Introduction:

The Auckland City Hospital Trauma Registry was established in December 1994 and as at 31 December 2009 the registry contained 19,559 patient entries.

Entry criteria:

Data is collected on all patients admitted to hospital following injury with the following exceptions:

- Injuries that are the result of pathological conditions.
- Late trauma transfers. Where a patient is transferred from another hospital where his/her initial treatment was expected to have been definitive.
- Hanging and drowning.
- Elderly patients who sustain femoral neck fractures for simple falls or other minor injuries when admission is primarily related to associated co morbidity.

Data collection:

Data is extracted from the patient charts during the daily ward round and recorded on a data collection form which is regularly reviewed and updated while the patient is in hospital.

Audit:

Each week the data forms are reviewed for accuracy and completeness during the Thursday trauma team audit meeting. Once signed off by the team they are ready for entry into the registry.

Trauma registry:

Collector® is the software used for the registry. The dataset is specifically configured to the requirements of Auckland City Hospital. Data is entered into the registry from the collection form after the patient has been discharged from hospital.
Trauma admissions:

During the 10 year time period the overall number of trauma patients admitted has trended downwards. Between 1131 and 1353 patients have been admitted per year (mean 1235). The total number of admissions for the period was 12,350.

![Total Trauma admissions 2000-2009](image)

During the decade of this report the only change in catchment area or service delivery has been in the development of a neurosurgical unit at Waikato Hospital. From 2007 this had the effect of reducing the small number of transfers of neurosurgical patients (see figure 8). ED presentations on the other hand have increased by approximately 4% year on year. This increase in ED presentations has been associated with a decrease in the number of admitted trauma patients. This reduction in admitted patients either represents a decrease in the incidence or severity of trauma presenting to ACH or a more stringent admission policy with additional resources available in the community to assist injured patients not admitted to hospital.
Major trauma:

Major trauma categorises patients with the most life threatening injuries.

The definition used at Auckland City Hospital is:

- Patients with an injury severity score (ISS) >15 or
- Patients who have been admitted to the Department of Critical Care Medicine (DCCM) or
- Patients who have died in hospital.

![Major trauma 2000-2009](Figure 2)

The number of major trauma admissions (in contradistinction to all trauma admissions) has stayed steady over the decade reported. The only significant change in service delivery during this period has been the creation of a neurosurgical unit at Waikato Hospital in 2007. Previously all patients requiring neurosurgical intervention were transferred to Auckland but after the creation of the unit at Waikato Hospital all neurosurgical trauma from the Midland region stayed in the region.

This change in service provision resulted in a drop of between 10 to 20 patients per year in the number of transfers from Waikato Hospital and a commensurate drop in the number of craniotomies performed for acute trauma by the neurosurgical service at Auckland City Hospital.
Total trauma admissions v major trauma:

The linear graph shows the comparison between the number of overall trauma admissions, which is decreasing, and the steady number of major trauma admissions.
Age and sex distribution:

The patterns of age and sex distribution of patients admitted to the ACH Trauma Service are consistent with most other trauma units elsewhere in the world. Between ages 15 and 65 males predominate, particularly in the 15-45 age bracket. After age 65 females predominate. It is worth noting that this older age female predominance exists despite the ACH Trauma Registry excluding femoral neck fractures and other injuries related to co morbidity such as osteoporosis and metastatic disease.
Transfers:

Auckland City Hospital is a major tertiary hospital and therefore receives transfers of patients from a range of secondary hospitals for specific injury complexes. Cardiothoracic and neurosurgical referrals form the predominant surgical reasons for transfer but urology, vascular, OHNS, and some aspects of both orthopaedic and general surgery are also reasons for transfer to Auckland City Hospital on occasions. Auckland City Hospital also contains the regional Intensive Care Unit and some patients are transferred primarily for intensive care although trauma patients in this category also have one or more surgical specialties involved (although not necessarily at a tertiary level).

Over the period of this report the numbers of major trauma transfers have varied to some degree but they have remained within the range of 25 - 35% of major trauma overall (Figure 5).

