Acknowledgements

Alaina Campbell • MRTS Nurse Consultant and Programme Manager

MRTS Hub Group • Kristy Medd, Shelly Wadhwa, Karen McInroe, Yvonne Joynes

MRTS Clinical Staff • Jennifer Dorrian, Katrina O’Leary, Cherry Campbell, Grant Looker, Barnaby Smith, Ulrike Beuhner, Glenn Farrant

Lisa Moore • Statistician

Suzanne Andrew • HealthShare Programme Manager
Executive Summary

Over 4,700 patients are admitted to hospitals in the Midland region each year with serious injuries. Of these about 470 have injuries which are severe or life-threatening. The outcomes of these patients are improved by application of best practice to all parts of their clinical journey, coordinated by skilled and dedicated trauma services working within an organised and collaborative trauma system.

The Midland Regional Trauma System (MRTS) was established from the precursor Waikato Trauma Service in 2010 to enable the development of clinical trauma services and provide a supportive regional network in which they could grow and consolidate their functions. MRTS clinical staff contribute data to a customised trauma database which is the platform for a Trauma Quality Improvement Programme (TQIP). Clinical staff are responsible for local governance and quality improvement activities that arise from the TQIP.

Since its establishment MRTS has made significant progress in delivering and enabling the critical elements of an efficient trauma system; MRTS staff have clinical contact with over 93% of trauma patients admitted within the region and have been able to identify and mitigate risks to these patients first hand. There has been considerable work done in strengthening links and fostering a common language between multiple care providers along the patient’s journey and enabling feedback and collaboration between these groups.

Trauma data is revealing multiple opportunities for positive system change and has shown risk groups in the community that may benefit from focussed prevention activities. MRTS continues to develop its registry and database capabilities to provide a platform for comprehensive evidence-based quality improvement activities.

Regional trauma guidelines and transfer matrices are designed and under consultation. These will define agreed standards and processes for safe and efficient treatment and transfer of trauma patients.

MRTS clinical staff are passionate about their work and committed to the welfare of their patients. They provide constancy and advocacy for patients and their families as they go through challenging, and possibly the worst times of their lives.

We are proud to bring you the MRTS Annual Report. It contains descriptions of MRTS activities and achievements to date, a review of demographic data, and a summary of strategic directions.

Grant Christey
Director, MRTS
September 2013

Highlights

1. MRTS staff have assessed and improved the clinical journeys of over 16,000 trauma patients since May 2010.
2. Mortality has reduced from 12.8% in 2010 to 8.4% in 2013. This exceeds the generally agreed standard for best practice of 10%.
3. Multiple processes for discussion and resolution of regional trauma issues are operational or under development.
4. Regional trauma verification programme underway.
5. Customised regional trauma registry completed and operational.
6. Comprehensive relational database designed and under construction.
7. Midland Trauma Research Centre founded.
MRTS Vision
The Midland community will receive highest quality trauma care

MRTS Mission
To lead trauma quality improvement activities in Midland Region

MRTS Key Objectives

1. To enable provision of highest quality trauma care focused on the needs of patients
2. To improve patients journeys by encouraging collaboration between all trauma care providers
3. To develop a trauma quality improvement programme based on trauma registry data
4. To ensure that stakeholders are informed of MRTS activities and progress
5. To ensure adequate resourcing and sustainability of MRTS

Pictured: Grant Looker (Taranaki), Ulrike Buehner, Cherry Campbell (Lakes), Kristy Medd, Shelly Wadhwa (MRTS Hub team), Grant Christey (MRTS Trauma Director Waikato), Tony Ryall (Minister of Health), Jenny Dorrian (Waikato), Alaina Campbell (MRTS Hub team), Katrina O’Leary, Barnaby Smith (Bay of Plenty).
Absent: Karen McInroe, Yvonne Joynes (MRTS Hub Team), Glenn Farrant (Taranaki)
Summary of Progress

