before surgery, as evaluated by surgeons

(source: NTASM database, n=114)



3.4 Aboriginal and Torres Strait Islander (ATSI) patients

Almost a third (30%) of the Northern Territory's population are Aboriginal and Torres Strait Islander people. This is the highest ATSI population in any Australian state or territory. (www.abs.gov.au/ausstats accessed 08/11/2013).

This is reflected in the NT surgical population where the percentage of ATSI is also about one third (36.6%).

3.4.1 ATSI patients and surgically related deaths

- 36.6% (64/176) of NTASM patients were ATSI.
- 63.4% (112/176) were non-ATSI.

3.4.2 ATSI patients and age

For age distribution, see Figure 5.

- ATSI patients who died in the perioperative period were significantly younger than non-ATSI patients (see Table 11).
- The difference in median ages between the ATSI and non-ATSI groups was 16 years.

Table 11: Age at death (in years) of ATSI and non-ATSI patients

(source: NTASM database, n=175)

	Age at surgical death of ATSI patients (n=64)	Age at surgical death of non-ATSI patients (n=112)
Median	53	69
IQR	40–61	55–78
Minimum	17	16
Maximum	86	99

3.4.3 ATSI patients and ASA grade

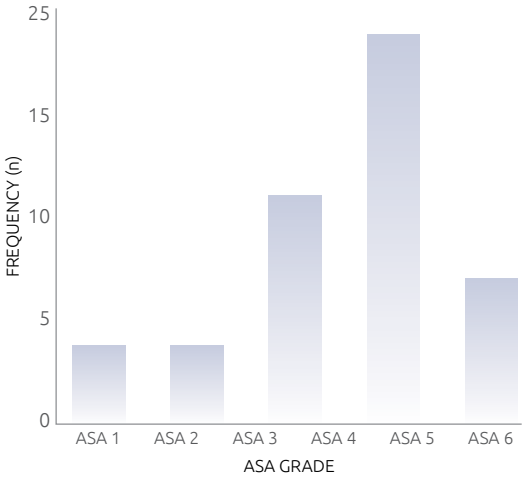
NTASM data shows the ATSI surgical population presented with a lower burden of disease than non-ATSI patients.

- An ASA grade of 3 or higher was present in 82.5% (47/57) of ATSI patients who died. These patients had severe disease, or worse, before going to theatre (see Figure 9). This data is not age adjusted.
- An ASA grade of 3 or higher was present in 88.9% (10,432/11,730) of all ANZASM patients who died. This data is not age adjusted.
- This signifies that ATSI patients who died presented with a slightly lower burden of disease than non-ATSI patients. This could be a reflection of the younger age of ATSI patients. (Note: see page 22 for ASA grade definitions).

Figure 9: Distribution of ASA grades in ATSI population in NTASM

(source: NTASM database, n=57)

(Note: The ASA grade for seven ATSI patients was not provided.)



- Five ATSI patients who had ASA grade 1 (healthy patient) and died after surgery are outlined as:
  - > left subdural, subarachnoid haemorrhage, right haemopnuemothorax (MVA)
  - > massive bleed from stab wound
  - > spontaneous massive subarachnoid haemorrhage
  - > severe traumatic head injury due to MVA
  - > multi-system trauma—intoxicated pedestrian versus car

3.4.4 ATSI patients and malignancy

(source: NTASM database, n=59)

- Malignancy was present in 16.9% (10/59) of ATSI patients.
- Malignancy was present in 25.5% (25/98) of non-ATSI patients.
- This difference in rate is probably a reflection on the younger median age of the ATSI patients.

3.4.5 ATSI patients and comorbidities

(source: NTASM database, n=58)

The prevalence of comorbidities challenges the surgical care of ATSI patients.

- The overall proportion of ATSI patients who died and who had serious comorbidities present, 81% (47/58), was similar to the 76% (74/98) of non-ATSI patients. This data was not adjusted for age.
- However, when comparing by similar age groups (≤53 years), there were strong differences between the groups (see Table 12).

Table 12: Percentage distribution of serious comorbidities by ATSI status at 53 years or younger

(source: NTASM database, n= 64)

ATSI status	Serious co-morbidity present (%)	Cases (n)
ATSI	70%	23/33
non-ATSI	33%	8/24

A risk ratio of 2.09 (95%, CI 1.14–3.84) is present for serious comorbidity for ATSI patients compared with non-ATSI patients. Therefore ATSI patients, when young, are at twice the risk of serious comorbidities than non-ATSI. [12]

3.4.6 ATSI patients and operations

Fewer ATSI patients died than non-ATSI patients.

- 36% (41/115) of NTASM patients, who had operations, were ATSI.
- 64% (74/115) of NTASM patients, who had operations, were non-ATSI.

