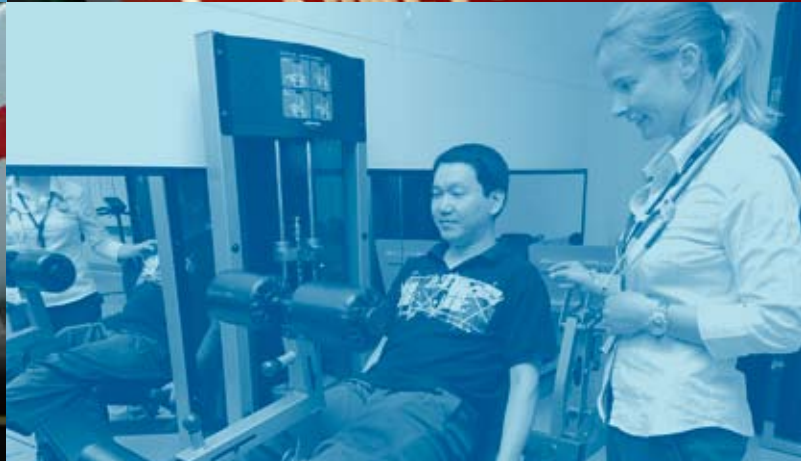


Trauma towards 2014

Review and future directions of the Victorian State Trauma System



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Foreword

The tragedy of serious road accidents and other major trauma confronts us daily through the media. While we all hope this won't happen to us or any of our loved ones, we need to know that the best possible treatment and care will be available if we are unfortunate enough to experience major trauma.

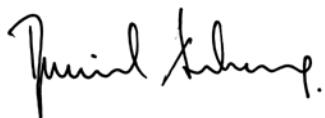
Victoria has an excellent record in trauma care and is internationally renowned for its work in this area. The Victorian State Trauma System (VSTS) has been introduced progressively since 2000 to ensure that trauma patients are taken to the right hospital in the quickest possible time and receive the highest standard of care. The results of this system speak for themselves: survival rates following major trauma have improved and compare very favourably with international experience. In addition, Victorian trauma patients are spending less time in hospital and more are able to go home rather than to inpatient rehabilitation.

The successes of the VSTS are the result of investment by the Victorian Government to date and the hard work and dedication of many organisations and individuals. These include the paramedics, doctors, nurses, rehabilitation clinicians and other professionals who care for over 2,400 major trauma patients each year; saving lives and relieving suffering with skill, efficiency and compassion.

Everyone involved in the VSTS should be proud of its achievements, but we all recognise that there is important work still to do. The State Trauma Committee and other major stakeholders have identified several areas the VSTS needs to further develop and refine to ensure that it continues to deliver outstanding trauma care.

I am pleased to introduce *Trauma towards 2014*, a five-year strategic framework for the continued development of the VSTS. Key priorities include meeting the education and training needs of the trauma workforce, reviewing the triage and transfer guidelines that underpin the system, and ensuring that rehabilitation services are integrated into the VSTS.

In commending *Trauma towards 2014* to you, I want to underline the Government's commitment to making sure Victoria continues to lead the way in providing world class trauma care. We will build on our achievements to date to offer every major trauma patient the best chance of surviving and making a good recovery.



HON DANIEL ANDREWS MP
MINISTER FOR HEALTH

Executive summary

Victoria has been a significant leader in the development and implementation of innovations to reduce injuries and improve the care of trauma patients. This has included progressive traffic injury prevention programs that have led to Victoria having one of the lowest road fatality rates in the world. Injury prevention programs have been successful in reducing injuries in the workplace, near drownings and burns. Victoria's success in injury prevention has been matched by significant improvements in the management and treatment of trauma injury patients.

The Victorian State Trauma System (VSTS) was established in 2000 following the *Review of Trauma and Emergency Services (1999) (ROTES)*, which found improvements to reduce trauma mortality and morbidity could be obtained by enhancing trauma patient management at all stages. Underpinning the findings of the review was the concept that the right patient be delivered to the right hospital in the shortest time. The review made more than 100 recommendations that provided a framework for an integrated system of care for patients that sustain significant injury. The key features of the system included:

- Designation of two adult and one paediatric hospital as Major Trauma Services (MTS), functioning as the hub of an integrated system.
- Statewide system organisation and management of trauma response.
- Development of triage and transfer protocols.
- Improvements in communications protocols and technology.
- Enhancement of retrieval and transfer services.
- Education and training.
- Research, service and technology developments.
- Funding structure to sustain the system.
- Quality management, including monitoring major trauma victims across the state.

Following a progressive roll out, implementation of the recommendations is virtually complete and the VSTS is established. Key improvements have been that 80 per cent of all major trauma patients are treated at a MTS; a reduction in mortality rates with fewer than expected deaths according to international benchmarks; positive trends in preventable deaths; and, reduced length of stay in hospitals.

Trauma towards 2014 has been an opportunity to reflect on the establishment and building of Victoria's trauma system, note the improvements in patient management and outcomes achieved, and consider how the VSTS can continue to be enhanced into the future. This review has been conducted by the Department of Human Services in collaboration with the State Trauma Committee (STC), with broad stakeholder consultation.

Strengths and weaknesses

There is unanimous agreement that the Victorian State Trauma System has been highly effective in improving the clinical management and outcomes of major trauma patients. Factors thought to underpin success of the system were:

- Establishment of three major trauma centres as centres of excellence.
- Clear and consistent system response to trauma management, ensuring patients receive definitive care at an appropriate health service.
- Monitoring of the system via the Victorian State Trauma Registry (VSTR), providing quality data to inform system improvements.

Establishment of the new Adult Retrieval Service was considered to have improved the coordination and timely transfer of patients and government investment in ambulance infrastructure has also improved patient outcomes.

Though the VSTS is well regarded by stakeholders and the system's effectiveness and improvement in patient outcomes supported by quality data, areas for improvement have been identified.

Education and training was considered an area for improvement, to address issues such as perceived deskilling of staff not working in a Major Trauma Service and having reduced exposure to patients with significant injury. Mindful of the health sector-wide workforce demands, particularly for nursing and medical staff, strengthening the trauma workforce through strategies to recruit and retain were identified as priorities.

