

ANNUAL REPORT 2011/2012



ROYAL AUSTRALASIAN
COLLEGE OF SURGEONS



Northern
Territory
Government





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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) has had over 100 deaths audited; data collection has increased and improved.

The NTASM surgical case form and first- and second- line assessment forms remain our main data collection tools. The first two forms are available online, and indeed, some surgeons have accessed NTASM online. However, I would encourage more surgeons to do so.

In November 2011, some Northern Territory (NT) surgeons attended a Brisbane-based seminar (*Distance, Delays, and Deteriorating Patients*) hosted by the Queensland Audit of Surgical Mortality (QASM). This seminar was of benefit to those who attended and subsequent review of evaluation forms has confirmed the seminar as a useful learning experience. As a direct result of the seminar, the Adult Deterioration Detection System that was presented at the seminar was re-affirmed and its use facilitated at all the NT public hospitals, by the participants who attended. A modification of the Adult Deterioration Detection System was introduced and is now actively utilised at a private hospital in the NT.

In 2011/2012, NTASM data analysis shows that 65% of patients who died were males. This is a higher rate than QASM data (58% males) and higher than national ANZASM data (55% males), and cannot be explained merely by the higher rate of males in the NT (51.8% males^[1]). This may be related to the known higher rates of trauma in the NT. For example, there was also a high proportion of deaths from subdural haematoma and severe closed head injury.

As expected, there were deaths from necrotising fasciitis, as the NT has one of the highest reported rates of this condition in the world^[2]. This partly relates to the high rates of diabetes in the population (24% of those who died), and especially in the Aboriginal population, as well as the high rates of "alcohol abuse" and heavy smoking.

There was also a significant difference in the 'unplanned return to theatre' cases in the NT for those who died in the peri-operative period (19%). This was significantly higher than the national rate (13%) but perhaps NTASM numbers are too low for true comparison at this point.

There is, however, a substantial difference in age for surgically-related deaths in NT compared with nationally. The national median was 78 years but in the NT it was 65 years. If we compare national data to NT data: age at death for non-Aboriginal patients averages at 69 years (IQR 54-78) and age at death for Aboriginal patients averages at 53 years (IQR 41-62).

Given the overall younger age of persons at death, the rates of death from malignancy were predictably low, especially in the Aboriginal and Torres Strait Islander population.

Our data also reviewed the percentage distribution of serious co-morbidities. This showed that in non-Aboriginal patients almost one third had a serious co-morbidity, while in Aboriginal patients almost two thirds had a serious co-morbidity. However the ASA score in persons who died was significantly lower in the NT (76.7% had ASA 3 or more) compared to the rest of Australia (85.2%). This is likely a reflection of the younger age at death in the NT, as the ASA grades were age-related, for both ATSI and non-ATSI.

My sincere thanks go to all colleagues who participated in NTASM during 2011/2012 and to all NTASM staff who support the audit process. We are proud to say that all public and private hospitals in the Territory participate in, what is, an excellent quality assurance activity.

Dr John North

NTASM Clinical Director

Shortened Forms

ANZASM	Australian and New Zealand Audit of Surgical Mortality
ASA	American Society of Anestheologists
ASH	Alice Springs Hospital
ATSI	Aboriginal and Torres Strait Islander
CEO	Chief Executive Officer
CIA	Clinical Information Analysis
CT	computed tomography
EDMS	Executive Director of Medical Services
FLA	first-line assessment
HDU	high dependency unit
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 and Academic Surgery
RDH	Royal Darwin Hospital
SASM	Scottish Audit of Surgical Mortality
SCF	surgical case form
SET	Surgical and Education 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. The NTASM project is funded by NT Health and has qualified privilege protection under Commonwealth legislation.

This audit is designed principally to provide feedback to participating surgeons about their performance and to encourage 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, and 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/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 ‘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.

Hospitals

- Three NT hospitals participating.

Patients (all)

- In total 108 surgically-related deaths were reported to NTASM over the two-year audit period (July 2010-June 2012).
- In 65% of cases were male (this is a higher rate than QASM data & ANZASM data).
- There were 74% (62/84) of patients who had serious co-morbidities (49% (32/66) of patients were at considerable risk of death before surgery).

Aboriginal and Torres Strait Islander (ATSI) patients

- In total 34% (32/95) of NTASM patients were ATSI patients.
- NTASM ATSI patients were significantly younger than non-ATSI patients.
- There were 77% (23/30) of NTASM ATSI patients had an ASA grade of 3 or higher before going to theatre (85% (9,068/10,640) is the national average with the same level of burden of disease).

Clinical Incidents

- NTASM data shows a 'clinical incident' rate of 10% (8/79).
- ANZASM data shows the same rate of 10% (1,345/13,650).

Participation

- Over the period of the audit:
- In all, 95 surgical case forms (SCFs) were returned (88%, 95/108).
- Three hospitals in the Northern Territory participated in NTASM, including one private hospital.

Areas of concern and adverse events

- There were 10 areas of concern and adverse events identified during the audit period.

Operative deaths

- Of the 78% (66/85) of audited surgical patients who died, each had at least one operation.

Unplanned returns to theatre

In 19% (12/64) of cases who died, the surgeon reported an unplanned return to theatre.

Trauma and Infection

25 case forms were returned which contained the new Trauma and Infection questions. For this reasons there is limited data for which trauma or infection was present:

Trauma: Vehicle accidents and falls equally contributed to 67% of the trauma cases (8/12). Vehicle accidents were evenly distributed between non-aboriginal and Aboriginal patients.

Infection: Of the 12 case in which infection was reported (58%, 7/12) were acquired during the admission and (42%, 5/12) were present prior to admission.



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Recommendations

The NTASM data would suggest that continuing education and prevention programs for all sub-groups of the Northern Territory population be directed particularly at safe driving practice, smoking, drinking, and other lifestyle activities that are represented in a significant way in surgical deaths in the Northern Territory population.