- Established a functional network of dedicated trauma personnel throughout the region.
- Data collection on minor and major trauma patients has been comprehensive and continuous since May 2010.
- MRTS is facilitating detailed case reviews and system discussions on clinical issues across service and DHB boundaries.
- Aligned with regional services work through HealthShare.
- Engaged key senior clinicians across Midland DHBs in development of agreed clinical transfer matrices and guidelines based on international best practice.
- Reached minimum FTE levels in DHBs.
- Regional trauma verification is influencing strategic plan development.
- Established research partnership with University of Auckland resulting in successful grant application as a precursor to future project grants. TQUAL database is identified as an ideal resource for producing high-quality research, and for growing of clinical researchers.
- Steering group for Midland Trauma Research Centre is active and ToR developed. Expectation is a functioning virtual research facility in 2014.
- Participated in New Zealand Medical Assistance Team (NZMAT) development and training. Initiated regional response service. Implementation on hold pending support platform.
- Facilitated Abbreviated Injury Scale (AIS) coding training courses for 22 national trauma staff involved in data collection.
- Facilitated formation and implementation of Midland DHB trauma committees and governance lines.
- New web-based registry has been designed, built and now repatriated to NZ with national security and sovereignty measures inbuilt.
- Facilitating face-to-face spinal and neurosurgical discussions across the region to enhance and streamline transfer processes.
- Implemented and collated national capacity and capability survey for Major Trauma National Clinical Network (MTNCN).
- Comprehensive regional trauma capacity and capability survey completed and referenced to strategic plan.
- Regional bariatric trauma process map completed.
- Registry implemented with innovative features to support an advanced TQIP: time-based KPIs, multi-facility patient tracking and relational capabilities.
- National and bi-national minimum trauma datasets integrated into registry.
- NZ hospitals coded within the web-based registry to enable hosting.
- Innovative relational database designed and under construction.
- Trauma Guidelines and Regional Transfer Matrices under development.
- Significant contributions to development and activities of Major Trauma National Clinical Network.
- First regional trauma system in NZ.
- First web-based, patient-tracking registry in NZ.
- About half of NZ’s trauma registry data is now handled by MRTS.
- MRTS strategic planning referenced to national health priorities and logically applied within an innovative, trauma-focussed Triple Aim framework.
1.0 Activities

Core Business

The MRTS clinical team in each of the MRTS DHBs consists of a Trauma Nurse Specialist (TNS) and a Trauma-Oriented Consultant (TOC). The teams provide clinical support and collect trauma data which is sent to the hub group for quality checking and entry into the MRTS registry.

The hub group of MRTS team consists of a trauma specialist, nurse consultant, administrator, data manager and data analyst. This group provides clinical and strategic support, guideline development, registry and TQIP development, high-level jurisdictional links, data handling and quality control, reporting and research.
Governance

Midland DHBs are responsible for the care delivered to their own patients and maintain autonomy to do so, supported by the collaborative functions of MRTS. MRTS is governed by the MRTS Strategic Group which has regional representation at a high level. This group authorises agreed clinical best practice guidelines, and guides policy for data security, access and terms of utilisation. Patient data is subject to patient privacy and ethical protection.

Operational issues are dealt with by the Operational Group, again with broad regional representation. MRTS staff facilitate local trauma committees which have links through existing DHB structures, so that issues can be discussed and resolved in an efficient manner. Action on regional issues may be enhanced utilising relationships with Midland HealthShare Network.

MRTS Governance Model

MRTS Strategic Group
- MRTS Clinical Director
- MRTS Programme Manager
- Regional Chief Operating Officer representative
- Regional Chief Medical Advisor representative
- Operational Group representative
- HealthShare representative
- Pre Hospital representative
- Planning and Funding representative

MRTS Operational Group
- MRTS core personnel
- Midland St John’s manager
- Trauma Orientated Consultants
- Trauma Nurse Specialists
- Service Managers

Midland DHB’s Trauma Services

Funding Structure

MRTS clinical personnel are funded by their own DHBs. The hub group FTE and registry development is funded solely by Waikato DHB until 2015 when the cost of this will be divided between participating DHBs on pro-rata basis by patient volume. The current cost is 2.6 FTE for DHB clinical staff; and 2.4 FTE for the hub group.
HealthShare

MRTS is aligned with HealthShare Midland in a collaborative relationship that gives access to regional governance groups and resources for critical deficits, and provides a formal link with other regional groups. MRTS strategic elements are featured in the Midland Regional Services Plan.

Registry and TQIP

The MRTS registry is a version of the Collector™ program customised to provide the unique features of inter-facility patient-tracking and multiple time-based KPIs to address regional trauma quality issues. The registry is web-based and forms the main data source to the TQIP, currently under construction. This will import data from existing sources such as Cost-Pro and inpatient management systems into a relational database for clinical support, reporting, system improvement, cost analyses, trauma research and prevention strategies. This is a unique and innovative program with exciting opportunities for system and process improvement. The flexibility and capability of the program will be a resource for authorised stakeholder groups and can potentially support hosting of registries from other DHBs.

Research

MRTS is developing a virtual research centre to maximise data from TQIP within a focused and rationalised research program. This will be greatly enhanced by a close collaboration with Waikato Clinical School of the University of Auckland. The aim of the research centre is to optimise data management and provide a focus point for researchers or multiple stakeholder groups to produce answers to important questions. The research centre ethos is to produce high-quality, clinically based research that will directly improve care and reduce the burden of trauma on the Midland community. The geographic stability of the Midland trauma population and relative demographic equivalence to NZ as a whole implies that studies done on this population will have relevance beyond Midland. Alignment with Australian and US TQIPs and minimum trauma datasets in USA, Canada, Scandinavia and UK will enable international comparative research.