Advice, feedback and follow up about patient outcomes for hospitals that refer patients onto a MTS would improve communication, support and education for referring service providers.

It was generally agreed that *Trauma towards 2014* provides an opportunity to discuss and review the transfer and triage guidelines, and the need for further development and standardisation of clinical guidelines and protocols. Also identified was the need for a renewed focus on trauma system quality assurance processes.

The need for greater consideration of a patient's full journey, particularly the post acute period, was acknowledged. A key aspect of this would be expanding data collection to include the sub-acute and rehabilitation periods with more comprehensive analysis and understanding of patient outcomes.

The need for improved communication regarding governance of the trauma system was highlighted and the continued investment in the system by government.

Trauma towards 2014 recommendations

The following initiatives have been identified to ensure the continued refinement and further strengthening of the Victorian State Trauma System.

Education and training

- Promulgate the findings of the Trauma Education Group (TEG) performance stocktake of *A trauma education framework for Victoria*.
 - Update *A trauma education framework for Victoria*, based on the stocktake outcomes.
 - Develop a marketing strategy for the revised framework.
 - Consider conducting a trauma education and training needs analysis.
 - Identify appropriate skill set requirements for staff at different designated trauma services.
 - Consider methods to improve the coordination of trauma education and training.
- Clarify roles and responsibilities to strengthen Major Trauma Services' education and training leadership role.
- Clarify funding for trauma education and training.
 - Clarify funding sources to support trauma education and training.
 - Develop pathways to assist health sector staff to access education, training, research and funding information and assistance.
- Support the forging of partnerships between MTSs and rural/regional health services to foster rotation of medical and nursing staff to broaden and develop major trauma knowledge and experience.
 - Assist MTSs and regional/metropolitan trauma services in developing a rotational roster system for trauma staff to gain broad trauma clinical experience.
 - Consider and evaluate other jurisdictions and international trauma education and training systems with staff rotation elements.
- Develop strategies to support workforce recruitment and retention for rural/regional health services and metropolitan trauma services that incorporate education and training programs.
- Explore opportunities to best promote medical workforce sustainability through collaboration, training and education, particularly to support sub-specialty service provision.
- Improve utilisation of technology to support the delivery of effective training and education programs to non-MTS trauma health professionals.

Advice and feedback to referring hospitals

- Implement the MTS feedback protocols developed to better inform referring hospitals of patient trauma management outcomes.
- Improve the promotion and utilisation of the 1800 TRAUMA and Adult Retrieval Victoria clinician advice and referral phone numbers.
- Identify opportunities to utilise telemedicine formats to support clinical decision making and patient management.

Triage and transfer guidelines

- Review the *Victorian major trauma triage and transfer guidelines*, including the specialist trauma triage and transfer directions.
 - Review current triage guidelines and transfer criteria/targets to ensure the most appropriate and timely responses in line with international experience and evidence-based clinical practice.
- Identify methods to improve and reinforce the promulgation of trauma triage and transfer guidelines across the state.
- Broaden the designation of specialist health services to include the statewide burns management services and other statewide clinical management centres, as appropriate.
- Continue to monitor and support the access and coordination role of Adult Retrieval Victoria to transfer trauma patients with appropriate access to required services, such as intensive care and surgery.

Clinical guidelines and protocols

- Review the current trauma-related practice guidelines with a view to:
 - Identifying gaps.
 - Developing additional guidelines in identified high-priority areas.
 - Developing and promoting a database of relevant clinical guidelines.
- Determine roles and responsibilities for the ongoing management and review of clinical guidelines and protocols.

Quality assurance

- Clarify quality assurance responsibilities and protocols for case reviews of patients managed through the trauma system by more than one health service provider.
 - Strengthen the identification, review and analysis of 'outlier' cases.
 - Strengthen 'sentinel event' monitoring at a statewide level through improved processes and reporting to the department's statewide health services incident database.

Sub-acute and rehabilitation

- Explore options for extending the vision and focus of the VSTS to incorporate the sub-acute and rehabilitation aspects of a patient's journey and their quality-of-life outcomes. This includes both bed based rehabilitation, sub-acute ambulatory care services and burns services.
- Explore opportunities to enhance the alignment of trauma patients' acute management with the sub-acute service system.
- Support the inclusion of appropriate subacute, rehabilitation and burns patient data to the Victorian State Trauma Registry (VSTR).
- Investigate opportunities to interface VSTR with complementary databases, such as those maintained by the Transport Accident Commission (TAC) and rehabilitation services, to improve analysis of trauma patient outcomes.
- Explore options for enhancing analysis of quality of life and functional outcomes for trauma patients through their accessing of services such as rehabilitation, remedial therapies and pain management services.

Governance

- Review membership of the STC and consider broadening it to include professional bodies, burns services, subacute and rehabilitation expertise.
- Improve the promotion of the VSTS and its governance arrangements.
 - Revise the trauma website to better inform stakeholders of STC governance, membership, subcommittees and their activities.
 - Identify and develop strategies to promote and improve stakeholder awareness of the trauma system and its outcomes.
- STC and the department should consider broader strategic development and future management directions for the VSTS and trauma services.

Data collection and reporting

- Consider expanding the data collection window beyond six months post trauma incident to enable better analysis of post injury outcomes for patients.
- Adjust data collection to facilitate improved analysis and understanding of major trauma patient clinical outcomes, such as quality of life and community engagement.
- Investigate the applied analysis of VSTR data to better understand major trauma and inform the development of prevention strategies.
- Greater promotion of the VSTR and wider promulgation of VSTR reports.

System issues and resources

- Review the *Statewide health service trauma role delineation guidelines*.
- Investigate opportunities for increased collaboration, cooperation and resource sharing between the two adult MTSSs.
- Investigate opportunities for increased collaboration, cooperation between the MTSSs, burns services and sub-acute and rehabilitation services.
- Review system-wide trauma funding to ensure sustainability and capability.
- Review the effectiveness and continuing need for the trauma appropriateness payment.
- STC develop a trauma workforce strategy.
- That the department strengthen policy development linkages between trauma and other relevant programs, such as emergency, critical care, statewide surgical services, burns services and subacute and rehabilitation services.

1. Introduction

The Victorian State Trauma System is designed to ensure trauma patients are appropriately triaged and transferred to the right care at the right health service, thereby reducing patient mortality and morbidity, particularly as a result of major trauma. Integral to this system's success is the appropriate and timely primary and secondary transfer of major trauma patients.