The NTASM data also suggests that earlier consultant input in complex patients, especially those with deep sepsis should be encouraged so that the junior registrar is able to be supported in assessing and addressing the deep sepsis in the Northern Territory population.

NTASM data indicates that of the surgically related deaths, the Aboriginal population is unevenly distributed within the Northern Territory and at least 16-20 year younger than the non-aboriginal population. We suggest that community education programs need to be strengthened - highlighting the need for earlier rather than later presentation to clinics and hospitals.

We would recommend the continued utilisation of the adult deterioration system in the private hospital and adoption of this tool in all the Northern Territory public hospitals. We expect it will improve early recognition of the deteriorating patient in many instances.

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 the period 1 July 2010 to 30 June 2012, as audited on 1 July 2012.
- All NT surgeons are participating in the audit.
- NTASM's main role is to provide feedback to participants about their performance and to encourage reflection and learning about surgical care and practice.

1.1 Background

The NTASM is an external and independent peer review audit of the process of care associated with surgically-related deaths in the NT. The project is funded by NT Health and its methodology is based on the Scottish Audit of Surgical Mortality (SASM) (www.sasm.org.uk/).

The project timeline:

NTASM started on 1 July 2010 joining all states and territories as part of the Australian and New Zealand Audit of Surgical Mortality (ANZASM), which began in 2005.

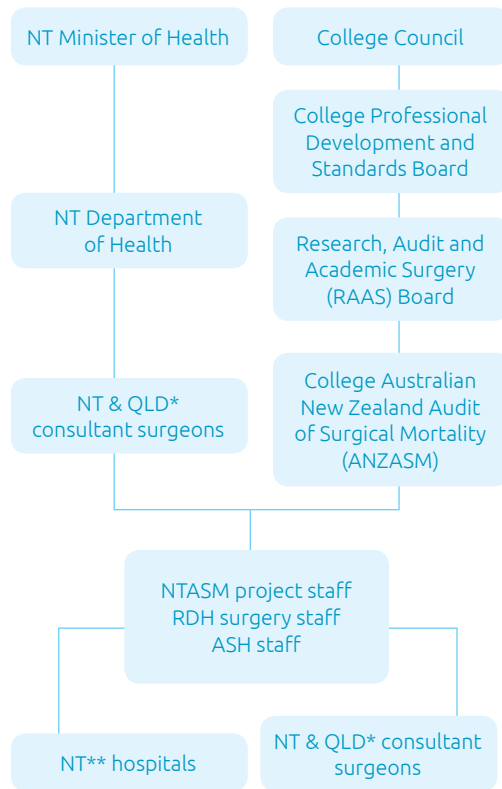
1.2 Project governance

The project governance structure is illustrated in Figure 1.

NTASM, being part of ANZASM, has protection under 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)

Figure 1 Project governance structure



ANZASM = Australian and New Zealand Audit of Surgical Mortality, College = Royal Australasian College of Surgeons, *QLD consultant surgeons do assessments, **Royal Darwin Hospital and Alice Springs Hospital

1.2.1 Education for Surgeons

NTASM has contributed to the surgical education process in the NT. This contribution is listed below:

- There were 83 NTASM first-line assessment reports sent to NT surgeons.
- NTASM had 11 second-line assessment reports sent to NT surgeons
- *Lessons from the Audit* case studies were sent to all NT surgeons; all NT surgical trainees; IMGs (international medical graduates); hospital surgical administration departments; hospital Chief Executive Officers (CEOs); Executive Directors of Medical Services (EDMSs); Intensive Care Units; Emergency Departments; Quality Managers and Medical Records Departments.

NT surgeons also received:

- two booklets of case studies from national ANZASM data.
- the 2010/2011 NTASM annual report.
- the 2010/2011 ANZASM annual report.

Four NT surgeons attended a Brisbane-based seminar in November 2011 (*Surgical dilemmas: distance, delays and deteriorating patients*). NT attendees represented Alice Springs Hospital, Darwin Hospital, Katherine Hospital and Gove Hospital.



1.3 Audit Process

1.3.1 Methodology

NTASM methodology is outlined in Figure 2.

In brief, NTASM is notified of all in-hospital surgically-related deaths directly via the surgical departments or the medical records departments of the NT participating hospitals. All cases in which a surgeon was involved in the care of the patient are included in the audit (whether or not the patient had an operation).

The consultant surgeon associated with the case is sent a structured questionnaire (surgical case form – SCF) for completion. The completed SCF is returned to NTASM to be de-identified and then assessed by a first-line assessor. This assessor will be a different surgeon but from the same specialty (peer review). The first-line assessor will either close the review or advise that the case undergo further assessment (that is, a second-line assessment - SLA or 'case note review').

Second-line assessors are consultant surgeons from the same specialty as the surgeon associated with the case but work in a different hospital to that in which the death occurred thus there is no conflict of interest in the assessments.

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.
- A SLA report could usefully draw attention to lessons to be learned, either for surgeon involved in the case or as part of a collated assessment (case note review book – **Lessons from the Audit**) for wider distribution.
- Where insufficient information has been provided for the FLA to form an opinion on the case.

1.3.2 Providing Feedback

Surgeons receive written feedback from assessors about each of their cases through NTASM. They also receive extensive reports after each second-line assessment.

