Contact

Royal Australasian College of Surgeons
Northern Territory Audit of Surgical Mortality
PO Box 47
Spring Hill QLD 4004
Australia
Telephone: 07 3835 8603
Facsimile: 07 3236 9320
Email: NTASM@surgeons.org
Website: www.surgeons.org/NTASM

The information contained in this Annual 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 6 November 2006).
## Contents

Clinical Director’s report 6

Abbreviations 7

Executive summary 8

Recommendations 9

1. Introduction 10
   1.1 Background 10
   1.2 Project governance 10
   1.3 Audit process 11
   1.4 Reporting conventions 12

2. Audit 14
   2.1 Overview of NTASM 14
   2.2 Overview of surgical mortality rates 14

3. Results 15
   3.1 Surgeons 15
   3.2 Hospitals 18
   3.3 Patients 20
   3.4 Indigenous patients 22
   3.5 Clinical incidents 24

Acknowledgements 25

NTASM Steering Committee 25

NTASM Staff 25
Tables

Table 1  Overview of NTASM 14
Table 2  Grade of surgeon completing SCFs 15
Table 3  Grade of surgeon operating 16
Table 4  Grade of surgeon (by specialty) operating 16
Table 5  Surgical specialty and number of patients 16
Table 6  Surgical specialty and patient age distribution 16
Table 7  Assessors’ views of case management 16
Table 8  Overall case management 19
Table 9  Ages at Death 22

Figures

Figure 1  Project governance structure 10
Figure 2  NTASM methodology 10
Figure 3  Surgeon participation by specialty 15
Figure 4  Days in hospital before death 18
Figure 5  ASA grade (non-indigenous) 20
Figure 6  Distribution of co-morbidities 21
Figure 7  Risk of death before surgery 21
Figure 8  Indigenous status 22
Figure 9  ASA grade (indigenous) 22
Clinical Director’s report

The Northern Territory Audit of Surgical Mortality (NTASM) was established in 2010. Audit progress and data collection has been encouraging.

Northern Territory (NT) surgeons have been extremely supportive and the audit data is steadily building. Nearly 60 NTASM surgical case forms (SCFs) have been received and most of these forms have been or are being processed.

Data analysis is demonstrating trends already, and it is possible to see that NTASM data will soon become an important reference for surgeons, health departments and health-care delivery planners in the Territory.

Congratulations must go to NT surgeons, who faithfully and promptly complete their SCFs. Staff in NT hospitals, staff at the NTASM coalface and staff at the RACS office (Brisbane) are also to be congratulated for their dedication. Thanks to all who have contributed their time and effort in gathering the data presented in this first annual report.

Special thanks should be given to the NTASM Chairman, Mr John Treacy, whose support and leadership has been unwavering. The NTASM Steering Committee has been supportive and enthusiastic as well.

Sincere thanks must also go to Ms Therese Rey-Conde for her project management and her time spent preparing this annual report for distribution.

Recently, NTASM presented data at state-based RACS Annual Scientific Meetings and explained best practice audit processes to those who attended.

I trust you will read this first NTASM annual report with interest and appreciate all the work involved to make NTASM a shining reality.

John North
NTASM Clinical Director
# ABBREVIATIONS

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACTASM</td>
<td>Australian Capital Territory Audit of Surgical Mortality</td>
</tr>
<tr>
<td>ANZASM</td>
<td>Australian and New Zealand Audit of Surgical Mortality</td>
</tr>
<tr>
<td>ASA</td>
<td>American Society of Anesthesiologists</td>
</tr>
<tr>
<td>ATSI</td>
<td>Aboriginal or Torres Strait Islander</td>
</tr>
<tr>
<td>CEC</td>
<td>Clinical Excellence Commission</td>
</tr>
<tr>
<td>CEO</td>
<td>Chief Executive Officer</td>
</tr>
<tr>
<td>CHASM</td>
<td>Collaborating Hospitals Audit of Surgical Mortality</td>
</tr>
<tr>
<td>CI</td>
<td>confidence intervals</td>
</tr>
<tr>
<td>CIA</td>
<td>Clinical Information Analysis</td>
</tr>
<tr>
<td>CPD</td>
<td>continuing professional development</td>
</tr>
<tr>
<td>DVT</td>
<td>deep vein thrombosis</td>
</tr>
<tr>
<td>EDMS</td>
<td>Executive Director of Medical Services</td>
</tr>
<tr>
<td>GI</td>
<td>gastrointestinal</td>
</tr>
<tr>
<td>HDU</td>
<td>high dependency unit</td>
</tr>
<tr>
<td>ICU</td>
<td>intensive care unit</td>
</tr>
<tr>
<td>IMG</td>
<td>international medical graduate</td>
</tr>
<tr>
<td>IQR</td>
<td>interquartile range</td>
</tr>
<tr>
<td>LMWH</td>
<td>low molecular weight heparin</td>
</tr>
<tr>
<td>NTASM</td>
<td>Northern Territory Audit of Surgical Mortality</td>
</tr>
<tr>
<td>QASM</td>
<td>Queensland Audit of Surgical Mortality</td>
</tr>
<tr>
<td>RACS</td>
<td>Royal Australasian College of Surgeons</td>
</tr>
<tr>
<td>SASM</td>
<td>Scottish Audit of Surgical Mortality</td>
</tr>
<tr>
<td>SCF</td>
<td>surgical case form</td>
</tr>
<tr>
<td>SPSS</td>
<td>Statistical Package for Social Sciences</td>
</tr>
<tr>
<td>SQL</td>
<td>Structured Query Language</td>
</tr>
<tr>
<td>TSI</td>
<td>Torres Strait Islander</td>
</tr>
</tbody>
</table>
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. NTASM started in 2010. The NTASM project is funded by NT Health and has protection under Commonwealth legislation.