The Victorian State Trauma System (VSTS) has been in place for more than six years. Indications are that it is functioning very well overall and has led to significant improvements in outcomes for patients with serious injuries. However, it is timely to review the current system to identify:

- Key achievements and successes.
- Opportunities for improvement.
- Directions for further work to ensure the VSTS continues to evolve in ways that lead to the best possible outcomes for trauma patients.

1.1 Background to the Victorian State Trauma System

The VSTS was progressively introduced following the release of the *Review of Trauma and Emergency Services* (ROTES) report in 1999.

The ROTES taskforce was established by the then Minister for Health, the Hon. Robert Knowles MP, to advise the Victorian Government on ways of improving care for patients who had sustained major injuries. The review was prompted by research showing that, although outcomes for trauma patients in Victoria were comparable with international benchmarks, there were opportunities to reduce mortality and morbidity by improving patient care at all stages of trauma management. These included:

- Reducing times at the accident scene.
- Triage of patients to hospitals best able to meet the needs of time-critical major trauma patients.
- Improving processes for trauma patients requiring inter-hospital transfer.

Consistent with international studies suggesting that outcomes are improved when patients receive definitive treatment at major trauma centres, Victorian research in the 1990s found that the rate of preventable and potentially preventable deaths following major trauma varied widely, depending on the type of hospital providing treatment.

The ROTES report made over 100 recommendations, which together formed a blueprint for an integrated system of care for major trauma patients. The central message of the ROTES report was *'the right patient to the right hospital in the shortest time'*. The proposed system was based on the designation of two adult hospitals and one paediatric hospital as Major Trauma Services (MTS), with other Victorian hospitals assigned to levels within a tiered structure that reflected their different capabilities in trauma management.

The government endorsed the ROTES recommendations with the establishment of the VSTS in 2000. Implementation of the recommendations is now virtually complete.

The establishment and coordination of the VSTS and the Victorian State Trauma Registry (VSTR), which collects data and monitors the effectiveness of the system, was co-funded by the Transport Accident Commission (TAC) and the Department of Human Services. The department and the TAC work collaboratively to ensure an efficient and effective trauma system and a smooth systemic and clinical pathway for the appropriate management of major trauma patients.

1.2 About *Trauma towards 2014*

This report reviews the implementation of the ROTES recommendations and the consequent establishment of the VSTS. Its purpose is to identify specific areas that have worked well, those requiring refinement and to identify new directions for the next five years.

The review and forward planning for the VSTS builds on and extends work already in place to refine the system after its initial implementation, and on broader initiatives that have strengthened the capacity of hospitals, ambulance and retrieval services to manage trauma patients.

The aim of the VSTS continues to be to deliver the right patient to the right hospital in the shortest time. *Trauma towards 2014* will build on this and further enhance trauma management in Victoria to ensure a holistic system that focuses on the entire patient journey from the incident site, acute and sub-acute episode of care, to discharge from care.

This report is based on:

- Analysis of information from the VSTR.
- Consultation with representatives of the following stakeholders groups:
 - The major, metropolitan and regional trauma services.
 - Ambulance Victoria.
 - Adult Retrieval Victoria.
 - Victorian State Trauma Outcome Registry and Monitoring group.
 - Transport Accident Commission.
 - State Trauma Committee (STC) and its working groups.

The remaining sections of the document are:

- Section 2, **Context:** This outlines trends in the occurrence of major trauma and issues in service delivery for major trauma patients.
- Section 3, **Review of Trauma and Emergency Services – 1999:** This describes the ROTES report and the implementation status of its recommendations.
- Section 4, **Victorian State Trauma System:** This describes Victoria's trauma system, presenting data from the VSTR and stakeholder feedback on the strengths and weaknesses of the current system.
- Section 5, **Towards 2014:** The final section of the report outlines priorities and planned initiatives for the continued development of the trauma system over the next five years.

2. Context

Major trauma comprises a low volume – high complexity portion of overall emergency cases. In contrast with the 1.3 million presentations to Victorian emergency departments in 2006–07, the Victorian State Trauma Registry identified 2,378 major trauma patients treated at Victorian hospitals in that year.

The nature of major trauma – the frequent involvement of younger and previously healthy people, and the time-criticality and complexity of the response – presents special challenges for patients, their families and health services.

This section defines major trauma, discusses trends in the profile of major trauma patients, and describes the context in which trauma services are delivered.

2.1 Major trauma patients

In the absence of an internationally-recognised standard definition, the ROTES taskforce adopted the following operational definition of major trauma in injured patients:

- Death after injury.
- Admission to an intensive care unit for more than 24 hours, requiring a period of mechanical ventilation.
- Serious injury to two or more body systems (excluding integumentary).
- Injury severity score¹ (ISS) greater than 15, or
- Urgent surgery for intracranial, intrathoracic or intraabdominal injury, or for fixation of pelvic or spinal fractures.

The VSTR established in response to the ROTES recommendations has since refined this definition to ensure that its data collection captures all major trauma patients in Victoria. The registry records details of trauma patients whose principal diagnosis is injury, irrespective of age, and who meet any of the inclusion criteria listed in Table 1. The first four criteria are based on those recommended in the ROTES report. The remaining inclusion criteria and a set of exclusion criteria (see Table 1) are intended to capture the wider population of potential major trauma patients, while screening out less serious cases.

1 This is a measure used to define injury severity. It incorporates both anatomical and severity indices and is derived from the Abbreviated Injury Scale for anatomic regions. The ISS has been demonstrated to be an important predictor of injury severity and mortality. The scale ranges from one (minor injury) to 75 (mortal injury). Generally, an ISS greater than 15 is taken to be indicative of major trauma because mortality in this group has been shown to be more than 10 per cent.

Table 1: The Victorian State Trauma Registry patient inclusion and exclusion criteria for major trauma

Inclusion criteria

Principal diagnosis of injury plus any of the following:

1. Death after injury.
2. Admission to an intensive care unit or high dependency area for more than 24 hours and mechanically ventilated after admission.
3. Significant injury to two or more ISS body regions or injury severity score (ISS) greater than 15.
4. Urgent surgery for intracranial, intrathoracic or intraabdominal injury, or fixation of pelvic or spinal fractures.
5. Electrical injuries, drowning and asphyxia if admitted to an intensive care unit and have mechanical ventilation for longer than 24 hours.
6. Length of stay of three days or more – unless exclusion criteria apply.
7. Transferred or received from another hospital for further emergency care, or admitted to a high dependency area – unless exclusion criteria apply.