Research priorities for 2013-14 include:

1. Faculty Research Development Fund (FDRF) Study to enhance registry development and integration of Clinical Decision Support Systems (CSSD)
2. Midland Paediatric Trauma Study
3. Trauma Incidence by Ethnicity
4. Cost-benefit Analysis of Trauma Service Implementation (includes definition of potential areas for cost saving in clinical journeys, particularly high volume – low severity cases)
5. Impact of Alcohol in Trauma
6. Quad Bikes (completed)
7. Spinal Injuries
8. Trauma in the Elderly
2.0 Strategic Plan

MRTS clinical staff observe and record patient journeys across multiple provider groups and are in an ideal position to assess and influence delivery of care toward best practice. Trauma data provides key information to improve clinical and cost-effectiveness as well as demographic information to inform targeted prevention strategies to reduce the burden of trauma in the community.

To address multiple spheres of activity that impact on trauma care and injury prevention, the strategic elements of MRTS are designated to a unique Triple Aim structure with the relational database and quality loop at the centre.

MRTS Quality Improvement Model

Population
- Monitoring
- Prevention
- Equity

Individual
- Patient experience
- Quality of Care
- Safety

System
- Continuous Service Integration and Optimisation
- Cost Effectiveness
- Governance
3.0 Data Review

This review represents a summary of all trauma patients admitted to Midland hospitals over one year. Owing to some lag in data entry during registry development, the time frame under study is 1st April 2011 to 31st March 2012. The primary focus of this report is on trauma volumes and demographic profiles of trauma patients. As TQIP and the relational database mature, subsequent reports will explore patient-tracking, quality improvement, cost/benefit issues and opportunities for positive system change.

This data review has three aims:

1. Define the volumes of trauma patients impacting on MRTS hospitals.
2. Determine the incidence rates of trauma in specific demographic groups.
3. Explore anomalies in trauma information to identify groups at risk of injury, or those requiring further research.

Key Findings

• There is considerable variation in injury patterns and demographic risk groups across the region.

• Many anomalies identified will require more detailed analysis outside the scope of this report.

• Falls are the most common cause of injury for both males and females.

• There is a high incidence of trauma events for males between the ages of 15 and 34. The main causes are:
  o Falls
  o Struck by (an object)
  o Road Traffic Crash (RTC)
  o Assault (intentional)

• There is a high incidence of trauma events for females over 70 years old. The main causes are:
  o Falls
  o RTC

• Maori have a higher than expected percentage of major trauma injuries, with the exception of Tauranga which has a lower than expected percentage of major trauma injuries.

• Tauranga has a high incidence of major trauma injuries in the elderly population.
Trauma System Timeline

The use of the Collector™ registry program has evolved as the needs of the services and regions have grown. The timeline of the three versions of Collector™ are described in the following table.

Note that a non-clinical service collected data at Waikato Hospital from 1998 to 2004.
## Terminology

<table>
<thead>
<tr>
<th>Term</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Event</td>
<td>An event refers to the occurrence of a single injury incident. For example; if a patient is cared for at Tauranga Hospital, then transferred to Waikato, and then transferred back to Tauranga; this counts as one event.</td>
</tr>
<tr>
<td>Admission</td>
<td>An admission refers to a period of occupancy of a patient in an inpatient bed excluding Emergency Department. Referring to the example above where a patient moves from an inpatient bed at Tauranga Hospital, to Waikato, and then back to Tauranga; this counts as three admissions.</td>
</tr>
<tr>
<td>Length of Stay (LOS)</td>
<td>The length of stay of a patient is the length of time from admission date to discharge date. This is calculated for each admission. The entire event LOS has been calculated by adding the LOS for each admission for each patient event.</td>
</tr>
<tr>
<td>Severity</td>
<td>The Injury Severity Score (ISS) is calculated from Abbreviated Injury Scale (AIS) for single injuries. A score of greater or equal to 16 is reported as a major trauma case, a score of less than 16 is reported as a minor trauma case. AIS is the international standard for injury scoring.</td>
</tr>
<tr>
<td>Mechanism</td>
<td>The mechanism is the means by which injury occurs. For example; if a patient had a car crash, the event causing the injury is a road traffic crash (RTC).</td>
</tr>
<tr>
<td>Type of Injury</td>
<td>Blunt, Penetrating or Burn</td>
</tr>
<tr>
<td>Outcome</td>
<td>Outcome groups the patient on whether the patient was alive or dead at discharge.</td>
</tr>
<tr>
<td>Estimated</td>
<td>Admissions have been estimated for the months with no data captured using the ratio of admissions to event.</td>
</tr>
<tr>
<td>Expected</td>
<td>Expected calculations are based on population demographics supplied by Statistics New Zealand to District Health Boards. The number of trauma events has been proportioned across the population distribution.</td>
</tr>
<tr>
<td>Incidence</td>
<td>Incidence rates of injury are calculated as events per 100,000 people per year.</td>
</tr>
<tr>
<td>Term</td>
<td>Description</td>
</tr>
<tr>
<td>---------------------------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Observed</td>
<td>Observed is the analysis based on the data in the MRTS registry.</td>
</tr>
<tr>
<td>Population Demographics</td>
<td>The population demographics of the hospital have been used as a comparison. For example; Waikato Hospital ethnicity profile has been compared to the Waikato District Health Board population profile. Tauranga Hospital ethnicity profile has been compared to the Bay of Plenty District Health Board population profile, and so on.</td>
</tr>
</tbody>
</table>
Data Qualifications