The audit is designed principally to provide feedback to participants about their performance and to encourage reflection on clinical care.

Reporting conventions
NTASM is notified of deaths in all hospitals and, where a surgeon was involved in the care of the patient, the death is included in the audit. NTASM then gives or sends a surgical case form (SCF) to the surgeon to complete, with events to be reported against the following 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, highlighting any areas for consideration or concern, or adverse events that may have occurred during the process of care.

The completed SCF is de-identified. It is then peer reviewed by another consultant surgeon (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 the assessor requires further information in order to make decisions on the case at the first-line assessment level.

NTASM provides the surgeon involved with feedback from those assessments.

Participation
Over the period of the audit:
- 72 deaths were reported
- 51 surgical case forms (SCFs) were returned
- 71% of SCFs were returned
- Three hospitals in the Northern Territory currently participate in NTASM

Areas of concern and adverse events
- Assessors reported slightly more areas of concern or adverse events (n=5) than surgeons (n=4)

Patient sample demographics
Of the 51 cases with completed data:
- 62 years was the median age
- 75% of cases were males
- 80% had an ASA grade of three or more
- 69% of cases were associated with at least one significant co-morbidity

Admissions
- 87% were emergency
- 13% were elective
- No patients who had been admitted to the Darwin Private Hospital were referred to NTASM

Operative and non-operative deaths
- In 26% (10/39) audited deaths, no operation was performed
- In 30% (3/10) of non-operative deaths, an active decision not to operate was made
- 55% of audited patients underwent two or more operations

Unplanned returns to theatre
- In 22% (8/37) of cases, the surgeon reported an unplanned return to theatre
- All of these cases, operations were performed by the consultant surgeon
- One of these cases had an associated area of concern or adverse event
RECOMMENDATIONS

Surgeon participation
• To encourage the participation of all surgeons in the Audit process in regard to the changes to the College’s Continuing Professional Development (CPD) programme (effective in January 2010). This means that audit participation would be a mandatory requirement for those surgeons working in hospitals where an audit is available. This would require greater completion of surgical case forms to ensure accurate analysis of data.
• To encourage College Professional Standards Committee to review and increase the allocation of CPD points for the completion of both first-line and second-line assessments when the new programme is reviewed in 2012. This should improve surgeon participation in first-line and second-line assessments.
• To encourage Surgeons at the Royal Darwin Hospital to use NTASM online which is available either through their own computers or on the computer made available by the College. Locums can use this computer to complete their surgical case forms before returning to their hospitals of origin.

Surgeon feedback
• Provide individual reports to surgeons annually, including total number of cases, surgical case form completion rates and assessment status.

Clinical management
• Continue to monitor DVT prophylaxis, particularly in relation to reasons for not using prophylaxis during a patient admission.

ICU/HDU
• Continue monitoring ICU/HDU use, to assess whether current bed allocation practices are appropriate and sufficient.

Reporting
• Participation in the National Surgical Mortality Audit Report
• Develop yearly trend analysis when sufficient data becomes available
• Provide and develop recommendations for the NT Health
• Monitor:
  > trauma (assaults, violence)
  > indigenous health
  > areas of concern and adverse events
  > transfers
  > DVT prophylaxis uptake
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 annual report covers the period 1 July 2010 to 30 June 2011, as audited on 1 July 2011.

• 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 on clinical care.

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.

• In 2005, the Royal Australasian College of Surgeons (the College) formed the Australian and New Zealand Audit of Surgical Mortality (ANZASM), with the purpose of extending a similar mortality audit in all Australian states and territories.

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 6 November 2006).

Currently, all the states and territories are participating in the national audit. Information about each of these audits is available on the College website.