Exclusion criteria

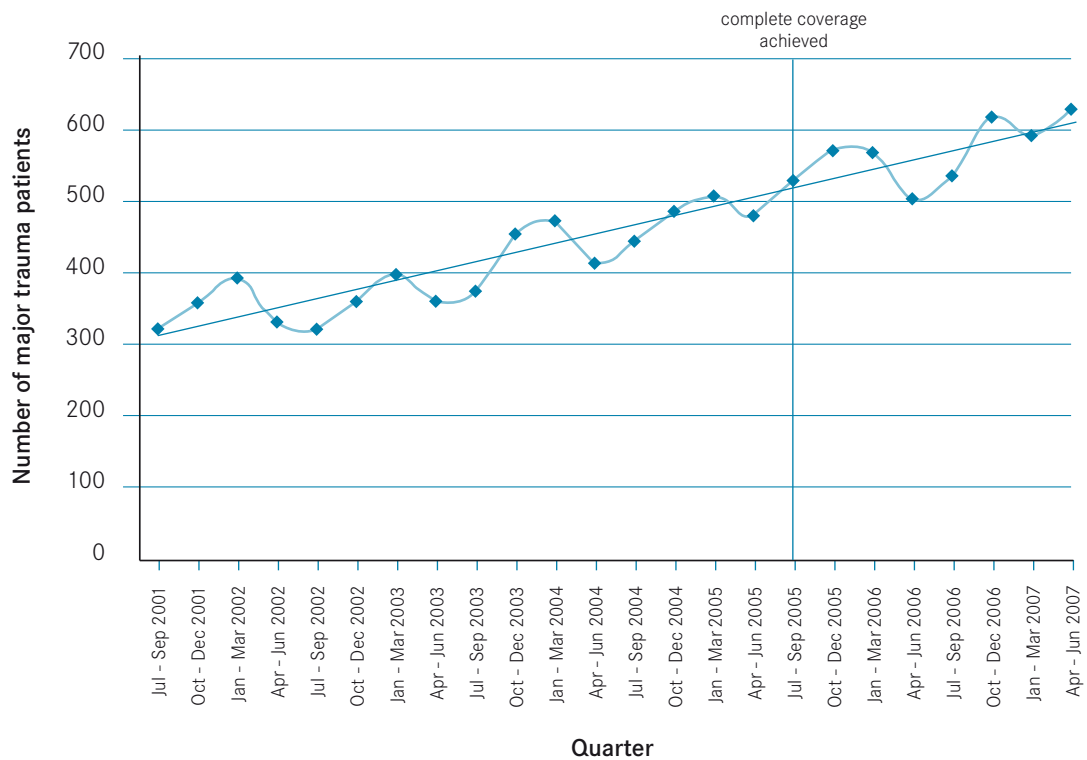
1. Isolated fractured neck of femur.
2. Isolated upper limb joint dislocation, shoulder girdle dislocation (unless associated with vascular compromise) and toe/foot/knee joint dislocation – *unless meets inclusion criteria 1, 2 or 4.*
3. Isolated closed limb fractures only (for example, fractured femur, Colles fracture) – *unless meets inclusion criteria 1, 2 or 4.*
4. Isolated injuries distal to the wrist and ankle only (for example, finger amputations) – *unless meets inclusion criteria 1, 2 or 4.*
5. Soft tissue injuries only (for example, tendon and nerve injury and uncomplicated skin injuries) – *unless meets inclusion criteria 1, 2 or 4.*
6. Burns to less than 10 per cent of the body – *unless meets inclusion criteria 1, 2 or 4.*
7. Isolated eyeball injury.

2.2 Trends in major trauma presentations

Figure 1 shows the number of major trauma patients for each quarter from 2001–02 to 2006–07. The quarterly trends demonstrate seasonal variations in the number of major trauma patients.

The *Victorian State Trauma Registry 2006-07 annual report* identified 2,378 hospitalised major trauma patients that year, or 46 incidents per 100,000 population. This is an increase from 2,176 in 2005–06, a rate of 42 major trauma patients per 100,000. The number of major trauma patients has increased significantly from 2001–02, when the annual rate was 30 per 100,000 population. Part of the observed rise can be attributed to improved case identification and complete health service participation in the registry over recent years.

Figure 1: Trends in the number of hospitalised major trauma patients recorded by the Victorian State Trauma Registry, 2006-07 Annual Report



The trauma registry has also identified changes in the demographic profile of major trauma patients over time, and the cause and intent of their injuries. Trends since 2001–02 are discussed fully in the registry’s 2006–07 annual report. Key points are noted below:

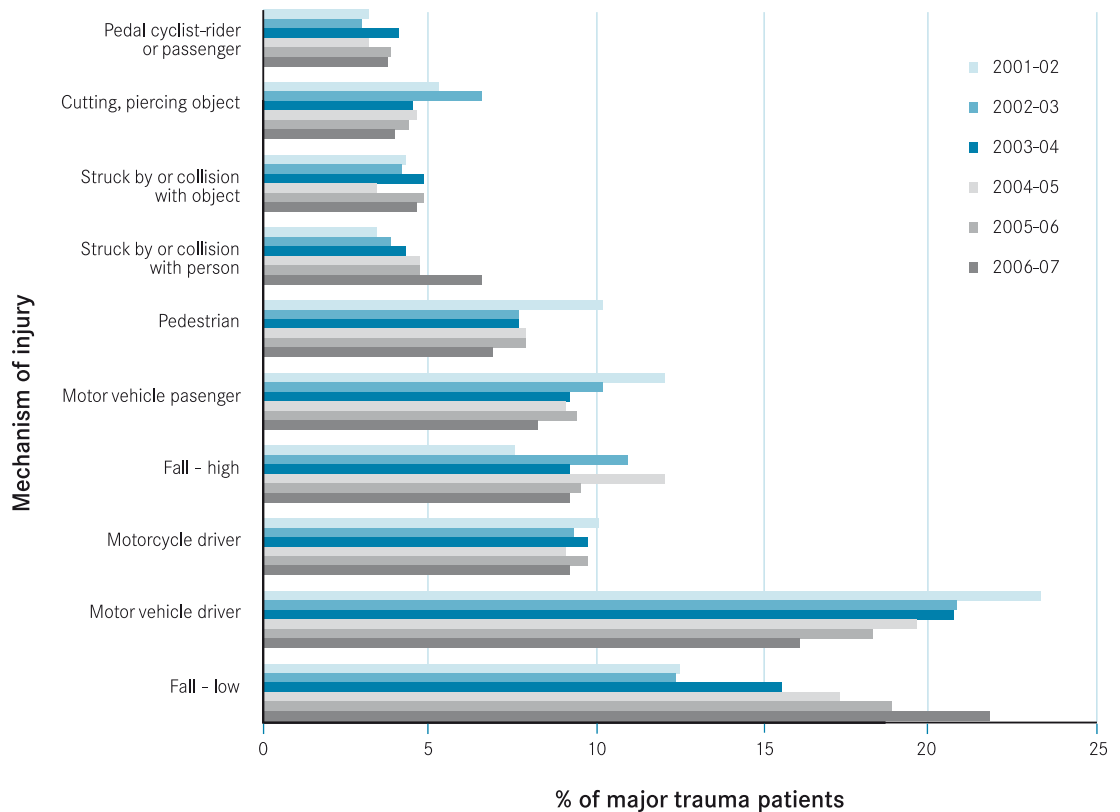
- **Age:** More than half of all major trauma patients are aged between 15 to 44 years. However, while major trauma cases have increased across all age groups, there has been a significant increase in the percentage of major trauma cases aged 75 years and over. This could be explained by the improved coverage of the registry, improvements in case identification at each health service, changes in approaches to diagnosis and management of the elderly and an ageing population.
- **Mechanism of injury:** There has been a significant change in the mechanism of injury of major trauma cases captured by the VSTR between 2001 and 2006 (see Figure 2). In particular, the percentage of hospitalised major trauma cases related to low falls has risen significantly, along with cases resulting from being struck by, or collision with, a person. (The higher percentage of low falls reflects the greater percentage of elderly major trauma cases now captured by the registry). Concurrently, the percentage of major trauma cases involving motor vehicle drivers has fallen for every year of the registry.
- **Place of injury:** Consistent with the predominance of road crashes as a cause of major trauma, roads remain the most common place of injury, but this has fallen from 64 per cent of cases in 2001–02 to 47 per cent of cases in 2006–07. At the same time, there has been a significant rise in major trauma cases occurring at home and in residential institutions (for example, nursing homes), reflecting increases in the registration of low falls and elderly major trauma cases.
- **Injury intent:** The percentage of hospitalised major trauma patients injured as a result of an assault rose from 6.4 per cent (n=86) in 2001–02 to 9.9 per cent (n=229) in 2006–07. Intentional self-harm accounted for 3.1 per cent of all patients in 2006–07 and has remained stable since 2001–02.
- **Injury severity:** The percentage of very severely injured major trauma patients (with an injury severity score greater than 40) decreased significantly from 10.5 per cent in 2001–02 to 8.7 per cent in 2006–07, although the 2006–07 figure was an increase on the 7.6 per cent observed in 2005–06. The median ISS was also higher in 2006–07 than previous years.
- **Head injury severity:** The percentage of major trauma cases with a severe head injury (Glasgow Coma Scale² score less than nine) decreased significantly from 20 per cent in 2001–02 to 13 per cent in 2005–06, predominantly in the road trauma group, but increased slightly to 14.3 per cent in 2006–07.

2 The Glasgow Coma Scale (GCS) is a measure of consciousness ranging from fully conscious (GCS=15) to unconscious (GCS=3). Patients with a GCS score less than nine are considered to have a serious head injury.

The cause of the overall decline in the proportion of severe head injuries is not clear, and may be partly related to changes in patient demographics and mechanism of injury. However, as the capture of major road trauma cases is likely to have been high since the beginning of the registry, the trend towards decreased head injury severity in this group suggests a population-based decrease in serious head injury associated with road trauma. Potentially, this reflects improved vehicle design and safety features, such as airbags, and the presence of safer vehicles on Victorian roads in recent years. Victoria has been at the forefront of innovations to reduce road injuries and, from the 1970s, has progressively introduced traffic injury prevention programs that have cut road fatalities by two thirds.

Injury prevention programs have also been successful in reducing injuries from other causes, including work-related injuries, near drowning and burns.

Figure 2: The 10 most common mechanisms of injury of hospitalised Victorian major trauma patients



2.3 The patient journey

Major trauma patients require intensive treatment that often incorporates a number of different clinical services. Each step in the care pathway is important to the eventual recovery of the patient.

The response to the trauma patient starts at the roadside, or scene of injury, with prehospital assessment, triage and stabilisation. The first hour immediately after sustaining major trauma, commonly referred to as the 'golden hour', is critical to patient survival. This is not a strict deadline, but recognises that many deaths could be prevented by appropriate care shortly after injury and that the risk of death or complications increases with the time taken to get to definitive care. Ambulance personnel must balance the need to stabilise the patient prior to transport with the need to get to a hospital in the quickest possible time. Further assessment and stabilisation often occurs en route to the hospital, prior to reception in the emergency department.

Many major trauma patients may have sustained multi-system and torso injuries: treatment in the emergency department is carried out in conjunction with services provided by various departments of the hospital, such as neurosurgery, orthopaedics, plastics, general surgery, intensive care, anaesthetics, pathology and imaging. At MTSs, specialist trauma staff coordinate care for this complex patient group.

VSTR data for 2006–07 show that while most major trauma patients (70.8 per cent) require only one episode of care, 27.8 per cent experienced two episodes of care and 13.9 per cent had three episodes of care. Forty-six per cent of patients required an intensive care unit admission. The length of the patient's initial hospital stay has tended to decrease over the past six years; excluding burns patients, the mean length of stay was 8.8 days in 2001–02 and 7.6 days in 2006–07.