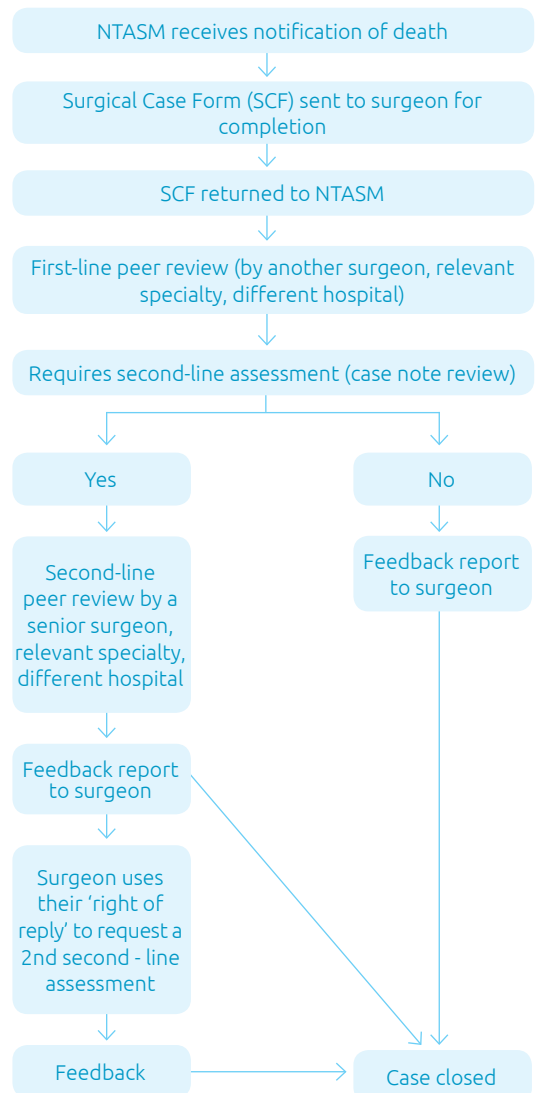
In addition, aggregated feedback is disseminated to all surgeons and hospitals annually. This aggregated feedback and related clinical events are not linked to individual patients, surgeons or hospitals. The process is managed by the NTASM team following ANZASM guidelines and is co-ordinated through a secure database.

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 summaries of second-line assessments in the *Lessons from the Audit* booklets from NTASM and QASM cases and also *Case Note Review* documents from case studies drawn from national cases.
- hospitals participating in NTASM receive specific reports on aggregated, de-identified data which compare 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*).
- Individual surgeons are able to receive reports on their audit data and assessments by logging on NTASM online at www.surgeons.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, or
- the patient was under the care of a physician (**medical admission**) and subsequently underwent a surgical procedure.

Note: Obstetrics and Gynaecological cases will be included in future audits having agreed to participate from 2012. Terminal care patients are excluded from the full audit process.

If a case does not fulfil either 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 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 on 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 but second-line assessors have access to all available patient information through medical records for their review of the case.

Therefore, this represents a two-level peer review process. The second-line assessment is more in-depth and more forensic.

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 upon areas of concern and adverse events. Data regarding *areas for consideration* are collected, but they are 'less serious events', and have little impact on the overall care of the patient. Therefore, they are generally excluded from the analysis because they make no difference to the outcome.

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

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 2012. Therefore, two years of data collection are included in this report in order to strengthen the dataset.

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 2012/2013 annual report.

Data is entered and stored in a specifically designed database. Data is encrypted in the database with Secure Sockets Layer (SSL) certificates. This data is sent to and stored in a central Structure Query Language (SQL) server database which includes a reporting engine. All transactions are time stamped. All changes to audit data are written to an archive table enabling a complete audit trail to be created for each case. Therefore, 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. This system is designed and supported by Alcidion Corporation.

Data is entered into the system from paper surgical case forms by audit staff or by surgeons directly



by using an electronic platform (Fellows Interface). This platform feeds the data into the same database.

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 are 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 are downloaded again before analysis (28 tables are downloaded in Excel and then copied across to Statistical Package for Social Sciences (IBM-SPSS) version 19.0 for analysis). There is a key variable that is common to all tables that 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 numbers of cases included in the analyses are provided for all tables and figures in the report.



2. Audit

Key points:

- 108 surgically-related deaths have been reported to NTASM in the study period.
- 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 below.

- There have been 83 first-line assessments completed.
- There have been 11 second-line assessments completed.

At the end of June 2012:

- In total 13 surgical case forms were outstanding
- Two first-line assessment were outstanding
- Two second-line assessments were outstanding

Table 1: Overview of NTASM

(Source: NTASM database: n=108)

2011/2012	n
total deaths reported	108
closed cases	79
surgical case form complete (awaiting first-line assessment)	2
first-line assessment complete (awaiting second-line assessment)	2
surgical case form (not returned)	13
Excluded - terminal care	9
Excluded - error	2
lost to follow up	1

2.2 Overview of surgical mortality rates

An overview of NT Health data (2010/2012)* is outlined below:

- There were 5,035 patients at the Royal Darwin Hospital who had been admitted to hospital and where the patient had undergone a theatre procedure under anaesthesia in the financial year 2011/2012.
- There were 2,209 patients at Alice Springs Hospital who had been admitted where the

patient had undergone a theatre procedure under anaesthesia in financial year 2011/2012.

- This totalled 7,244 surgical patients in NT for that time period.
- There were a total of 44 surgically-related deaths in NT. 37 of these patients died in Royal Darwin Hospital and 7 died in Alice Springs Hospital.
- 7,200 surgical cases who did **not** die remained to be used as baseline data
- 6.1 surgically-related deaths per 1,000 surgical patients occurred for the whole of the NT in 2011/2012 (44/7,244).
- 6.4 surgically-related deaths per 1,000 surgical patients occurred in the previous year 2010/2011.

*Source: Clinical Information Analysis (CIA) team, Northern Territory Health (25-Jul-2011).

3. Results

3.1 Surgeons

Key points:

- All (24) surgeons are participating in NTASM
- It is challenging keeping track of locums and involving them in NTASM

*source: Royal Australasian College of Surgeons database

3.1.1 Surgeon participation

Fellows of the College

All of the participating surgeons are Fellows of the Royal Australasian College of Surgeons, except two, who are International Medical Graduates (IMGs).

Surgeons may participate by signing a participation form or by submitting details about a death. Not all participating surgeons have deaths in their specialty.