While most transfers have been from the Auckland or Northland District Health Boards, referrals for neurosurgical cases came from the Midland District Health Board for neurosurgical cases prior to 2007 and some referrals came from as far away as the South Island for specific subspecialty areas within both general and orthopaedic surgery.
Transfers:

Major trauma transfers
Originating hospitals - 10 years

Major trauma transfers
Originating hospitals - except Midland

Transfers from Waikato Hospital

Auckland City Hospital Trauma Registry Report 2000-2009
Transfers:

As can be seen from Figure 8, the number of transfers from Waikato Hospital dropped dramatically after 2007 when the local neurosurgical unit commenced operations. This is similarly reflected in the decrease in number of urgent craniotomies and craniectomies performed by the Neurosurgical service at Auckland City Hospital from 2007 which is reflected in Figure 9.
Motor vehicle related trauma comprising motor vehicle occupants, motorcycle riders, pedestrians and riders of non powered vehicles (e.g. cyclists) form the largest group of patients who were admitted with major trauma. Falls, “other” (usually blunt assault) and penetrating injuries form the remainder. This pattern is in concert with the patterns seen in other countries where blunt trauma predominates and guns are not freely available.
Admitting specialty:

Orthopaedic injuries are the most common result and it is not surprising that Orthopaedics is the most common admitting specialty.

Most severely injured patients are admitted to intensive care but a significant number with AIS ≥3 head injuries are admitted to the neurosurgical unit and many of this group qualify as major trauma as well. Some patients with both general surgical and orthopaedic injuries have combinations of injury usually at the AIS 3 level, which see them characterised as major trauma, but not severely enough injured to require admission to ICU.
Discharge destination:

The vast majority of patients are discharged home after an injury related admission, without special assistance. A small number, predominantly those with significant head injuries, are discharged to a rehab facility.

The majority of major trauma patients have a head injury of some degree. These patients have a significant mortality (17%) and a high number of patients require further care at a rehabilitation facility.
Discharge destination:

Destination on discharge - Major trauma, head injury AIS>2

Figure 16
Discharge details:

Mean length of stay - Excluding deaths

Median length of stay - Excluding deaths
Discharge details:

Number of days in hospital (excluding deaths)
Total Trauma Admissions - 10 years

![Figure 19](image)

Number of days in hospital (excluding deaths)
Major Trauma Admissions - 10 years

![Figure 20](image)

As can be seen in tables 17 – 20, trauma patients consume a significant bed day resource both in ICU and in hospital. Over the 10 years of this report trauma patients utilised an average of 8 days in hospital per patient.
Patient outcomes:

<table>
<thead>
<tr>
<th></th>
<th>ISS ≥16</th>
<th></th>
<th>ISS&lt;16</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Total</td>
<td>Died</td>
<td>Mortality %</td>
<td>Total</td>
</tr>
<tr>
<td>Blunt</td>
<td>2184</td>
<td>317</td>
<td>14.5</td>
<td>Blunt</td>
</tr>
<tr>
<td>Penetrating</td>
<td>78</td>
<td>10</td>
<td>12.8</td>
<td>Penetrating</td>
</tr>
</tbody>
</table>

Trauma in Auckland is predominantly blunt with only 10% of all trauma and <5% of major trauma being penetrating.

![Cause of death](image)

Brain injury is the predominant cause of death after trauma at Auckland City Hospital
Injury Severity Scores:

ISS v Average length of stay (excluding deaths)

As would be expected increasing severity of injury is associated with increasing length of stay for survivors.

<table>
<thead>
<tr>
<th>ISS Category</th>
<th>Average no of days</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 - 8</td>
<td>5.8</td>
</tr>
<tr>
<td>9 - 15</td>
<td>8.7</td>
</tr>
<tr>
<td>16 - 24</td>
<td>12.7</td>
</tr>
<tr>
<td>25 - 40</td>
<td>21.3</td>
</tr>
<tr>
<td>41 - 75</td>
<td>28.3</td>
</tr>
</tbody>
</table>

Length of stay and mortality are proportional to injury severity. Mortality below ISS 16 is related primarily to medical co-morbidity rather than the direct consequence of the injuries or their treatment.

Mortality rate within each ISS Category

<table>
<thead>
<tr>
<th>ISS Category</th>
<th>&lt;16</th>
<th>%</th>
<th>16-24</th>
<th>%</th>
<th>25-40</th>
<th>%</th>
<th>41-75</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>42/10,086</td>
<td>0.4</td>
<td>69/1,346</td>
<td>5.1</td>
<td>201/795</td>
<td>25.3</td>
<td>58/122</td>
<td>47.5</td>
</tr>
</tbody>
</table>
Mode of Transport to Hospital:

Mode of Transport - All admissions

- Ambulance: 62%
- Helicopter: 4%
- Fixed Wing: 1%
- Private vehicle: 33%
- Other: 0%

Mode of Transport - Major Trauma

- Ambulance: 81%
- Helicopter: 8%
- Fixed Wing: 2%
- Private vehicle: 0%
- Other: 9%

Most patients were transported to hospital by ambulance although a significant number suffering minor trauma either transported themselves or were transported by private vehicle. No patients arrived by fixed wing aircraft.
Glasgow coma scale for major trauma patients on admission:

Using GCS definition, 18% of major trauma patients had a severe head injury (GCS ≤ 8).