A period of rehabilitation and convalescence follows the patient's initial surgical and medical treatment. Major trauma patients may be discharged directly home from the hospital where they received their definitive care, or to rehabilitation centres and other forms of special care. A range of community-based and hospital services—including community rehabilitation, allied health, sub-acute, and aged care—may be involved in the patient's recovery from injury and adjustment to any longer-term impairment or disability.

The development of VSTS has led to trauma patients staying fewer days in hospital, receiving less episodes of care and being sent home rather than to inpatient rehabilitation. This has improved patient's functional recovery.

Information about outcomes for major trauma patients is presented in Section 4.2.

2.4 A changing health system

Victoria's trauma system exists in an environment of constantly evolving health service delivery. Health services are striving to improve the quality and efficiency of their services to respond to community expectations and growing demand. Factors contributing to demand pressures include:

- Overall population growth.
- New technologies that enable treatment of previously untreatable conditions.
- An ageing population.
- Increasing prevalence of chronic disease, such as diabetes and heart disease.

The Victorian Government has continued to invest strongly to build the health system's capacity to meet these challenges. As well as providing funding for growth in hospital activity and new facilities and equipment, the government has introduced a range of initiatives to assist health services to:

- Develop models of care that use alternatives to traditional inpatient beds or that reduce the time patients spend in acute hospitals.
- Better manage patients with chronic conditions in the community and prevent avoidable hospitalisation in high-risk populations.
- Apply evidence-based technologies, clinical interventions and practices that improve the quality and cost-effectiveness of patient care.
- Measure, monitor and report on patient experiences, outcomes, care standards and access to care.
- Improve clinical leadership and networking of health professionals.
- Improve working conditions to attract and retain skilled staff.

Ambulance service system improvements of specific relevance to the trauma system are outlined below:

- One of the most important factors influencing patient outcomes is how quickly the patient receives appropriate medical care at the scene by ambulance crews, prior to transport to hospital. There has been a significant investment in the provision of Advanced Life Support training for ambulance paramedics and the provision of additional ambulance and Mobile Intensive Care Ambulance (MICA) paramedic positions across Victoria.
- General paramedic education has also been enhanced with paramedics now attaining degree-level qualifications equivalent to many other health professions, including nursing.
- Rollout of the Victorian Ambulance Clinical Information System (VACIS) across Victoria is allowing increased review and research into patient clinical outcomes.
- Reconfiguration of the MICA paramedic workforce and their resources in metropolitan Melbourne has achieved greater distribution and availability of this specialised workforce to time-critical incidents.
- Investment in the deployment of Peak Period Units (PPU) has provided additional paramedic crews during times of consistently higher demand across metropolitan Melbourne.
- Professional fire fighters and community volunteers provide trained groups of locally-based first responders to time-critical incidents across Victoria, such as suspected cardiac arrest.
- There continues to be investment in infrastructure to support paramedic crews, such as the ambulance vehicle replacement strategy, air ambulance as a transport platform, as well as capital works across Victoria with new ambulance stations and upgrades to ambulance stations, to better support road paramedic crews.
- Investment in air ambulance services including upgrading the fixed wing fleet; an additional emergency helicopter based at Bendigo (HEMS 3) and 24-hour flight co-ordination capacity at Essendon airport.

2.5 Developments in trauma-related services

2.5.1 Ambulance services

The *2008–09 State Budget* contained the single biggest investment in the state's ambulance services to date for a range of commitments to strengthen ambulance services in Victoria.

These include:

- A new ambulance helicopter for south west Victoria.
- A dedicated retrieval helicopter to bring critically ill or injured adults, children or babies from regional hospitals to specialist care in Melbourne.
- 258 new paramedics for 59 new and upgraded ambulance services based in 48 towns or suburbs.

As well as new funding for service delivery, the very way the state's ambulance services work has been changed, with the Metropolitan Ambulance Service and Rural Ambulance Victoria becoming one organisation. The combined organisation, Ambulance Victoria, commenced operation on 1 July 2008.

2.5.2 Adult Retrieval Victoria

In November 2007, a new service, Adult Retrieval Victoria (ARV), replaced the Victorian Adult Emergency Retrieval and Coordination Service. ARV is operated by Ambulance Victoria (formerly the Metropolitan Ambulance Service, MAS). The integration of the adult retrieval service into AV was the result of a review by the Department of Human Services, which identified the opportunity for improvements in service delivery.

As providers of adult retrieval and critical care services, ARV has the following functions as the state's entry point to the VSTS:

1. **Telephone advice:** Critical care coordinators are available to advise on the clinical care of critically ill patients 24-hours a day and can provide advice irrespective of whether a retrieval is required.
2. **Retrieval of patients:** ARV evaluates the practicality and clinical benefit of transferring a critically ill patient from the source hospital. If a transfer is necessary, the service organises transport and the appropriate clinical staff to accompany the patient and arranges a suitable critical care bed at the receiving hospital.
3. **Bed coordination:** ARV liaises closely with public and private hospital intensive care units and coronary care units to facilitate access to critical care beds when required. It monitors the availability of critical care beds in the state and seeks to optimise the use of state critical care resources.

The service is available 24-hours a day, 365 days a year, via the ARV 1300 36 86 61 or Trauma Advice and Referral 1800 70 00 01 contact line.

Paediatric Emergency Transport Service

The Paediatric Emergency Transport Service (PETS) provides advice and support to clinicians and transfers critically ill children from hospitals throughout Victoria, Tasmania and southern New South Wales to the Royal Children's Hospital and MMC. Expert interhospital transfers and clinical advice is provided for children less than 16 years old who weigh more than five kilograms. PETS is based at the Paediatric Intensive Care Unit of the Royal Children's Hospital.

2.5.3 Intensive care services

Over recent years, there has been increased demand for intensive care unit (ICU) beds. Demand for ICU beds is also unpredictable: there are sometimes periods of very high demand according to seasonal patterns of illness and demand for elective surgery.

The Victorian Government has been steadily increasing ICU bed numbers across the state. The average number of open ICU beds increased from 139 in 2004–05 to 158.6 in 2006–07 and funding has been provided for an additional five ICU beds in 2007–08 and a further six beds (including one paediatric intensive care bed) to be opened in 2008–09.