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 processes in the NT:

• 31 first-line assessments reports sent to surgeons

• 3 second-line assessment reports sent to surgeons

• 2 volumes of Lessons from the Audit 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; Medical Records Departments.
1.3 Audit Process

1.3.1 Methodology

Detailed methodology of the ASM audit process is contained in the ASM annual reports (1-5), which are also available on the College website: (http://www.surgeons.org/Content/NavigationMenu/Research/Audit/NTASM)

In brief, NTASM is notified of all in-hospital surgical deaths directly via the surgical departments or the medical records departments of the 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 underwent a surgical procedure.

The consultant surgeon associated with the case is sent a structured surgical case form for completion. The completed surgical case form is returned to NTASM where it is de-identified and then assessed by a first-line assessor. This will be a different surgeon but of 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’ or ‘case note review’).

Second-line assessors are consultant surgeons from the same specialty as the surgeon associated with the case (‘peer review’), 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 are thought to have occurred during the clinical care of the patient that warrants further investigation
- a report could usefully draw attention to lessons to be learned, either for clinicians involved in the case or as part of a collated assessment (case note review book – Lessons from the Audit) for wider distribution.

1.3.2 Providing feedback

Surgeons receive written feedback from assessors on 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 de-identified summaries of second-line assessments in the Lessons from the Audit, plus newsletters and annual reports.
- Hospitals participating in NTASM receive reports on aggregated, de-identified data relating specifically to their hospitals and comparing them to the averages of the other hospitals.
- Annual reports are available to the surgical community on the NTASM website: www.surgeons.org/ntasm (see the reports and publications page).
- Individual surgeons are able to receive reports on their audit data and assessments by logging on to the 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**

- NTASM receives notification of death
- Surgical Case Form (SCF) sent to surgeon for completion
- SCF returned to NTASM
- First-line peer review (by another surgeon, relevant specialty, different hospital)
- Requires second-line assessment (case note review)
  - Yes
    - Second-line peer review by a senior surgeon, relevant specialty, different hospital
    - Feedback report to surgeon
  - No
    - Feedback report to surgeon

Surgeon uses their ‘right of reply’ to request a 2nd second-line assessment
- Feedback
- Case closed
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: 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.
Obstetrics and Gynaecological cases are not included, although this may change in the future.

1.4 Reporting conventions

1.4.1 Reporting clinical incidents
In the structured surgical case form 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 outcome
  > 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 comparable as they are asked essentially the same questions but second-line assessors have access to all available patient information through medical records.
Therefore, this represents a two-level peer review process. The second-line assessment being 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 case by either the first-line or the second-line assessor (referred to as “assessors”).
The categorisation of the severity of the event, the effect on outcomes, and the location the event was associated with, are the opinions of the assessors.

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, terminal care cases may be excluded from the full audit process.
This report covers deaths reported to NTASM from 1 July 2010 to 30 June 2011.
Due to the audit process and the timing of returns of forms, 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 next 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.
Security for this system therefore is very 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. This platform feeds the data into the same database.

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.

To maintain data integrity, data are checked against the original surgical case forms and assessment forms. Resources used to cross-check data include; medical record departments, surgeons, coroner’s reports, and NTASM Clinical Director.

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:

- 51 surgically-related deaths have been reported to NTASM in the study period
- Most NTASM surgeons are involved
- 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 data is outlined in Table 1 below.

There have been 34 first-line assessments completed and 3 second-line assessments completed.

At the end of June 2011:

- 9 surgical case forms were outstanding
- 6 first-line assessment forms were outstanding
- 4 second-line assessments were waiting to be sent to assessors

Table 1 Overview of NTASM

<table>
<thead>
<tr>
<th>2010/2011</th>
<th>n</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total deaths reported</td>
<td>51</td>
<td>100%</td>
</tr>
<tr>
<td>Audit process complete</td>
<td>31</td>
<td>61%</td>
</tr>
<tr>
<td>Surgical case form complete, awaiting first-line assessment</td>
<td>6</td>
<td>12%</td>
</tr>
<tr>
<td>First-line assessment complete, awaiting second-line assessment</td>
<td>2</td>
<td>8%</td>
</tr>
<tr>
<td>Surgical case form not yet returned</td>
<td>9</td>
<td>18%</td>
</tr>
<tr>
<td>Excluded – terminal care</td>
<td>2</td>
<td>4%</td>
</tr>
<tr>
<td>Excluded</td>
<td>1</td>
<td>2%</td>
</tr>
</tbody>
</table>

2.2 Overview of surgical mortality rates

An overview of NT Health data (2009/2010) is outlined below.