Disclaimer

This analysis is only as accurate as the information provided and recorded. For the purpose of this report it is assumed information has been provided to and recorded by MRTS accurately and consistently.

An extract of data was provided to conduct the analysis. It is also assumed this extract was provided accurate and whole.

Trauma Events

- Date range is 1st April 2011 to 31st March 2012.
- Grouped to the first MRTS hospital the patient was admitted to.
- Events have been used as the measure for patient related statistics, such as demographic profiling and assessment of community risk factors for injury.
- Whakatane Hospital has been excluded from this report as they have insufficient data available due to recent initiation of data collection (January to June 2012). Whakatane Hospital will be included in future annual reports.

Trauma Admissions

- Date range is 1st December 2011 to 31st March 2012\(^1\).
- Admissions have been grouped to the MRTS district based hospital.
- Emergency Department attendances and admissions have both been counted as admissions when a patient has attended Emergency Department and then been admitted to another hospital.
- Admissions only are counted as admissions where a patient attends Emergency Department and then moves on to an inpatient area in the same hospital.
- Admissions have been used as a measure of hospital related statistics, such as average length of stay, and other measures that quantify the impact of a trauma event on a hospital’s resources.
- Owing to data backlog issues with implementation of the new registry, the events for the study year are known, however the admission processes can only be accurately stated for the first four months. The remainder of the study period is extrapolated using the ratio of admissions to events.

\(^1\) Trauma Admissions have been recorded as part of Collector 3 information. As the Collector 3 data captures September 2012 onwards, only 5 months of actual data is satisfactorily available, with 4 months relevant to this report.
MRTS Inclusion Criteria

• Admission to an in-hospital bed as a result of; and within 14 days of injury.

MRTS Exclusions

• Insufficiency fractures: osteoporotic, osteopenic, metastatic, pathologic. This includes fractured neck of femur, fractured neck of humerus, Colles fracture.

• Peri-prosthetic fractures.

• Exertional injuries: e.g. tendon rupture not associated with external force.

• Hanging, drowning, asphyxiation, poisoning without evidence of external force.

• Ingested foreign body not causing physical injury.

• Injury as a direct result of pre-existing medical conditions e.g. epilepsy, syncope, Parkinson’s, etc.

• Injury sustained is out of proportion to the force applied because of an underlying medical condition.

N.B.

• Patients admitted to a hospital bed then discharged for elective surgery follow up will be marked as interval surgery on discharge and not recollected when readmitted; i.e. one injury event = one trauma number. The registry is for acute admissions only.

• Elderly patients: Judgement calls need to be made about whether the injury is an insufficiency fracture including fracture neck of humerus, fracture neck of femur, fracture distal radius, Colles fracture. E.g. osteoporosis.

MRTS Diagnostic and Grading Tools

• AIS 2008

• ICD-10AM
Admissions and Events

Over the 2011-12 period analysed, MRTS saw a total of 4,645 events and an estimated 5,553 admissions. There are a further estimated 49 admissions of patients that had treatment initiated at hospitals outside of the Midland region.

There are approximately 1.21 MRTS hospital admissions per 1 trauma injury event.

Owing to different commencement dates of DHBs and technical constraints during the current upgrade of Collector 3; admission numbers have been estimated from existing data.

Number of Trauma Events and Admissions by MRTS Hospital

Looking at Taranaki as an example, there were 545 events and 685 admissions, and the Event: Admission ratio was 1:1.26. The difference in events to admissions occurs primarily because patients who go from Hawera Hospital to Taranaki Base Hospital after a single injury event will be recorded as having two admissions.

The table below outlines the relationship between events and admissions. Events are grouped to the hospital where the patient was first admitted.