3.4.7 ATSI patients and risk of death

The distribution of risk of death before any surgery for ATSI patients is different from that of non-ATSI patients (see Table 13).

Table 13: Percentage distribution of patients at risk of death

Risk of death	ATSI	Non-ATSI
Small	None	3%
Minimal	2%	14%
Moderate	27%	29%
Considerable	69%	46%
Expected death	2%	8%

3.5 Clinical Incidents

In order to remain under the protection of qualified privilege, these findings have been expressed in terms that cannot identify the patient, the surgeon or the hospital.

Clinical incidents, as defined by NTASM, include:

- ***area for consideration*** – where the clinician believes an area of care **could** have been improved or different but recognises that there may be debate about this
- ***area of concern*** – where the clinician believes that an area of care **should** have been better
- ***adverse event*** – an unintended "injury" caused by medical management, rather than by the disease process, that is sufficiently serious to:
  - > lead to prolonged hospitalisation
  - > lead to temporary or permanent impairment or disability of the patient at the time of discharge
  - > contribute to or cause death.

- 48 *areas of consideration* have been reported by assessors during the audit period (these areas are not considered of major importance and will not be discussed further in this report).
- 33 clinical incidents *(areas of concern* and *adverse events)* have been reported by assessors during the audit period.

Clinical incidents *(areas of concern and adverse events)* encompass issues that are specific to surgical care and may relate to hospital or management concerns. They are events or factors that are thought to be sub-optimal and should have been improved.

The 33 clinical incidents from this audit are described below:

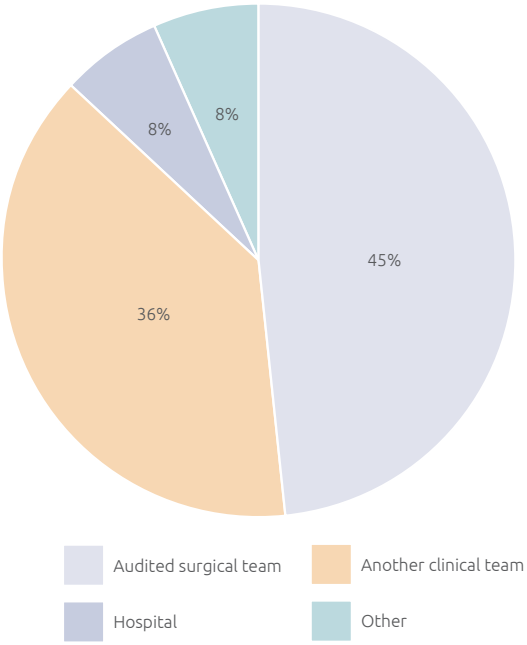
- 28 areas of concern
- 5 adverse events
- 25 were preventable
- 15 were associated with the surgical team
- 12 were associated with the clinical team
- 2 were associated with the hospital
- 2 were associated with "other" causes (one was associated with the anaesthetic team and one was associated with the local medical officer).

(note: Assessors did not give associations for two clinical incidents.)

These **33 clinical incidents occurred in 17 patients** (two patients each had five clinical incidents). This represents a clinical incident rate of 11% (17/148) from 2010 to 2013. This is comparable with reports from previous years.

Figure 10 highlights the distribution of association of clinical incidents.

Figure 10: Distribution of association of clinical incidents



Preventable clinical incidents:

The cases with preventable clinical incidents expressed in general, non-identifiable terms, were:

Preoperative

- preoperative assessment inadequate
- delay in transfer to surgical unit
- cardiac preoperative assessment inadequate
- delay to surgery
- delay in diagnosis.

Intraoperative

- equipment not available
- general coagulopathy related to endoscopic operation
- better to have done different operation or procedure
- incorrect use of drains or catheters.

Postoperative

- delay to reoperation
- delay in recognising a bleeding complication
- postoperative care unsatisfactory
- incorrect use of drains or catheters.

General

- poor communication between physician and surgeon
- poor documentation
- unsatisfactory medical management
- incorrect/inappropriate therapy

Many of these issues are systems failures and, as such, organisational factors are responsible. Only four were specifically related to surgery.

3.6 Trauma

(source: NTASM database, n= 99)

Trauma has the same prevalence in the Northern Territory as it does nationally. It is also the same for ATSI and non-ATSI groups.

Trauma is most commonly due to falls, both in NTASM and ANZASM data. However, the causes of trauma and the ages when those traumas occur are different between NTASM and ANZASM data.

In NTASM data, falls most commonly occur at 60 years. In national data, falls most commonly occur at 83 years.

In some cases in the NT, trauma was the result of violence. The numbers in this area are too low to compare with national data.