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 specialties

(Source: NTASM database: n=24)

surgical specialties	number
General surgery	13
Vascular surgery	1
Urology	1
Orthopaedic surgery	5
Otolaryngology head & neck surgery	1
Plastic surgery	2
Oral, maxillofacial surgery	1
Total	24

3.1.2 Surgeon participation in Fellows' Interface (NTASM online)

The Fellows' Interface is an online data entry system allowing surgeons to complete their NTASM forms electronically. It also provides surgeons with a report on their involvement in the audit. This service for NT surgeons has recently been introduced.

It was considered that this online system would enable all surgeons, especially visiting locums, to complete and submit their forms in the convenience of their office at the hospital (with medical records available).

In 2011/2012, five surgical case forms were submitted online (in 2010/2011 one surgical case form was submitted online).

Discussions within NTASM continue regarding NTASM online becoming more user-friendly.

3.1.3 Completion of surgical case forms (SCFs)

By 30 June 2012, 88% (95/108) of all SCFs had been completed and returned to NTASM. Of the 98 SCFs returned to NTASM office, the cases:

- took a median of 41.5 days
 - covered a range of 0 days* to 365 days
- (*The SCF that took 0 days was returned using NTASM online).

Most surgical case forms were filled in by the consultants in charge of the cases (see Table 3 below).

Table 3: Grade of surgeon completing surgical case forms

(Source: NTASM database: n=85)

Grade of surgeon	Surgical case form completion rate (%)
Consultant	82%
Service Registrar	4.7%
IMG*	2.4%
SET** Trainee	11%

*IMG = International Medical Graduate
**SET = Surgical Education and Training

3.1.4 Consultant surgeons involvement in operations

(Source: NTASM database)

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

There were 78% (85/110) of operations that had consultant surgeons making the decision to operate.

In 64% (70/110) of operations the consultant surgeon was operating.

Trends in consultant involvement in operations will be reviewed in future audit years.

3.1.5 Grades of surgeons operating

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

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

(Source: NTASM database: n=65)

	Deciding	Operating	Assisting	Extra in Theatre
Consultant	78%	64%	10%	19%
SET* trainee	8.1%	12%	22%	3.6%
Service Registrar	2.7%	8.1%	11%	2.7%
IMG**	1.8%	1.8%	2.7%	1.8%
Fellow		1.8%	1.8%	
GP Surgeon		0.9%		

*SET = Surgical Education and Training

**IMG = International Medical Graduate

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 these questions were answered for each operation.

3.1.6 Grade of surgeon (by specialty) operating

(source: surgical case form n=65)

Table 5 below highlights the grade of surgeons (by specialty) operating.

Table 5: Number of patients operated on by consultants by specialty

(source: NTASM database: n= 65)

Specialty	Number of patients operated on	Consultant surgeon operating (%)
General surgery	57	61%
Orthopaedic surgery	8	50%

3.1.7 Specialty of surgeon and number of patients in NTASM

Table 6 highlights the surgical specialty and number of patients admitted.

Table 6: Surgical specialty and number of patients admitted

(source: NTASM database: n=107)

Although there are surgeons of various specialties working in NT, the surgically-related deaths occurred in two specialties – general surgery and orthopaedic surgery (see Table 6 below).

Specialty	Number of operations	Percentage of total operations
General surgery	95	89%
Orthopaedic surgery	12	11%
Total	107	100%

3.1.8 Specialty surgeon & age distribution of patients

(source: notification of death n=107)

The range of ages of patients who died after surgery was older in the orthopaedic group than in the general surgical group, as can be seen in Table 7 below (median age was the same for general and orthopaedic).

Table 7: Surgical specialty and patient age distribution

(source: NTASM database: n=107)

Specialty	Median age (years)	Interquartile range (years)
General (n=95)	64.5	48.3-74.8
Orthopaedic (n=12)	64.5	53.0-82.5

3.1.9 Surgeons and Assessors views on management

Table 8 below highlights, whether an operation was performed, and the assessors' view of case management.

It can be seen that opinions differed between all three groups, especially the second-line assessors who had access to complete medical records.

Table 8: Surgeons' and Assessors' views on improvement needed in management

(sources: NTASM database)

(note: Not all surgeons answered all questions.)

Patient management with areas of concern or adverse events	Surgeons' views (n=63)	First-line assessors' views of management issues (n=74)	Second-line assessors' views of management issues (n=10)
pre-operative management	10%	10%	30%
decision to operate	14%	10%	20%
choice of operation	3.2%	5.5%	20%
timing of operation	8.1%	5.5%	11%
intra-operative management	11%	8.5%	0%
grade surgeon deciding	0%	0%	0%
post-operative care	6.3%	5.4%	13%

3.1.10 Duration of operation for surgeons doing each operation

(source: surgical case form n=97 operations)

Duration of operation is an important predictor of an adverse event in a surgical admission^[3]. According to Kable, there is an increased risk of an adverse event with increase in duration of operation.

For this data:

- < 60 minutes duration has an adjusted odds ratio for adverse event of 1.0.
- > 180 minutes duration has an adjusted odds ratio for adverse event rate 5.5 (3.3-9.2).

There was a wide range of time spent in theatre for these patients who died in the peri-operative period.

- Median = 90 minutes
- IQR = 60 minutes to 165 minutes
- Minimum = 30 minutes
- Maximum = 360 minutes

3.1.11 In retrospect

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

- In 23% (18/79) of cases, surgeons answered that they would have done something differently.

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

- better pre-operative care
- *earlier operation*
- *no operation*
- *should have waited longer*
- *less time in theatre*
- *more medical team input*

Examples of comments from surgeons were:

"Not have done the operation"

"Added a CT scan day 4 or 5"

3.2 Hospitals

Key points:

- Three hospitals participate in NTASM
- Most patients in NT were not transferred between hospitals
- In 7% (6/85) of cases, there was a delay in obtaining the main surgical diagnosis
- (source: NTASM database)

3.2.1 Hospital participation

Staff from the surgical department 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 section 1.3.3).