- 6 849 patients in Royal Darwin Hospital were admitted where the patient underwent a theatre procedure under anaesthesia in 2010/2011.*
- 4 073 patients in Alice Springs Hospital were admitted where the patient underwent a theatre procedure under anaesthesia in 2010/2011.*
- 10 922 is the total of surgical patients for NT for that time period
- 50 of these patients died in Royal Darwin Hospital and 21 died in Alice Springs Hospital – total = 71 deaths in NT.
- 9 220 surgical cases who did not die remained to be used as baseline data.
- 51 surgically-related deaths were reported to NTASM in that year. Reporting is a continuous process and more are expected to be reported.
- For NT, the overall death rate per 1000 surgeries is 6.4 (95%CI:4.7-8.4).**
- It compares slightly unfavourably with Scottish Audit of Surgical Mortality (SASM) where there was a surgical mortality rate of 0.6% of all surgical admissions where anaesthetists were present at operations.(McFarlane, 2009 #282)

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

** The margin of error of this value cannot be calculated.
3. Results

3.1 Surgeons

Key Points:
• 24 surgeons are participating in NTASM
• This represents 100% of all surgeons (24/24)* in the Northern Territory
• It is challenging keeping track of locums and involving them in NTASM

*source: 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 one, who is an IMG.

Those surgeons who are Fellows of the College are able to participate as assessors.

Surgeon participation by specialty
Figure 3 highlights surgeon participation by specialty.

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 online 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).

To date, only one surgeon has used the online system. Discussions are continuing about making this service more suitable for the surgeons.

3.1.3 Completion of surgical case forms (SCFs)
(Source: surgical case form)
By 30 June 2011, 70% of all SCFs had been completed and returned to NTASM.

Of the 42 SCFs returned to NTASM office, it took:
• a median of 40 days
• a range of 0 days* to 246 days.

(*The SCF that took 0 days was returned using NTASM online).

Grades of surgeons completing surgical case forms
(Source: surgical case form) n=42 forms
Table 2 highlights the grade of surgeons completing SCFs.

<table>
<thead>
<tr>
<th>Grade of surgeon completing form</th>
<th>2010/2011</th>
</tr>
</thead>
<tbody>
<tr>
<td>Consultant</td>
<td>87%</td>
</tr>
<tr>
<td>Advanced surgical trainee</td>
<td>8%</td>
</tr>
<tr>
<td>Service Registrar</td>
<td>3%</td>
</tr>
<tr>
<td>Basic Surgical trainee</td>
<td>2%</td>
</tr>
<tr>
<td></td>
<td>100%</td>
</tr>
</tbody>
</table>

3.1.4 Consultant surgeons involvement in operations
(Source: surgical case form)
Consultant input into the surgical management of patients was very strong as would be expected. Consultant input is outlined below:
• 87% of operations having consultant surgeons making the decision to operate
• 80% of operations having the consultant surgeon present in the operating theatre
• 100% of operations having a consultant anaesthetist present.

Trends in these levels will be monitored in future audits.

Grades of surgeons operating
(Source: surgical case form)
Details available for 50 operations performed on 29 patients.
Table 3 highlights the grade of surgeons operating.
Table 3  Grade of surgeon operating

<table>
<thead>
<tr>
<th>Grade of Surgeon</th>
<th>Deciding</th>
<th>Operating</th>
<th>Assisting</th>
<th>Extra in Theatre</th>
</tr>
</thead>
<tbody>
<tr>
<td>Consultant</td>
<td>87%</td>
<td>64%</td>
<td>7%</td>
<td>9%</td>
</tr>
<tr>
<td>AST*</td>
<td>7%</td>
<td>7%</td>
<td>22%</td>
<td>2%</td>
</tr>
<tr>
<td>Service Registrar</td>
<td>2%</td>
<td>9%</td>
<td>9%</td>
<td>0%</td>
</tr>
<tr>
<td>BST**</td>
<td>0%</td>
<td>0%</td>
<td>2%</td>
<td>2%</td>
</tr>
</tbody>
</table>

*AST = Advanced surgical trainee  
**BST = Basic surgical trainee

The columns do not add up to 100% because in many cases there were multiple surgeons performing and assisting in the tasks.

Grade of surgeon (by specialty) operating

Source: surgical case form. (n=29 patients)
Table 4 highlights the grade of surgeons (by specialty) operating.

Table 4  Grade of surgeon (by specialty) operating

<table>
<thead>
<tr>
<th>Specialty</th>
<th>Consultants doing operations</th>
<th>Number of patients operated on in specialty</th>
</tr>
</thead>
<tbody>
<tr>
<td>General surgery</td>
<td>62%</td>
<td>26</td>
</tr>
<tr>
<td>Orthopaedic</td>
<td>0%</td>
<td>3</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>29</td>
</tr>
</tbody>
</table>

*For two of the operations, the consultant was in theatre. Two of the operations were performed by advanced surgical trainees and one was performed by a service registrar.