The key limiting factor in opening additional intensive care beds is the worldwide shortage of skilled nursing staff. The government is addressing this issue through workforce innovation strategies (such as development of ICU nurse liaison roles and implementation of medical emergency teams to provide an early response to patients who may require admission to intensive care) and post-graduate critical care nursing scholarships.

3. Review of Trauma and Emergency Services - 1999

The *Review of Trauma and Emergency Services* (ROTES) report provided comprehensive advice to the Victorian Government on a best practice model for the integration and enhancement of trauma services.

The report made over 100 recommendations for the implementation of a trauma system aimed at reducing preventable death and permanent disability. The main theme of the report – an integrated trauma system that matches the needs of injured patients to an appropriate level of treatment – was supported by international evidence and endorsed by local medical colleges and professional organisations.

The Ministerial Taskforce on Trauma and Emergency Services worked closely with an existing departmental advisory group, the Working Party on Emergency and Trauma Services, to develop the report.

3.1 ROTES recommendations

Appendix 1 provides a detailed account of progress against each of the ROTES recommendations. The recommendations of the report addressed a number of areas to ensure the establishment of an integrated and coordinated trauma system for the care of patients who have sustained major injuries. The fundamental components of this system included:

- The designation of two adult and one paediatric hospital as MTSs, functioning as the hub of an integrated system.
- System organisation and management.
- Development of triage and transfer protocols.
- Improvements in communications protocols and technology.
- Enhancement of retrieval and transfer services.
- Education and training.
- Research, service and technology developments.
- A funding structure to sustain the system.
- Quality management, including monitoring of major trauma victims across the state.

In 2006, the department conducted a ‘stocktake’ of progress in implementing the ROTES recommendations. A number of projects have flowed from this work, including the development of workplans for State Trauma Committee (STC) subcommittees, an audit of education and training activities and process improvements such as the development of feedback mechanisms for referring health services.

The STC established an Education Subcommittee to advise on the process for the implementation of the ROTES recommendations related to trauma education and training and provide advice on the coordination of these activities. *A Trauma Education Framework for Victoria* was released in 2002 and included 29 recommendations to guide the development of trauma education. The Education Subcommittee subsequently disbanded. In 2007, the Trauma Education Group (TEG) STC subcommittee undertook a stocktake of the 2002 framework recommendations, which will shape the group’s workplan and the STC’s future direction for trauma education and training development.

Section 4 describes more fully the system that has been put in place in response to the ROTES report.

4. Victorian State Trauma System

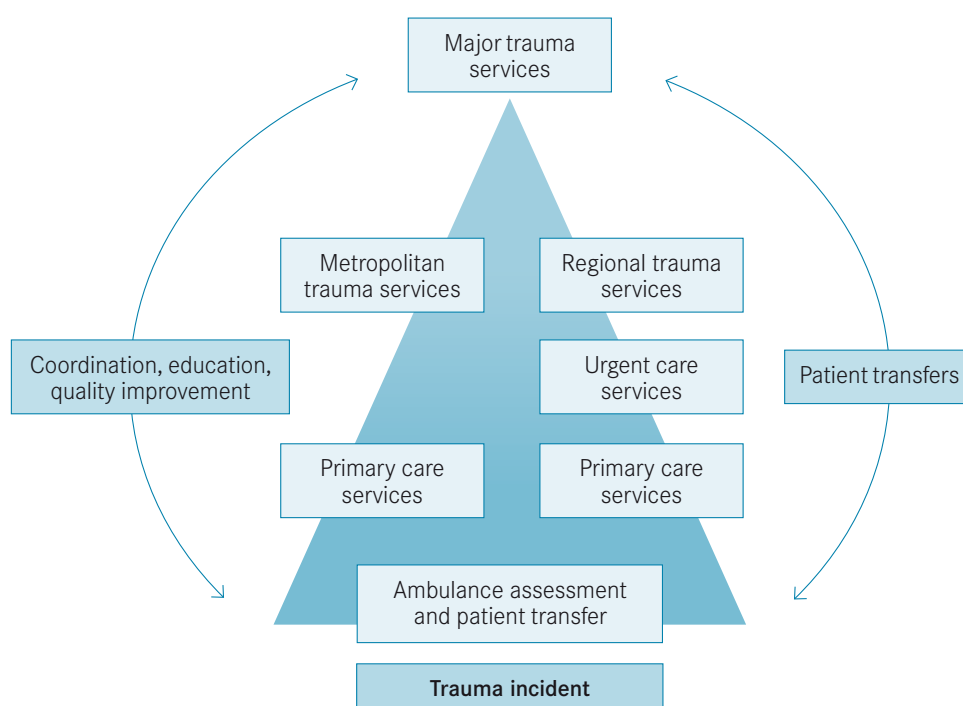
This section describes the current Victorian State Trauma System and looks at how patient management and outcomes have changed since it was introduced. The section includes a discussion of stakeholder feedback on the achievements and strengths of the system, as well as opportunities for improvement.

4.1 System overview

4.1.1 Service designation

In establishing the VSTS, all public hospitals in Victoria were designated to a particular level within the integrated system depicted in Figure 3. This integrated service system represents the different complexities of care provided at each level. Appendix 2 lists Victoria's health services by trauma service designation.

Figure 3: Integrated trauma system



Ambulance

The ambulance service is the primary provider of a 24/7 response to medical and trauma-related emergencies, including the interhospital transfer of these patients. Ambulance Victoria provides a disciplined and organised system, allowing a timely response of ambulance and MICA paramedics. Coordination of the medical retrieval team and air ambulance is provided by the ambulance communications centre, including Air Ambulance Victoria (AAV) and Adult Retrieval Victoria, and also crewed with intensive care paramedics and, in some instances, retrieval physicians.

Metropolitan Melbourne

The Alfred and the Royal Melbourne Hospitals are designated adult Major Trauma Services and the Royal Children's Hospital is designated as the paediatric MTS.

MTSs provide definitive care to most of the state's major trauma caseload through primary triage and secondary transfer. They also function as a resource to the healthcare field through:

- Provision of clinical advice.
- Delivery of trauma education.
- Development of a universal and reliable referral process.
- Contribution to the development of trauma policies and guidelines.

Metropolitan trauma services (MeTS) are the second tier of the trauma system for metropolitan Melbourne. MeTS:

- Provide definitive care to non-major trauma patients and a limited number of major trauma patients where appropriate.
- Stabilise major trauma patients prior to their transfer to a MTS.
- Provide a support role to MTSs in times of high demand.