There are three hospitals participating in NTASM:

Note: 77% (83/108) of surgically-related deaths occurred in one hospital.

3.2.2 Transfers

Most cases in NT were not transferred from one hospital to another hospital.

- 14% (12/84) of cases were transferred.

Of the 12 cases that were transferred:

- there were no delayed cases
- one case (9%) had a problem with the transfer
- all transferred cases were appropriate transfers
- the level of care was appropriate during transfer for all cases
- there was sufficient patient information sent with the transfer
- no elective cases were transferred



3.2.3 Hospital admissions

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

- NT Hospital admissions (surgical patients who died) nearly all came from one hospital and were mostly emergency admissions.
- Of these cases, 90% (74/80) were emergency admissions and 10% (8/82) were elective admissions
- All eight elective admission patients had operations
- In 74% (55/74) of all emergency admissions had operations
- In 78% (66/85) of all surgical patients who later died had had operations

3.2.4 Delays in main surgical diagnosis

Delays are an important factor contributing to deaths in peri-operative care.

- In 93% (79/85) of cases, there was no delay in obtaining the main surgical diagnosis.
- In 7.1% (6/85) of cases, there was a delay in obtaining the main surgical diagnosis.

Delays were associated with:

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

3.2.5 Surgical diagnosis

- 108 patients had a surgical diagnosis
- The most frequent surgical diagnoses on admission, for surgical patients who died were:
 - > traumatic subdural haemorrhage (n=5).
 - > peripheral vascular disease (n=4)
 - > ischaemic bowel (n=4)
 - > necrotising fasciitis (n=3)
 - > severe head injury (n=3)
 - > Note: All other diagnoses were in single numbers (n=90).

3.2.6 Cases with operations

- In 78% (66/85) of cases those surgical admissions who died, had had operations (19 had not had operations).
- There was no data on 24 cases.

- The total number of operations in patients was 111.
- 41% (45/111) of patients who died had more than one operation.

In order of frequency, the most common operations in patients who died were:

- debridement of skin (9.4%)
- exploratory laparotomy (6.1%)
- re-opening of laparotomy site (6.1%)

3.2.7 Use of critical care units

- In 71% (47/66) of patients, who had operations, they also received care in a critical care unit.
- There were five cases where an assessor felt that a patient should have received intensive care unit (ICU) or high dependency unit (HDU) care and did not.
- In one case, the surgeon also felt that the patient should have been treated in a critical care unit.
- In one case, both the surgeon and the assessor agreed that the patient had been admitted to a critical care unit, but both were dissatisfied with that care.

3.2.8 Unplanned issues with patients:

Rates of unplanned returns to theatre are higher for NTASM patients who died compared with the national data.

However the rates are very similar in both data sets for patients who were admitted to ICU.

- 19% (12/64) of cases who died in the peri-operative period had an **unplanned return to theatre**.
- 13% (1274/9884) of cases is the national rate of unplanned **returns to theatre**.
- There were 16% (10/63) of patients who died in the peri-operative period who **had unplanned admissions to ICU**.
- 17% (1233/7193) in the national ANZASM data also had unplanned **admissions to ICU**.

Unplanned returns to theatre and unplanned admissions to ICU, are each strong predictors of death in surgical patients. ^[4-6]

3.2.9 Days in hospital before death

- Most people who died had been in hospital for a short time only.
- In 20% of patients who died had been in hospital for one day or less.

- The median time in hospital for surgical patients who died was eight days (IQR 4-20 days).
- the minimum time in hospital was <1day.
- the maximum time in hospital was 100 days.

3.3 Patients

Key points:

- Patient deaths reviewed by NTASM were younger than those reviewed in other Australian regionally-based audits
- Most cases had significant co-morbidities
- Most cases were emergency admissions
- There were more male than female patients.

3.3.1 Overview

For the two years of the audit:

- There were 108 cases were reported to NTASM.
- In total 111 operations/procedures were performed.
- Nine cases were excluded 'terminal care'.
- Two cases were excluded 'error*'.
*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.
- There are 95 cases which were audited or are currently being audited.
- In total 79 of the 108 (73%) cases are closed.

3.3.2 Gender

There is a different distribution in NTASM from other regions in Australia.

NTASM gender distributions (see Figure 3)

*65% males

*35% females

(Note: There was a 'no gender' recorded for one patient.)

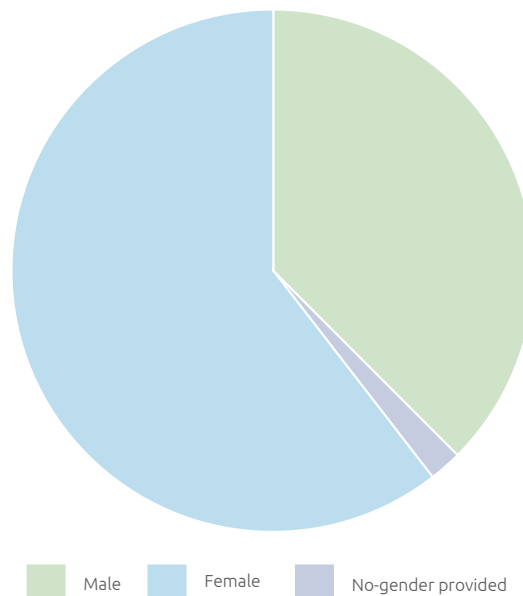
National ANZASM data gender distribution:

*55 % males

*45% females

(Note: There was a 'no gender' recorded for two patients.)

Figure 3 NTASM gender distributions)
(Source: NTASM database)



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

- There were 108 patients who died in the peri-operative period 1 July 2010 to 30 June 2012.
- The median age of surgical patients who died in the NT was considerably younger than the comparable population in other Australian states (see Table 9).