3.1.5  Specialty of surgeon and number of patients in NTASM

Source: Notifications of death (n=29)
Table 5 highlights surgical specialty and number of patients.

Table 5  Surgical specialty and number of patients

<table>
<thead>
<tr>
<th>Specialty</th>
<th>Consultants doing operations</th>
<th>Number of patients operated on in specialty</th>
</tr>
</thead>
<tbody>
<tr>
<td>General surgery</td>
<td>62%</td>
<td>26</td>
</tr>
<tr>
<td>Orthopaedic surgery</td>
<td>0%</td>
<td>3</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>29</td>
</tr>
</tbody>
</table>

Table 6  Surgical specialty and patient age distribution

<table>
<thead>
<tr>
<th>Specialty</th>
<th>Median age (years)</th>
<th>Interquartile range (years)</th>
</tr>
</thead>
<tbody>
<tr>
<td>General</td>
<td>62</td>
<td>46-71</td>
</tr>
<tr>
<td>Orthopaedic</td>
<td>75</td>
<td>Too few to calculate</td>
</tr>
</tbody>
</table>

3.1.6  Specialty of surgeon & age distributions of patients

Source: Notifications of death (n=51)
Table 6 highlights surgical specialty and patient age distribution.

Table 7  Assessors’ view of management

<table>
<thead>
<tr>
<th>Management with areas of concern or adverse events</th>
<th>Surgeons’ views (n=31)</th>
<th>Assessors’ (FLA &amp; SLA) views of management issues present (n=30 FLA &amp; 3 SLA)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-op management</td>
<td>19%</td>
<td>13%</td>
</tr>
<tr>
<td>Decision to operate</td>
<td>11%</td>
<td>10%</td>
</tr>
<tr>
<td>Choice of operation</td>
<td>0%</td>
<td>7%</td>
</tr>
<tr>
<td>Timing of operation</td>
<td>11%</td>
<td>7%</td>
</tr>
<tr>
<td>Intra-operative management</td>
<td>4%</td>
<td>10%</td>
</tr>
<tr>
<td>Grade surgeon deciding</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td>Grade surgeon operating</td>
<td>7%</td>
<td>0%</td>
</tr>
<tr>
<td>Post-op care</td>
<td>11%</td>
<td>3%</td>
</tr>
</tbody>
</table>

3.1.7  Surgeons and Assessors views on management

Table 7 which highlights, if an operation was performed, the assessors’ view of case management.

3.1.8  Duration of operation for surgeons doing each operation:

Source: Surgical case form (n=43 operations)
Duration of operation is an important predictor of an adverse event in a surgical admission (Kable, Gibberd et al. 2008).

According to data from 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 rate of 1.0.
- >180 minutes duration has an adjusted odds ratio for adverse event rate of 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 = 120 minutes
- Minimum = 30 minutes
- Maximum = 360 minutes

3.1.9 ‘In retrospect’

Surgeons were asked if, in retrospect, they would have done anything differently with these patients who died in the peri-operative period.
- 24% said “Yes, they would have done something differently.”

The most frequent changes that surgeons would have made were:
- better pre-operative care
- better pre-operative work-up
- better post-operative care
3.2 Hospitals

Key points:
• Three hospitals participate in NTASM
• Most cases were not transferred in NT
• 8% (3/39) of cases – delay in obtaining the main surgical diagnosis
*source: College of Surgeons database

3.2.1 Hospital participation
Staff from the surgical department of Royal Darwin Hospital and the medical records department of Alice Springs Hospital notifies NTASM of all surgically-related deaths. Each hospital is aware of NTASM’s inclusion criteria (see 1.3.3 page 12).

There are three hospitals participating in NTASM:
• Royal Darwin Hospital
• Alice Springs Hospital
• Darwin Private Hospital

3.2.2 Transfers
Most cases were not transferred in the Northern Territory.
• 15% (6/39) of cases were transferred. Not all transfers were between NTASM hospitals (See 3.2.1).
• 92% (55/60) of deaths occurred in one hospital
• None of the elective cases had been transferred

Source hospitals (patients were transferred from the hospitals listed below):
• Darwin Private Hospital
• Katherine District Hospital
• Kununurra District Hospital

3.2.3 Hospital admissions
(Differences in denominators occur because in some cases surgical care forms have not yet been returned)
NT Hospital admissions (surgical patients who died) nearly all came from one hospital and were mostly emergency admissions.
• 92% (47/51) of NTASM deaths were from Royal Darwin Hospital
• 8% (4/51) were from Alice Springs Hospital
• 87% (32/36) of cases who died had been emergency admissions
• 69% (22/32) of all emergency admissions had operations
• 11% (4/36) of the cases who died were electives

• All 4 elective admissions had operations.
• 74% (29/39) of all hospital surgical admissions who died had operations