- 31% (31/99) NTASM patients presented with trauma.
  Nationally, the prevalence is 30% (612/2078).
- The prevalence of trauma is the same for the ATSI population and the non-ATSI population.
- 35% (11/31) of NTASM trauma patients were ATSI and 65% (20/31) of NTASM trauma patients were non-ATSI. (This is the same in the NTASM mortality population: 36% (64/176) ATSI and 64% (112/176) non-ATSI.)

Falls were the most frequent cause of trauma in NTASM patients: 48% (15/31).

- 60% (9/31) were falls at home.
- 10% (3/31) were falls in hospital.

Falls were also the most frequent cause of trauma in ANZASM patients but at a higher rate: 81% (490/607).

However, in addition to falls, there was a higher prevalence of other causes of trauma in NTASM patients (see Figure 11).

- 11 NTASM trauma cases were from traffic accidents
- 9 NTASM trauma cases were from motor vehicle accidents
- 2 NTASM trauma cases were from motorbike accidents

Of the 7 NTASM patients who experienced violence, the median age was 32 years. The age range for this group was: 25 year to 68 years.

Note: Care should be used in the interpretation of this data as the numbers are low.

Figure 11: Distribution of trauma in NTASM

(source: NTASM database, n=31)

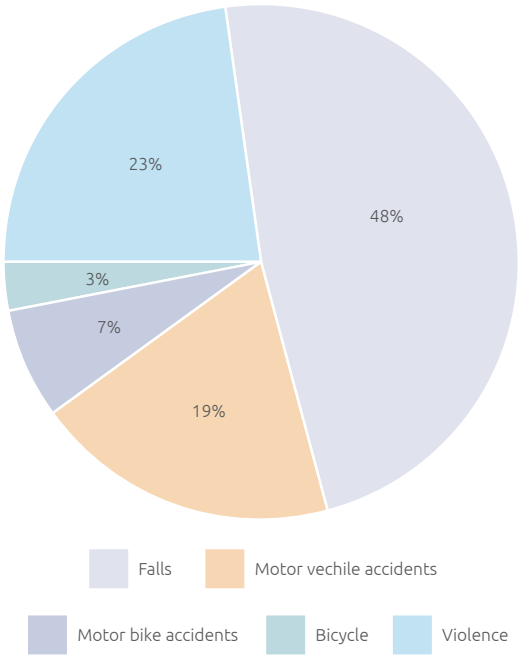


Figure 12 highlights the age distribution of patients where trauma was the result of falls.

Figure 12: Age distribution of patients where trauma was the result of falls

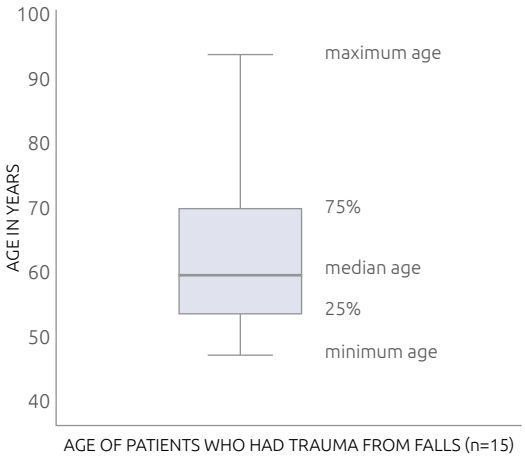


Figure 13 highlights the age distribution of patients where trauma was the result of accidents.

Figure 13: Age distribution of patients where trauma was the result of accidents

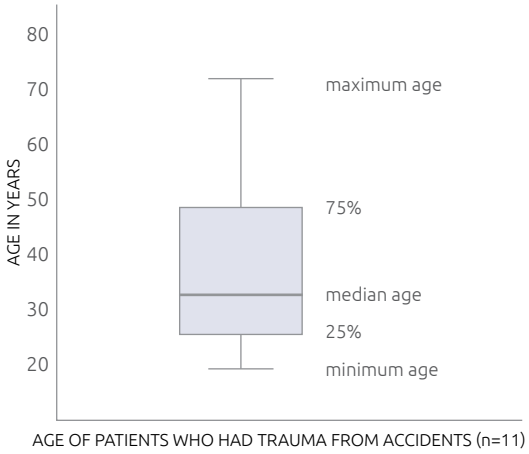
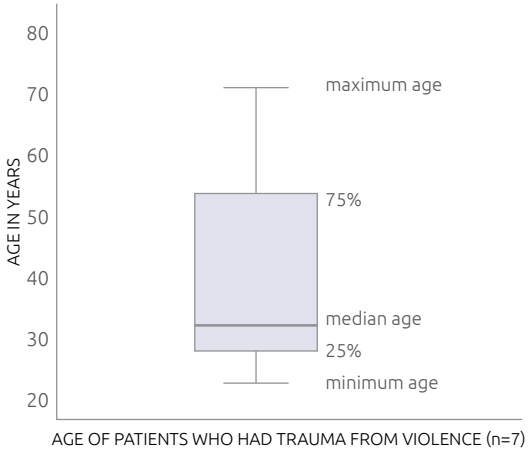


Figure 14 highlights the age distribution of patients where trauma was the result of violence.