Table 9: Age distribution of surgical patients who died in NTASM compared with ANZASM national data

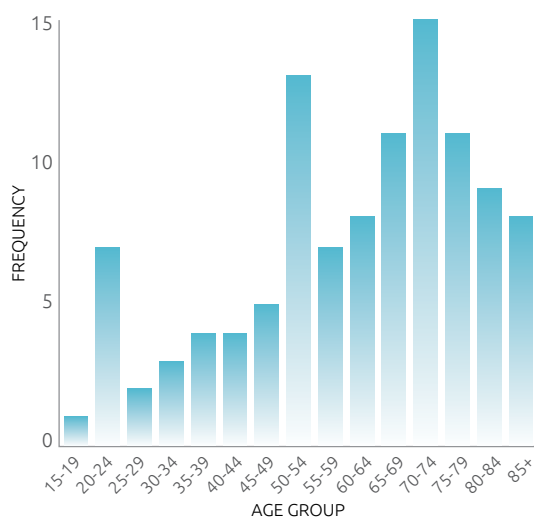
	NTASM (n=108)	ANZASM (14,102)
Median (years)	65	78
Minimum (years)	16	0
Maximum (years)	99	105
IQR (years)	50-70	66-85

- The NTASM patients showed a tri-modal distribution with peaks in the following age groups: 20-24, 50-54 and 70-74 (see Figure 4).
- The ANZASM patients showed a bi-modal distribution.
- In the 20-24 and 50-54 age groups in NTASM, the patients were predominantly Aboriginal.
- In the 70-74 years group in NTASM, the patients were predominantly non-Aboriginal.



Figure 4: Age distribution by groups in NTASM

(Source: NTASM database; n=108)



3.3.4 All surgical patients who had surgery and survived

- In the same period, the median age of the total surgical-patient population was younger than the population of surgical patients who died (see Table 10 below).

Table 10: Age distribution in years of all patients from Northern Territory Hospitals 2011/2012.

	Hospital 1	Hospital 2
Total patients*	5,035	2,209
% male	60%	52%
Median age (years)	35	30
IQR (years)	17-53	14-46

* Patients who had theatre visits and received general anaesthetics

3.3.5 ASA grades

The American Society of Anaesthesiologists (ASA) grade is an internationally recognised classification of peri-operative risk. An ASA grade is assigned to an NT hospital patient before an operation.

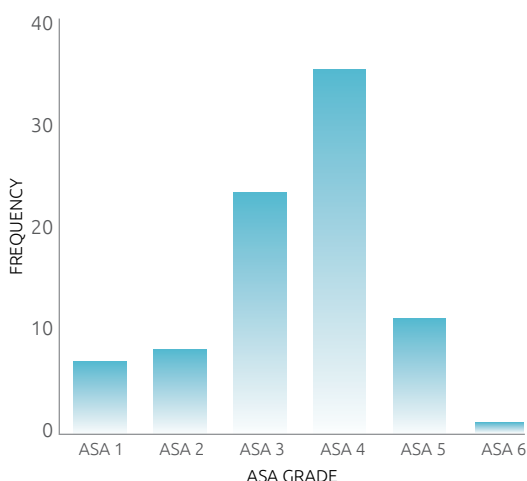
- In 82% (69/84) of patients who died had an ASA grade of 3 (severe disease) or worse, before going to theatre (see Figure 5 below).
- This is similar to the national rate of 85% (9,068/10,640) for patients who had the same level of burden of disease before theatre.

ASA grade definitions

1. A normal health patient.
2. A patient with mild systemic disease.
3. A patient with severe systemic disease which limits activity, but is not incapacitating.
4. A patient with an incapacitating systemic disease that is a constant threat to life.
5. A moribund patient who is not expected to survive 24hrs, with or without an operation.
6. A brain dead patient for organ donation.

Figure 5: Distribution of ASA grades over total population in NTASM

(Source: NTASM database; n=84)



The seven patients who had an ASA grade 1 (healthy patient) and who died after surgery, were documented as having:

- a massive bleed from a stab wound
- a head-on motor vehicle accident (MVA)
- a severe traumatic head injury - MVA
- a MVA
- multisystem trauma – intoxicated pedestrian versus car
- single vehicle – motorbike accident (MBA)
- unrestrained front-seat passenger - MVA

3.3.6 Malignancy

(source: NTASM database)

- In 22% (19/85) of all cases who died, malignancy was present.
- In Aboriginal patients, 13% (4/30) had a

malignancy present (in three of those four cases, malignancy was considered to have contributed to their death).

- The comparison of the prevalence of malignancy in the two groups is not statistically significant.

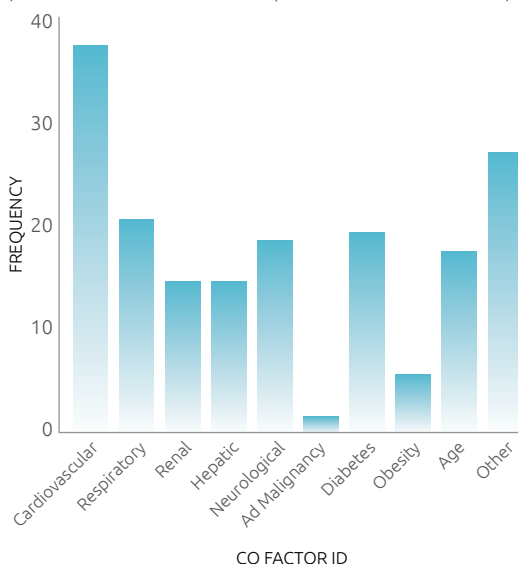
3.3.7 Co-morbidities

(source: NTASM database)

- In 74% (62/84) of all patients there were serious co-morbidities (most patients had more than one co-morbidity present).
- In 76% (22/29) of Aboriginal patients there were serious co-morbidities.
- The most frequent co-morbidities present in all patients included (see Figure 6 below):
 - > 45% had cardiovascular disease
 - > 25% had respiratory problems
 - > 4% had diabetes
- The most common "other" co-morbidities were:
 - > alcohol abuse
 - > coagulopathy
 - > heavy smoking.