Number of Trauma Events by Severity and MRTS Hospital

<table>
<thead>
<tr>
<th>Severity</th>
<th>Waikato</th>
<th>Tauranga</th>
<th>Lakes</th>
<th>Taranaki</th>
<th>Midland Regional Trauma System Total</th>
<th>Percentage of Events</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minor; ISS&lt;16</td>
<td>2,069</td>
<td>1,000</td>
<td>747</td>
<td>518</td>
<td>4,334</td>
<td>93%</td>
</tr>
<tr>
<td>Major; ISS&gt;15</td>
<td>167</td>
<td>18</td>
<td>41</td>
<td>27</td>
<td>311</td>
<td>7%</td>
</tr>
<tr>
<td>Total</td>
<td>2,236</td>
<td>1,018</td>
<td>788</td>
<td>545</td>
<td>4,645</td>
<td>100%</td>
</tr>
</tbody>
</table>

2 There were 4 months of admissions data; 2,065 admissions; satisfactorily collected in the period measured. The estimated admissions reported is a prediction using the rate of admissions to events for each month. This excludes Whakatane.

3 Events are reported against the first MRTS hospital that patients present to.
Number of Trauma Events by Month

The summer months see the largest number of events over the 12 month period, with January being the greatest.

While falls are the dominant cause of trauma injury in January (182 events), there were 43 events caused by contact with a sharp object. This is compared to an average of 15.6 sharp object events in other months.

Number of Trauma Admissions by Month and MRTS Hospital

1. Rotorua Hospital saw a larger number of pedal cyclist injuries in November than other months (10 pedal cyclist injuries).

2. Taranaki Hospital saw an increase in trauma events in both August and December.
Admission peaks in minor trauma are seen on Saturdays in Waikato and Lakes. The resulting clinical load on these days may put pressure on weekend acute services, including operating theatre utilisation.
The above charts are based on small numbers; however looking at the days of the week with the highest average major trauma for each MRTS hospital, anomalies between major and minor trauma rates are apparent:

- Waikato: Fridays and Sundays, mostly RTC
- Taranaki: Wednesdays and Sundays, mostly RTC
- Rotorua: Wednesday and Saturday, cyclists prominent
- Tauranga: Wednesday and Saturday, mostly falls

Length of Stay

The average hospital inpatient length of stay for a single hospital admission is 3.81 days\(^4\).

The average length of stay for a trauma patient over their entire hospital stay(s) from a single injury event is 4.60 days.

The average length of time a trauma patient spends in emergency department is just over four hours.

Average Length of Stay by Major and Minor Trauma Events

<table>
<thead>
<tr>
<th>Length of Stay Measured</th>
<th>Minor</th>
<th>Major</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average Inpatient Admission LOS (days)</td>
<td>3.39</td>
<td>10.91</td>
<td>3.81</td>
</tr>
<tr>
<td>Average Trauma Event LOS (days)</td>
<td>4.06</td>
<td>14.99</td>
<td>4.60</td>
</tr>
<tr>
<td>Average Emergency Department LOS (hours)</td>
<td>4.09</td>
<td>4.01</td>
<td>4.09</td>
</tr>
</tbody>
</table>

Average Trauma Admission Length of Stay by MRTS Hospital

<table>
<thead>
<tr>
<th></th>
<th>Waikato</th>
<th>Tauranga</th>
<th>Lakes</th>
<th>Taranaki</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average LOS</td>
<td>3.89</td>
<td>4.17</td>
<td>2.54</td>
<td>3.80</td>
<td>3.81</td>
</tr>
</tbody>
</table>

\(^4\) Day Cases have not been included in this analysis.
The scatter plot of ISS against the entire trauma event length of stay suggests there is a relationship. Smoothing the data; obtaining the average length of stay for each ISS value; there is a positive relationship between ISS and length of stay.

This relationship is important; a short length of stay for a very high ISS is usually related to early death. A long stay for a low ISS can indicate significant co-morbidities or unexpected and adverse outcomes; i.e. treatment complications. Outliers can be identified for further analysis although this is outside the scope of this report.

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5 The regression line y-intercept has been set to 0.
Bed Days
Over the four summer months (December 2011 to March 2012) admission data is satisfactorily available for this report; approximately 7,686 bed days were utilised by MRTS trauma patients. This equates to an average of 61 trauma patients in a MRTS hospital and two patients in a hospital outside the region at any given time. The total trauma load for all MRTS hospitals is approximately 21,000 bed days per year.

Average Number of Trauma Patients in Hospital; On Any Single Day; by MRTS Hospital

Although Rotorua have more trauma admissions than Taranaki; Taranaki had the longer length of stay; therefore on average Taranaki Hospital had more patients in hospital on any single day. Length of admission can be reduced in hospitals with a liberal transfer-out practice.
Demographics

Ethnicity

The majority of trauma patients are European descent followed by Maori and then Other ethnicities.