3.2.4 Delays in main surgical diagnosis
Delays are an important factor contributing to deaths in peri-operative care.
• In 92% of cases there was no delay in obtaining the main surgical diagnosis.
• In 8% (3/39) of cases there was a delay in obtaining the main surgical diagnosis
  > 2 were associated with a medical unit
  > 1 was associated with the surgical unit
  > 2 delays in diagnosis were associated with inexperienced staff
  > 1 delay was associated with an incorrect test being done

3.2.5 Presenting surgical diagnosis
There are some surgical diagnoses that present more frequently than others.
The most frequent surgical diagnoses, on admission, for patients who died were:
• peripheral vascular disease
• traumatic subdural haematoma
• ischaemic gut
• necrotising fasciitis
• diverticulitis
• infection of foot

3.2.6 Cases with operations
74% (29/39) of those surgical admissions who died had had operations (10 patients who died had not had operations).
There was no data on 12 cases. The total number of operations in patients who died was 50.
Thirteen patients (55% - 13/29) had more than one operation.

In order of frequency, the most common operations in patients who died were:
• exploratory laparotomy
• reopening of laparotomy site
• excision of ileum
• intracranial pressure monitoring
• evacuation of subdural haematomas
• debridement of skin
Note: In 3 cases (of patients who died), the operation was abandoned.
Cases with operations where patients did NOT die (baseline population)

The most common operations in patients who did NOT die in the NT for the same period, in order of frequency were: (total n = 8,646).
(Source: NT Clinical Information, Alice Springs Hospital)

- excisional debridement of soft tissue 744
- excision skin lesion 406
- incision & drainage of abscess, soft tissue 381
- appendicectomy 273
- cystoscopy 203
- debridement of burn 140
- arthroscopy of knee 131
- open red fixation of mandible 108
- panendoscopy of duodenum + biopsy 105

In all patients, there were 1.4 theatre visits per patient – (8,646 theatre visits by 6,127 patients) in the study period.

For the patients who died, this rate was higher at 2.9 visits per patient. This is twice the rate of those who did not die.

Use of critical care units

- 80% (29/36) of patients who had operations received ICU care. There was no answer for one patient.
- 3 patients received HDU care.

There were no cases where an assessor felt that a patient should have received ICU/HDU care and did not.

3.2.7 Management of patients

There were several areas where surgeons felt management of their cases could have been improved. The most noted area was in pre-operative care (see Table 8).

Source: surgical case forms

Table 8 Overall case management

<table>
<thead>
<tr>
<th>Management area</th>
<th>Should be improved</th>
<th>Proportion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-operative management</td>
<td>19%</td>
<td>5/26**</td>
</tr>
<tr>
<td>Decision to operate</td>
<td>11%</td>
<td>3/27</td>
</tr>
<tr>
<td>Timing of operation</td>
<td>12%</td>
<td>3/27</td>
</tr>
<tr>
<td>Post-operative care</td>
<td>11%</td>
<td>3/27</td>
</tr>
</tbody>
</table>

** Denominators vary because not all surgeons answered all the questions

Unplanned issues with patients:

There was an unplanned return to theatre in 22% (8/37) of cases who died in the peri-operative period.

There was a similar rate of unplanned admission to ICU of 25% (9/36) of patients who died in the peri-operative period.

Each of these factors is a strong predictor of death in surgical patients.

3.2.8 Days in hospital before death

Most people who died had been in hospital for a short time only (see Figure 4).

- 35% of patients who died had been in hospital for 1 day or less.
- The median time in hospital for surgical patients who died was 5 days.
- The minimum was <1 day and the maximum was 25 days.

Figure 4 Days in hospital before death
3.3 Patients

Key points:
• Patient deaths reviewed by NTASM were younger than those reviewed in other state-based mortality audits
• Most cases had significant co-morbidities
• Most cases were emergency admissions
• There were more male than female patients

3.3.1 Overview
The total number of operations/procedures performed on all the patients was 6,127 for the year.
• 51 deaths were reported to NTASM in the study period.
• Three cases were excluded: two cases were excluded “terminal care” and one case was excluded “error”. Therefore 48 cases were audited.
• 48 cases were reported as “deceased” surgical discharges from NT statistics department.
• The comparable source surgical population was 10,922 cases (obstetrics, gynaecology and ophthalmology cases not counted).
• 31 of the 51 cases are closed

3.3.2 Gender
Three quarters of all the patients who died in the NT (n=51) were males. This is a different distribution from other states in Australia.
NTASM gender distribution:
• 75% males
• 25% females

3.3.3 Ages of patients (who had operations) in the Northern Territory
Patients from NT who died in the peri-operative period were younger than patients in the same circumstances in other states. (Note: The interquartile range (IQR) is a measure of variability, based on dividing a data set into quartiles. The difference between the quartiles tell us how much territory the middle half of the data covers. It is used to demonstrate the distribution because the spread of ages is not symmetrical.)
*Median age 62 yrs
Minimum 21 yrs
Maximum 85 yrs
*IQR (47 – 72) yrs