Figure 6: Distribution of co-morbidities present in surgical patients who died

(Source: NTASM database: n=84 patients with 184 co-factors)



3.3.8 Risk of death before surgery

Surgeons were asked to rate the overall risk of death (before any surgery) for each patient (see Figure 7).

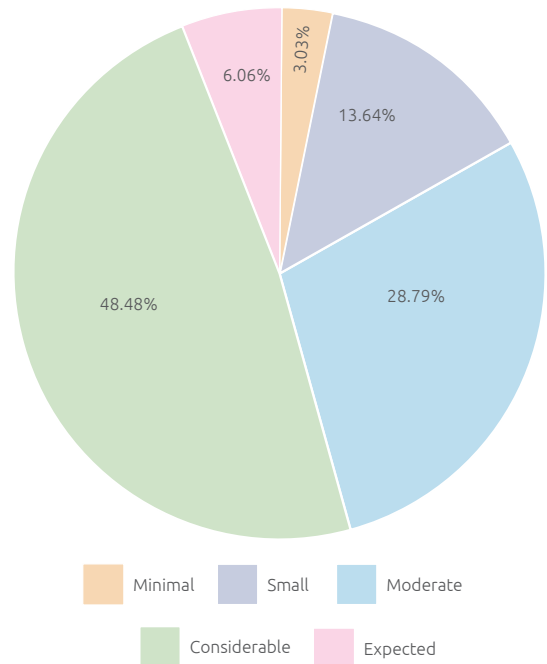
- In 83% (55/66) of cases were considered to be at least at a moderate risk of death

before surgery (moderate or considerable or expected) (See Figure 7 below).

- In 49% (32/66) of cases were at considerable risk of death before surgery.
- Four patients were expected not to be able to survive surgery.

Figure 7: Distribution of risk of death before surgery as evaluated by surgeons

(Source: NTASM database: n=66)



3.4 Aboriginal and Torres Strait Islander (ATSI) patients

NTASM data shows that the overall surgical population has a high percentage of Aboriginal and Torres Strait Islanders (34%). In addition the surgical population within the Northern Territory region itself is unevenly distributed. This section highlights the key differences.

Key points:

- In total 36% (2,029/5,631) of all surgical admissions in Hospital 1 were ATSI patients
- In total 60% (1,458/2,429) of all surgical admissions in Hospital 2 were ATSI patients

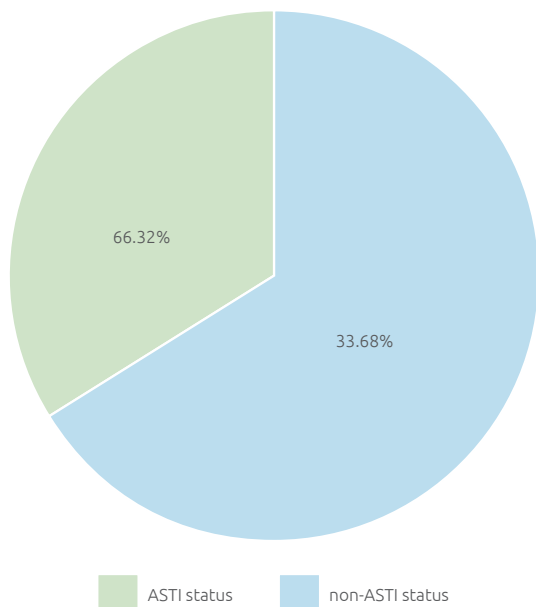
3.4.1 ATSI patients and surgically-related deaths

In 34% (32/95) of patients who died in the peri-operative period in both hospitals were ATSI (see Figure 6).



Figure 8: Surgically-related deaths distributed by ATSI status in 2010/2012

(source: NTASM database: n=95)



3.4.2 ATSI patients and age

Aboriginal patients who died in the peri-operative period were significantly younger than non-Aboriginal patients (see Table 11).

The percentages of Aboriginal patients in the tri-modal age groups (20-24, 50-54 and 70-74) were 56%, 63% and 45% respectively. These tri-modal rates are higher than the overall rate (34%) for Aboriginal patients.

The difference in median ages between the Aboriginal and non-Aboriginal groups was 16 years.

Table 11: Ages at death (in years) of Aboriginal and non-Aboriginal patients

(source: NTASM database: n=94)

	Ages at surgical death of Aboriginal patients (n=32)	Ages at surgical death of non-Aboriginal patients (n=62)
Median (years)	53 (IQR 41-62)	69 (IQR 54-78)
Minimum (years)	22	16
Maximum (years)	73	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-Aboriginal patients.

In 77% (23/30) of Aboriginal patients who died had an ASA grade of 3 (severe disease) or worse before

going to theatre (see Figure 9).

In 85% (9,068/10,640) of cases is the national average with the same level of burden of disease before theatre.

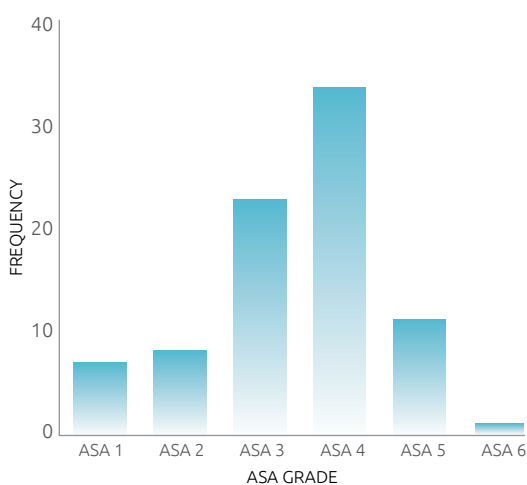
This signifies that Aboriginal patients who died presented with a lower burden of disease than non-Aboriginal patients. This could be a reflection of the younger age of Aboriginal patients.