Number of Trauma Events by their Ethnic Group and MRTS Hospital

<table>
<thead>
<tr>
<th>Ethnicity Group</th>
<th>Walkato</th>
<th>Tauranga</th>
<th>Lakes</th>
<th>Taranaki</th>
<th>Midland Regional Trauma System Total</th>
<th>Percentage of Events</th>
</tr>
</thead>
<tbody>
<tr>
<td>European</td>
<td>1,522</td>
<td>766</td>
<td>486</td>
<td>406</td>
<td>3,180</td>
<td>66%</td>
</tr>
<tr>
<td>Maori</td>
<td>583</td>
<td>247</td>
<td>261</td>
<td>120</td>
<td>1,211</td>
<td>26%</td>
</tr>
<tr>
<td>Other</td>
<td>131</td>
<td>63</td>
<td>41</td>
<td>19</td>
<td>254</td>
<td>5%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>2,236</td>
<td>1,076</td>
<td>788</td>
<td>545</td>
<td>4,645</td>
<td>100%</td>
</tr>
</tbody>
</table>

To gain a greater understanding of the ethnicity of trauma patients, we compare our findings to the population demographics for each hospital. We can then see if the ethnicity of trauma patients is what we’d expect to see based on the same injury rate applied to the whole population.

To do this, we now group the ethnicity of patients as Other, Maori and Pacific to compare against information provided by Statistics New Zealand. Of the Other category, 95% are European.

MRTS Events Breakdown for Other Ethnicities

<table>
<thead>
<tr>
<th>Other Ethnicity</th>
<th>Midland Regional Trauma System Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>European</td>
<td>95%</td>
</tr>
<tr>
<td>Asian</td>
<td>1%</td>
</tr>
<tr>
<td>Indian</td>
<td>2%</td>
</tr>
<tr>
<td>Other</td>
<td>3%</td>
</tr>
</tbody>
</table>
The percentage of major and minor trauma events by ethnicity group are very close to what is expected based on population demographics.

Waikato and Taranaki Hospitals observe the greatest variance between population demographics and trauma events for the Other and Maori ethnicity groups. These groupings are consistent with Ministry of Health format.

Further detailed analysis is required to determine the reasons for ethnic variation.
Major Trauma Events Ethnicity Group Percentage by MRTS Hospital: Expected versus Observed

Overall, Maori are more likely to have major trauma than expected. In Tauranga Hospital, Maori are 4% less likely to have major trauma than expected. This relationship requires further detailed analysis.
Age

In general, the rate of trauma injury for patients aged less than 35 years is higher than in the over 35 years age group.

First we look at the number of events by age group for MRTS hospitals and then investigate incidence rates of injury.

**Number of Trauma Events by Age Group and MRTS Hospital**

Waikato has a larger number of trauma events in their younger age groups, whereas Tauranga’s age group profile is flatter with a rise in their older age groups.

To investigate the relevance of age in trauma events we compare the events observed to what we would expect to see if all age groups had the same rates of injury.
Number of Trauma Events by Age Group: Expected versus Observed

The two charts above show the highest rates of injury primarily in the 15 to 24 year and 85+ year age groups. The 35 to 84 year age group has lower rates than expected.
Incidence of Major Trauma Events per 100,000 by Age Group

The 90+ age group has a very high rate of major trauma injury per capita; nearly 3 times the MRTS incidence of major injury.

Number of Trauma Events by Age Group by MRTS Hospital: Expected versus Observed
There are significant variations in the injury rates of age groups across MRTS hospitals requiring further detailed analyses:

- Tauranga Hospitals 85 to 89 year age group has the highest incidence of injury (incidence rate = 1,419 events per 100,000 people per year).
- Rotorua Hospital has high incidence rates for their 15 to 24 age groups.
- Waikato has a broad peak of injury in the over 70's.
There is significant variation in the incidence of major trauma injury by age group between MRTS hospitals;

- Tauranga’s ageing population has a higher than expected incidence of injury.
- Taranaki’s elderly injury rate is comparatively low
- Injury peaks are apparent in 15-24 and 40-49 yr age groups in Waikato, Taranaki and Tauranga.

Of a total estimated population of 1,500 90+ year olds in the Bay of Plenty, there were four patients who had major trauma. Three were falls and one was an assault.
Gender

Percentage of Trauma Events by Gender and MRTS Hospital

<table>
<thead>
<tr>
<th>Gender</th>
<th>Waikato</th>
<th>Tauranga</th>
<th>Lakes</th>
<th>Taranaki</th>
<th>Midland Regional Trauma System Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>60%</td>
<td>63%</td>
<td>67%</td>
<td>74%</td>
<td>66%</td>
</tr>
<tr>
<td>Female</td>
<td>40%</td>
<td>37%</td>
<td>33%</td>
<td>26%</td>
<td>34%</td>
</tr>
<tr>
<td>Total</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
</tr>
</tbody>
</table>

- The male to female ratio is consistent across the region
- Taranaki Hospital has a higher percentage of male trauma events at 74%.