When AIS ≥3 rather than GCS ≤8 is used as the definition for major trauma a different distribution results. As can be seen, 53% of patients who have severe head injury as defined by AIS≥3 do not have a GCS which meets the Accident Compensation Corporation definition of severe head injury.
TRISS scores:

TRISS scores combine ISS and presenting physiology and estimations of probability of death.

Total deaths for period = 370  
Number of deaths with TRISS available = 240
Unexpected deaths:

The Z statistic and W score compare Trauma Centre performance.

<table>
<thead>
<tr>
<th></th>
<th>z</th>
<th>W</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adult Blunt</td>
<td>0.19</td>
<td>-</td>
<td>5174</td>
</tr>
<tr>
<td>Adult Penetrating</td>
<td>3.04</td>
<td>1.57</td>
<td>494</td>
</tr>
<tr>
<td>Paediatric</td>
<td>0</td>
<td>-</td>
<td>0</td>
</tr>
<tr>
<td><strong>Total subset</strong></td>
<td>0.93</td>
<td>-</td>
<td>5668</td>
</tr>
</tbody>
</table>

**z and W Report**

2005 - 2009

<table>
<thead>
<tr>
<th></th>
<th>z</th>
<th>W</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adult Blunt</td>
<td>3.62</td>
<td>0.76</td>
<td>4893</td>
</tr>
<tr>
<td>Adult Penetrating</td>
<td>2.93</td>
<td>1.46</td>
<td>500</td>
</tr>
<tr>
<td>Paediatric</td>
<td>0.34</td>
<td>-</td>
<td>4</td>
</tr>
<tr>
<td><strong>Total subset</strong></td>
<td>4.22</td>
<td>0.83</td>
<td>5397</td>
</tr>
</tbody>
</table>

**z and W Report**

2000 - 2009

<table>
<thead>
<tr>
<th></th>
<th>z</th>
<th>W</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adult Blunt</td>
<td>2.72</td>
<td>0.39</td>
<td>10067</td>
</tr>
<tr>
<td>Adult Penetrating</td>
<td>4.22</td>
<td>1.52</td>
<td>994</td>
</tr>
<tr>
<td>Paediatric</td>
<td>0.34</td>
<td>-</td>
<td>4</td>
</tr>
<tr>
<td><strong>Total subset</strong></td>
<td>3.67</td>
<td>0.49</td>
<td>11065</td>
</tr>
</tbody>
</table>

A Z statistic >1.96 is considered statistically significant. A value >+1.96 indicated more survivors than expected and a negative value indicates fewer survivors than expected.

The W score is the number of additional survivors than may have been expected per 100 patients. The result shown here indicated significantly more survivors than may have been expected for both blunt and penetrating trauma and the results, particularly for blunt trauma are much better in the second quinquennium from 2005 – 2009, than the earlier one from 2000 – 2004.

The results confirm the quality of trauma care provided at Auckland City Hospital
Auckland City Hospital Trauma Service:

Dr Ian Civil  Co Director
Dr Alex Ng  Co Director

Fellows/Registrars

Dr Ros Pochin  December 2000 – December 2001
Dr Glenn Farrant  December 2001 – June 2002
Dr Gowan Creamer  June 2002 – December 2002
Dr Grant Christey  December 2002 – December 2004
Dr Michael Lushkott  January 2005 – December 2005
Dr Gowan Creamer  December 2005 – May 2006
Dr Jia Min Pang  June 2006 – December 2006
Dr Li Hsee  December 2006 – December 2007
Dr Savitha Bhagvan  December 2007 – December 2008
Dr Heather Wilson  December 2008 – December 2009

Trauma Co-ordinator

Rhondda Paice

Trauma Systems Co-ordinator

Rangi Dansey

Team Administrator/Data entry

Lynn Tucker

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www.adbh.govt.nz/ trauma/
www.trauma.co.nz
Auckland City Hospital
Trauma Registry Report
2000 – 2009