3.3.4 All surgical patients who died
The ages of all patients receiving surgical care were:

Royal Darwin Hospital
*Median age 43 yrs
Minimum 0 yrs
Maximum 95 yrs
*IQR = 24-58 yrs

Alice Springs Hospital
*Median age 39 yrs
Minimum 0 yrs
Maximum 99 yrs
*IQR = 23-54 yrs

3.3.5 ASA grades
The American Society of Anesthesiologists (ASA) grade is an internationally recognised classification of peri-operative risk. An ASA grade is assigned to an NT hospital patient before an operation.
• 80% of patients who died had an ASA grade of 3 (severe disease) or worse before going to theatre (See Figure 5).

ASA grade definitions
ASA grade characteristics
1. A normal healthy 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 24 hrs, with or without an operation
6. A brain dead patient for organ donation

Figure 5  ASA grade (non-indigenous)
The four patients who had ASA grade 1 (healthy patient) and died after surgery, are documented as:
1. stabbed in fight
2. perforation of intestine from car accident
3. severe head injury from pedestrian, injured in collision with car
4. multi-trauma from pedestrian, injured in collision with car

3.3.6 Malignancy
(Source: surgical case form)
• Malignancy was present in 23% (9/39) of cases
• Malignancy contributed to the death of the patient in 66% (6/9) of those cases
• However, in aboriginal patients only 10% (1/11) had a malignancy present

3.3.7 Co-morbidities
(Source: surgical case form)
• 69% (27/39) of all patients had serious co-morbidities present (most patients had more than one co-morbidity)
• However, in the indigenous population, this proportion was lower - 55% (6/11) of aborigines had serious co-morbidities present
• The most frequent co-morbidities present (see Figure 6):
  > 23% of cases had cardiovascular disease
  > 13% had respiratory problems
  > 13% had diabetes

Figure 6 Distribution of co-morbidities

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).
• 83% (25/29) of cases were considered to be at least at a moderate risk of death before surgery (moderate + considerable + expected - see Figure 7).
• 52% (15/29) of cases were at considerable risk before surgery.

Figure 7 Risk of death before surgery
3.4 Indigenous patients

Key points:

• 32% (2564/8069) of all surgical admissions in Royal Darwin Hospital were indigenous patients.
• 48% (2301/4770) of all surgical admissions in Alice Springs Hospital were indigenous patients.

3.4.1 Indigenous surgically-related deaths

39% (20/51) of cases who died in the peri-operative period in both Royal Darwin Hospital and Alice Springs Hospital were indigenous. (See Figure 8)

Figure 8 Indigenous status

3.4.2 Ages of Indigenous patients

Indigenous patients who died in the peri-operative period were significantly younger than their non-indigenous counterparts (see Table 9).

Table 9 Ages at death

<table>
<thead>
<tr>
<th></th>
<th>Ages at death of Indigenous patients (n=19)</th>
<th>Age at death of non-indigenous patients (n=30)</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Median</em></td>
<td>53 yrs (IQR 30-67)</td>
<td><strong>69 yrs (IQR 53-77)</strong></td>
</tr>
<tr>
<td>Minimum</td>
<td>21 yrs</td>
<td>21 yrs</td>
</tr>
<tr>
<td>Maximum</td>
<td>71 yrs</td>
<td>85 yrs</td>
</tr>
</tbody>
</table>

*Interquartile range (IQR) = 30-67 yrs
**Interquartile range (IQR) = 53-77 yrs

3.4.3 ASA grade for indigenous patients

(n=11) Not all ASA grades available.

Figure 9 ASA grade (indigenous)

The three indigenous patients who had ASA grade 1 (healthy patient) and died after surgery are outline as:

• 1 young male stabbed in a fight
• 2 young males involved in separate motor vehicle accidents (car versus pedestrian)

3.4.4 Malignancy

(Source: surgical case form)

In aboriginal patients only 10% (1/11) had a malignancy present. This is half the rate of the rest of the cohort. It is possibly a reflection on the younger age distribution of this population.

The estimate is imprecise due to the low numbers reported so far.

3.4.5 Co-morbidities

(Source: surgical case form)

In the indigenous population, the proportion of patients with serious co-morbidities was lower than that of the general population - 55% (6/11) of aborigines had serious co-morbidities present. Once again, this could be a reflection of the younger age of this group.

3.4.6 Operations on surgical patient

There was a statistically significant* correlation between race and operations occurring with surgical patients. The non-indigenous patients were more likely to have operations after admission under a surgeon.