Percentage of Trauma Events by Age Group and Gender: Expected versus Observed

- Males have higher than expected trauma events for patients younger than 35 years of age; females have higher than expected trauma events for patients over 75 years old.
- Under 10 year old males have higher injury rates overall than females. The apparent spike in female injury in this group may be due to removal of gender bias in injury risk factors by infants, across all age groups, 34% are female.
- Gender has a clear impact on the distribution of trauma events across age groups. Below we investigate incidence rates by hospital for each gender.
1. The highest incidence of injury in males is across the 15 to 24 years old age groups. This is common across all four hospitals.

2. Tauranga hospital has a high incidence of injury for their elderly male population.

3. Rotorua hospital has the highest incidence of injury for the 15 to 24 year olds of all the hospitals.
Percentage of Trauma Events by Age Group and MRTS Hospital for **Females**: Expected versus Observed

- **Waikato, Tauranga and Lakes Hospitals** all see high incidence rates in their elderly. The rate in Tauranga is extreme.
- **Taranaki** has a relatively flat distribution of incidence rates across the age groups.

**Female Incidence of Trauma Events Per 100,000 by Age Group and MRTS Hospital**

- Waikato, Tauranga and Lakes Hospitals all see high incidence rates in their elderly. The rate in Tauranga is extreme.
- Taranaki has a relatively flat distribution of incidence rates across the age groups.
Severity
93% of trauma events are classed as Minor, with the remaining 7% being Major.

Number of Trauma Events by Severity and MRTS Hospital

<table>
<thead>
<tr>
<th>Severity</th>
<th>Waikato</th>
<th>Tauranga</th>
<th>Lakes</th>
<th>Taranaki</th>
<th>Midland Regional Trauma System Total</th>
<th>Percentage of Events</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minor; ISS&lt;16</td>
<td>2,090</td>
<td>1,000</td>
<td>747</td>
<td>518</td>
<td>4,334</td>
<td>98%</td>
</tr>
<tr>
<td>Major; ISS&gt;15</td>
<td>167</td>
<td>76</td>
<td>41</td>
<td>27</td>
<td>311</td>
<td>7%</td>
</tr>
<tr>
<td>Total</td>
<td>2,257</td>
<td>1,076</td>
<td>788</td>
<td>545</td>
<td>4,645</td>
<td>100%</td>
</tr>
</tbody>
</table>

Number of Trauma Events by Severity, Age Group and Gender

Note: The y-axis scales are different.

Number of Critical Trauma Events (ISS>25) by Age Group and Gender

Number of Critical Trauma Events (ISS>25) by MRTS Hospital

<table>
<thead>
<tr>
<th>Severity</th>
<th>Waikato</th>
<th>Tauranga</th>
<th>Lakes</th>
<th>Taranaki</th>
<th>Midland Regional Trauma System Total</th>
<th>Percentage of Events</th>
</tr>
</thead>
<tbody>
<tr>
<td>Critical; ISS&gt;25</td>
<td>54</td>
<td>27</td>
<td>9</td>
<td>9</td>
<td>99</td>
<td>2%</td>
</tr>
</tbody>
</table>
Mechanism

The top five trauma mechanisms accounting for 69% of trauma events are:

- Falls
- RTCs
- Struck by’s (by an object)
- Motorcycle Accidents
- Assaults

Percentage of All Trauma Events by Mechanism and MRTS Hospital

<table>
<thead>
<tr>
<th>Mechanism</th>
<th>Waikato</th>
<th>Tauranga</th>
<th>Lakes</th>
<th>Taranaki</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fall</td>
<td>38%</td>
<td>44%</td>
<td>40%</td>
<td>33%</td>
<td>39%</td>
</tr>
<tr>
<td>RTC</td>
<td>11%</td>
<td>11%</td>
<td>12%</td>
<td>10%</td>
<td>11%</td>
</tr>
<tr>
<td>Struck by (by an object)</td>
<td>7%</td>
<td>9%</td>
<td>9%</td>
<td>13%</td>
<td>8%</td>
</tr>
<tr>
<td>Motorcycle accident</td>
<td>7%</td>
<td>5%</td>
<td>6%</td>
<td>5%</td>
<td>6%</td>
</tr>
<tr>
<td>Assault</td>
<td>7%</td>
<td>5%</td>
<td>6%</td>
<td>3%</td>
<td>6%</td>
</tr>
<tr>
<td>Contact with sharp object</td>
<td>8%</td>
<td>4%</td>
<td>3%</td>
<td>5%</td>
<td>5%</td>
</tr>
<tr>
<td>Pedestrian cyclist</td>
<td>3%</td>
<td>3%</td>
<td>7%</td>
<td>6%</td>
<td>4%</td>
</tr>
<tr>
<td>Contact with other specified machinery</td>
<td>4%</td>
<td>4%</td>
<td>2%</td>
<td>5%</td>
<td>4%</td>
</tr>
<tr>
<td>Caught, crushed, jammed</td>
<td>4%</td>
<td>2%</td>
<td>2%</td>
<td>4%</td>
<td>3%</td>
</tr>
<tr>
<td>Bitten by animal</td>
<td>3%</td>
<td>1%</td>
<td>2%</td>
<td>2%</td>
<td>2%</td>
</tr>
<tr>
<td>Exposure to smoke, fire, flames</td>
<td>2%</td>
<td>2%</td>
<td>3%</td>
<td>1%</td>
<td>2%</td>
</tr>
<tr>
<td>Other (from the 91st percentile)</td>
<td>11%</td>
<td>10%</td>
<td>9%</td>
<td>9%</td>
<td>10%</td>
</tr>
<tr>
<td>Total</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
</tr>
</tbody>
</table>