The ASA grades were age related for both the aboriginal patients and non-aboriginal patients.

(See page 37 for ASA definitions.)

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

(source: NTASM database: n=30)



(Note: The ASA grade for two Aboriginal patients was not provided.)

- Four Aboriginal patients who had ASA grade 1 (healthy patient) and died after surgery are outlined as:
 - massive bleed from stab wound
 - severe traumatic head injury – motor vehicle accident
 - motor vehicle accident
 - multi-system trauma – intoxicated pedestrian versus car

3.4.4 ATSI patients and malignancy

(source: NTASM database)

- In 13% (4/30) of Aboriginal patients a malignancy was present.
- This is **half the rate** of non-Aboriginal patients - 27% (15/55).
- This different rate is probably a reflection on the younger median age of the Aboriginal patients.



3.4.5 ATSI patients and co-morbidities

(source: NTASM database)

- The overall proportion, 76% (22/29), of Aboriginal patients who died and who had serious co-morbidities present was similar to that of the non-Aboriginal patients.
- However, when comparing by similar age groups, (<= 53 years) the following is indicated (see Table 12).

Table 12: Percentage distribution of serious co-morbidities ATSI status (at age 53 years or younger)

(source: NTASM database: n= 30)

ATSI status	serious co-morbidity present (%)	Cases (n)
non-Aboriginal	31%	4/13
Aboriginal	65%	11/17

3.4.6 ATSI patients and operations

There was a statistically significant correlation between ATSI status and operations where patients subsequently died.

- The mortality rate of non-ATSI surgical patients who had operations and later died was 84% (46/55).
- The mortality rate of ATSI surgical patients who had operations and died was lower at 67% (20/30).

3.4.7 ATSI patients and risk of death

NTASM data shows that of the ATSI patients, 77% presented with an ASA grade of 3 (severe disease) but were never classified to be at a "minimal risk of death" prior to operation. This is possibly due to late presentation to hospital.

- All Aboriginal patients were considered to be *at risk of death* before surgery.
- None were considered at minimal risk compared with 25% of non-aboriginal patients.
- In all, 25% were at *moderate* risk, compared with 22% for non-Aboriginal patients.
- In all, 75% were at *considerable* risk compared with 27% of non-Aboriginal patients.

The distribution of risk for Aboriginal patients is therefore different from that of non-Aboriginal patients

3.5 Clinical Incidents

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, and 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 clinical incidents reported below have been expressed in terms that cannot identify the patient, the surgeon or the hospital in order to remain under the protection of qualified privilege.

18 *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)

10 *areas of concern* or *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 ten clinical incidents from this audit consisted of:

- six areas of concern
- four adverse events

These ten clinical incidents occurred in eight patients, showing that:

- a rate of 10% (8/79) in the audited patients over two years exists.
- this rate is comparable with the national average (over several years) of 10% (1,345 patients with incidents / 13,650 patients).
- four clinical incidents caused the deaths of patients and in six cases may have contributed to the deaths of patients
- nine of these clinical incidents were either 'probably preventable' or 'definitely preventable', and one case was 'probably not preventable'.

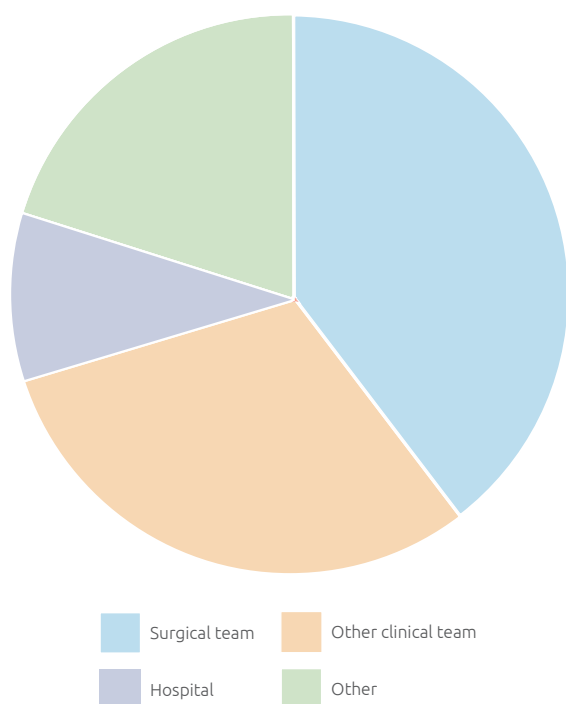


- four clinical incidents were associated with the surgical team.
- three clinical incidents were associated with another clinical team.
- one clinical incident was associated with the hospital.
- two clinical incidents were associated with “other” causes (one was the anaesthetic team and one was the local medical officer).

Figure 10 below highlights the distribution of associations of clinical incidents

Figure 10: Distribution of associations of clinical incidents

(Source: NTASM database: n=10)



“Other” included patient x 2, pre hospital, local medical officer, ICU, clinic, anaesthetics department.

The ten clinical incidents expressed in general non-identifiable terms were:

- aspiration pneumonia during anaesthetic
- septicaemia (cause unspecified)
- technical complications of recent ileostomy
- vascular injury to colon during laparoscopic operation
- cardiac pre-operative assessment inadequate
- patient-related factors
- equipment not available
- over anticoagulation before admission
- delay in recognising a bleeding complication
- post-operative fluid balance unsatisfactory

Nearly all of these issues can be considered to be systems failures, and as such, organisational factors are responsible. Only two were specifically related to surgical technique.

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 (medical records departments and surgical departments)
- Northern Territory Department of Health (funding the project)
- Clinical Information Analysis (CIA) team (NT Department of Health) at Alice Springs Hospital (providing baseline data)
- Royal Australasian College of Surgeons (the College) (infrastructure support)
- Research, Audit and Academic Surgery (RAAS) Division of the College and the ANZASM Steering Committee

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