• 46% (5/11) of indigenous surgical patients had operations
• 85% (22/26) of non-indigenous surgical patients had operations

*Pearson correlation -0.400 significant at the 0.05 level (2 tailed).

3.4.7 Risk of death for indigenous patients

Looking at all NT data, it was found that there was an increased risk of death with surgery for indigenous patients (Lehman, 2009 #344)

For all NT patients there were 20 deaths for 3248 ATSI admissions.

There were 48 deaths for 10417 non-ATSI admissions.

• Risk of death for ATSI = 20/3248 = 0.0062
• Risk of death for non-ATSI = 48/10417 = 0.0046

Relative risk of death for ATSI patient compared to non-ATSI patient = 0.0062/0.0046 = 1.34 (95%CI:0.79-2.25).
3.5 Clinical Incidents

These findings have been expressed in terms that cannot identify the patient, the surgeon or the hospital under qualified privilege protection.

Assessors found that there were five areas of concern and adverse events that occurred in the period of the audit. Please see page 8 for definitions.

Areas of concern encompass issues that are specific to surgical care and may relate to hospital or handling concerns. They are events or factors that are thought to be sub-optimal and should have been improved.

The findings from this audit consisted of:

- 3 areas of concern
- 2 adverse events

These five incidents occurred with three patients. This represents 9% of audited patients but the numbers are too low to be of serious consideration.

It was found that three incidents caused the deaths of patients and two may have contributed to the deaths of patients.

All of these incidents were preventable.

Four of the five clinical incidents were associated with another clinical team and one was associated with the surgical team.

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

- missed diagnosis
- delay in transfer to surgical unit
- poor communication between physician and surgeon
- incorrect use of a drain or catheter
- delay in diagnosis

Nearly all of these issues can be considered to be systems failures, and as such, organisational factors are responsible. Only one was a specific surgical technical problem.

Delays are the largest single group of problems in all surgical audits in Australia and can only be resolved at the organisational level.
Acknowledgements

Our sincere thanks go to all assessors who have responsibly and promptly returned first and second-line assessments. There is no doubt that this assessment process is a small but integral part of the safety and quality enhancement that we, as surgeons, need to be part of as an integral part of daily activity. The audit and feedback mechanisms form a pivotal part of our learning process. Surgeons learn well by self-reflecting.

Second-line assessors need particular thanks for their excellent work. Their careful reading of cases (and medical records), along with forensic responses, form a significant portion of feedback to surgeons. Assessor comments (modified and de-identified) are regularly used as part of the Lessons from the Audit. The summary and de-identified comments sent to surgeons are often some of the NTASM’s best feedback tools.

Although there are occasional complaints about second-line assessment processes, these are rare and often related 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 audit process.

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

- hospital departments of medical records
- hospital departments of surgery
- Northern Territory Department of Health (for funding the project)
- Northern Territory Department of Health - CIA team at Alice Springs Hospital for providing baseline data
- Royal Australasian College of Surgeons (the College) for their infrastructure support
- Research, Audit and Academic Surgery Division and the College ANZASM Steering Committee.

NTASM Steering Committee

Dr John Treacy MBBS, MD, FRACS, Chair, Northern Territory Regional Committee, RACS, Australia

Dr John North, MBBS, FRACS, FAOrthA, Clinical Director NTASM

Dr Janak Mehta MBBS, MS (Orth) FCPS (Orth) DNB (Orth) D(Orth), FRACS

Dr Maurice Stevens MBBS (Qld), FRACS Chair, Queensland Regional Committee, RACS, Australia

Dr John Quinn MBBS, FRACS, FACS Executive Director of Surgical Affairs, RACS, Australia

Dr Jacob Ollapillil MBBS MS (Gen Surgery) MCh (Plastic Surgery) FRACS, Director of Surgery, Alice Springs Hospital

Louise O’Riordan, Quality Manager, Royal Darwin Hospital, Department of Health

NTASM staff

Clinical Director
Dr John North MBBS, FRACS, FAOrthA

Project Manager
Therese Rey-Conde BApp Sc, MAACB, MPH, AFAAQHC

Project Officer
Jenny Allen BTech (Biomedical), BSc (Hons)

Project Officer
Sonya Faint BApp Sc, MA

Project Officer
Kahler Jones RN, BN

Administration Officer
Kyrsty Webb

Project Officer (Darwin)
Gayle Eccles

Project Officer (Darwin)
Ann Crouch

Consultant Statistician
Dr Robert Ware BSc (Hons I), PhD
ANNUAL REPORT 2010/2011

Telephone: 07 3835 8671
Facsimile: 07 3236 9320
Email: qasm@surgeons.org
Address: 50 Water Street
Spring Hill QLD 4000
Post: PO Box 47
Spring Hill QLD 4004
Web: www.surgeons.org/ntasm