Summarising the anomalies in the mechanism category;

- Trauma in patients over the age of 70 years is primarily due to:
  - Falls (63%)
  - RTC (15%)
- Trauma events in females 70 years and older are primarily due to falls (71%)
- The top four categories of male patients aged 15 to 34 years olds are:
  - Falls (22%)
  - Struck by (by an object) (14%)
  - RTC (13%)
  - Assault (12%)
- Trauma events in children aged between 0 and 9 years are primarily due to:
  - Falls (53%)
  - Caught, Crushed, Jammed (10%)
• In the falls category:
  
  o Patients between 0 and 9 years old primarily had a fall on a multi-level surface or playground equipment.

  o Of patients 70+ years old the majority (56%) fell on a same level surface.
Type of Injury

Percentage of Trauma Events by Severity and Type of Injury

<table>
<thead>
<tr>
<th>Severity</th>
<th>Blunt</th>
<th>Penetrating</th>
<th>Burn</th>
<th>Midland Regional Trauma System Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minor; ISS&lt;16</td>
<td>93%</td>
<td>4%</td>
<td>3%</td>
<td>100%</td>
</tr>
<tr>
<td>Major; ISS&gt;15</td>
<td>94%</td>
<td>6%</td>
<td>2%</td>
<td>100%</td>
</tr>
<tr>
<td>Total</td>
<td>98%</td>
<td>9%</td>
<td>3%</td>
<td>100%</td>
</tr>
</tbody>
</table>

Percentage of Critical Trauma Events by Type

<table>
<thead>
<tr>
<th>Severity</th>
<th>Blunt</th>
<th>Penetrating</th>
<th>Burn</th>
<th>Midland Regional Trauma System Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Critical; ISS&gt;25</td>
<td>98%</td>
<td>1%</td>
<td>1%</td>
<td>100%</td>
</tr>
</tbody>
</table>

These percentages are consistent across the MRTS hospitals.

Outcome

Overall 99.3% of trauma patients survived to discharge. There were 34 deaths recorded for the period measured. Mortality under 10% for ISS>15 is generally considered a benchmark for best practice.

Percentage of Trauma Events by Severity and Outcome

<table>
<thead>
<tr>
<th>Severity</th>
<th>Alive</th>
<th>Dead</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minor; ISS&lt;16</td>
<td>99.8%</td>
<td>0.2%</td>
</tr>
<tr>
<td>Major; ISS&gt;15</td>
<td>91.6%</td>
<td>8.4%</td>
</tr>
<tr>
<td>Total</td>
<td>99.3%</td>
<td>0.7%</td>
</tr>
</tbody>
</table>

The majority of the deceased patients had a mechanism of:

- Falls
- RTC
- Pedestrian

Count of Mortality by MRTS Hospital

<table>
<thead>
<tr>
<th>Mortality</th>
<th>Waikato</th>
<th>Tauranga</th>
<th>Lakes</th>
<th>Taranaki</th>
<th>Midland Regional Trauma System Total</th>
<th>Midland Regional Trauma System Total</th>
<th>Percentage of MRTS Total Events</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minor; ISS&lt;16</td>
<td>3</td>
<td>4</td>
<td>1</td>
<td>0</td>
<td>8</td>
<td>0.2%</td>
<td></td>
</tr>
<tr>
<td>Major; ISS&gt;15</td>
<td>12</td>
<td>8</td>
<td>2</td>
<td>4</td>
<td>26</td>
<td>8.4%</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>15</td>
<td>12</td>
<td>3</td>
<td>4</td>
<td>34</td>
<td>0.7%</td>
<td></td>
</tr>
</tbody>
</table>