Figure 14: Age distribution of patients where trauma was the result of violence



3.7 Infections

(source: NTASM database, n= 94)

The infection rate in NTASM patients was similar to that in other Australian states.

However, there is difference in when those infections were acquired. For NTASM patients, most infections came prior to their hospital admission. In ANZASM data, this was not the case.

3.7.1 Infections and Operations

All NTASM patients were infection-free at their surgical sites.

- 3 patients acquired an infection preoperatively
- 6 patients acquired an infection postoperatively
- 2 patients had an invasive site infection
- There was no 'infection' data for 1 patient

3.7.2 Infection rates

- 37% (35/94) of NTASM patients had a clinically significant infection. The ANZASM rate was 28% (165/590).
- The median age for NTASM patients with a clinically significant infection is 65 years (IQR 50–75). The ANZASM median age is 79 years.

3.7.3 Timing of infection

- 65% (22/34) of NTASM patients, with infections, acquired the infections prior to admission, rather than during admission: 35% (12/34).
- 47% (212/450) of ANZASM patients, with infections, acquired the infections prior to admission, rather than during admission: 53% (238/450).

Conclusion

The implementation of the Northern Territory Audit of Surgical Mortality (NTASM) has helped surgical audit services throughout the Northern Territory.

All surgeons in the Territory have endorsed NTASM and actively use the strategies from the audit in their combined monthly meetings. For example, the surgeons have adopted the NTASM *surgical case form* questions as part of their meetings. These meetings focus attention on clinically significant infections; unplanned returns to theatre and critical care units; postoperative complications; adverse events; assessment of the risk of death at the time of surgery; and areas for overall improvement in management (including systems issues).

The surgeons have recognised the importance of feedback, not only, at each meeting but also more broadly. This includes routine reports to the Director of Medical Services of the Royal Darwin Hospital. As visiting surgeons to the Darwin Private Hospital, Darwin Day Surgery, Katherine District Hospital and Gove District Hospital, the surgeons feed back relevant findings and recommendations from the internal mortality audits to each Director of Medical Services or General Manager at these hospitals.

The gap between ATSI and non-ATSI patient is well demonstrated in this report. ATSI patients who died in the perioperative period were significantly younger than non-ATSI patients, by a median of 16 years. When young, ATSI patients are at twice the risk of serious comorbidities than non-ATSI.

The high death rates from motor vehicle accidents in the Territory (three times the national average) are not fully represented in this report because only those hospital-admitted patients are captured by NTASM. There remain a large number of people involved in motor vehicle accidents who die before reaching hospital: contributing factors include the Territory's vast geographical distances, motor vehicles travelling at high speeds, passengers not wearing seat belts, poorly maintained motor vehicles, and alcohol use [13]. These are all areas of interest and areas of lobbying, to our politicians, by NT Surgeons and the College.

NT surgeons will continue to support NTASM.

With regards,

Dr John Treacy

NTASM Chair

Acknowledgements

Our sincere thanks go to all assessors who have responsibly completed and promptly returned first-line and second-line assessments. This assessment process is a small but integral part of safety and quality in surgical care. As surgeons, we need to make this an integral part of our daily activity. These audit and feedback mechanisms form part of our learning process. Surgeons learn well by self-reflection.

Second-line assessors need particular thanks for their excellent reports. Their reviewing of cases (and medical records), along with forensic assessment and responses, form a significant portion of feedback to surgeons. Assessors' comments (modified and de-identified) are regularly used as part of the *Lessons from the Audit*.

Although there are occasional complaints about second-line assessment processes, these are rare and often relate to lack of information available to the second-line assessor at the time of their assessment activity.

Without committed assessors to review the activities of their surgical peers, NTASM could not exist and the data could not be gleaned from such an important quality assurance process.

The Northern Territory Audit of Surgical Mortality also acknowledges the support and assistance of many individuals and institutions that have assisted in the development and continuation of this project, including:

- Royal Darwin Hospital, Darwin Private Hospital and Alice Springs Hospital
- Northern Territory Department of Health
- Clinical Information Analysis (CIA) team at Alice Springs Hospital
- Royal Australasian College of Surgeons
- Research, Audit and Academic Surgery (RAAS) Division of the College
- ANZASM Steering Committee

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