Some MeTS provide the highest level of trauma care in specialist areas:

- The Austin Hospital provides specialist trauma care to major trauma patients with isolated spinal injuries.
- St Vincent's Hospital provides specialist trauma care to patients with major hand and upper limb trauma and microsurgery that includes: complete or partial amputation, significant crush or entrapment, tissue devascularisation, multiple open injuries and bilateral or brachial plexus injury.
- The Austin Hospital, St Vincent's Hospital and Monash Medical Centre (MMC) provide specialist neurosurgical services.

Metropolitan primary care service hospitals are the third and lowest tier of the state trauma system.

Primary care services:

- Are designated to this level due to significant resource limitations for trauma resuscitation, or their close proximity to a higher-level trauma service.
- Will be bypassed in preference to other hospitals with a higher designation.
- May manage a small number of major trauma patients who self-present but are expected to transfer these patients to an appropriate trauma service.

Regional Victoria

Hospitals in regional and rural Victoria are designated to one of three levels of trauma care: regional trauma services, urgent care services, or primary care services.

Regional trauma services:

- Resuscitate and stabilise major trauma patients prior to transfer to a MTS.
- Provide definitive care to non-major trauma patients and a limited number of major trauma patients where appropriate.
- Provide regional retrieval services.
- Undertake education, research and quality monitoring activities.
- Provide support to primary or urgent rural trauma services.

Urgent care services:

- Provide initial resuscitation and limited stabilisation prior to early transfer.
- Provide limited definitive care according to local resources.
- Participate in some aspects of education, research, quality improvement and performance monitoring.

Primary care services in rural areas have the same role as their counterparts in metropolitan Melbourne (see above).

Further information, including the trauma service designations of all Victorian hospitals, is available at <www.health.vic.gov.au/trauma>

4.1.2 Major trauma triage guidelines

Pre-hospital criteria for identifying major trauma patients and inter-hospital transfer guidelines were implemented to increase the proportion of major trauma patients treated at a MTS.

Appendix 3 provides the criteria for pre-hospital identification of major trauma in both adult and paediatric patients. It is recognised that diagnosis in the pre-hospital setting is largely limited to physical assessment: because many serious occult injuries are only revealed with time and because under-triage (failure to identify major trauma cases) can result in suboptimal clinical outcomes, the criteria attempt to give optimal inclusion of major trauma patients into the VSTS.

In 2006, the Victorian State Trauma Outcome Registry and Monitoring (VSTORM) group reviewed the effect of over-triaged or non-major trauma that presented or were incorrectly transferred to a MTS. It was found that non-major trauma patients had not inundated MTSs, trauma triage guidelines had been followed correctly and that trauma patients of all degrees were largely reaching definitive care at the correct places.

Table 3 summarises the main points of the triage and transfer guidelines.

Table 3: Major trauma triage and transfer guidelines**Victoria's major trauma triage and transfer guidelines require:**

1. Pre-hospital major trauma to be identified according to specified physiological and anatomical criteria (see Appendix 3).
2. Adult major trauma patients and suspected adult major trauma patients to be triaged directly to an adult Major Trauma Service (The Alfred and the Royal Melbourne Hospital), when the travel time is less than 30 minutes.
3. Paediatric major trauma patients and suspected paediatric major trauma patients (aged 15 or under) to be triaged directly to the Royal Children's Hospital when travel time is less than 30 minutes.
4. If a Major Trauma Service is not within 30 minutes travel time, then both adult and paediatric patients to be triaged to the next highest-level trauma service within 30-minute travel time from the accident site.
5. Triage to a designated trauma service accessible in the least amount of time in isolated rural areas that are more than 30 minutes from any trauma service.
6. Where a major trauma patient appears to be in an immediately life-threatening situation during transport, the patient is to be diverted to the nearest designated trauma service for stabilisation, with subsequent transport to a Major Trauma Service at the earliest appropriate time.
7. Where a patient is triaged initially to a non-major trauma service for stabilisation, early liaison with the Major Trauma Service is to occur via the Trauma Advice and Referral telephone line (see section 4.1.3) and consideration is to be given to appropriate medical retrieval or interhospital transfer to a Major Trauma Service.

Specialist trauma triage and transfer

8. Discrete spinal cord trauma to be triaged to Austin Health, within defined safety and logistic constraints.
9. All spinal trauma in paediatric patients to be triaged to the Royal Children's Hospital.
10. All trauma services receiving spinal trauma patients to consult the Victorian Spinal Cord Service at Austin Health early after patient reception to optimise patient outcomes.
11. Hospitals with neurosurgical specialities to manage neurotrauma patients requiring critical care support. All health services are advised to avoid patient deterioration during interhospital transfer by the timely and proactive transfer of such patients to a Major Trauma Service. Neurosurgical triage and transfer guidelines for major trauma still apply in rural areas, even where a neurosurgical specialist practises locally, as the management of these patients requires all the appropriate and agreed service supports of an MTS.
12. Multiple trauma, incorporating the need for microsurgery, should be referred and transferred to a Major Trauma Service. However, St Vincent's Hospital should be consulted as a leader in the management of hand and upper limb trauma and microsurgery. Isolated injuries requiring microsurgery should be referred and transferred according to established referral patterns; this would include St Vincent's Hospital in most cases.

4.1.3 Governance

The STC was established in 2000 to provide advice to the Minister for Health and the Department of Human Services on the VSTS. In partnership with the department, the committee has overseen the implementation of the ROTES recommendations and establishment of the VSTS. The committee provides advice on policy development, funding, system performance and quality management. The STC's statewide oversight of the trauma system is supported by subcommittees and regional forums. The committee has three subcommittees:

- The Trauma Coordination Group (TCG) identifies and reviews systemic issues, opportunities and initiatives within the VSTS.
- The Trauma Quality Group (TQG) is responsible for the monitoring and evaluation of the VSTS through analysis of Victorian State Trauma Registry reports and data. A subgroup of the TQG, the Case Review Group, provides advice on transfer policy, analysis and best practice.
- The Trauma Education Group (TEG) provides advice on education opportunities and initiatives within the Victorian State Trauma System (VSTS).

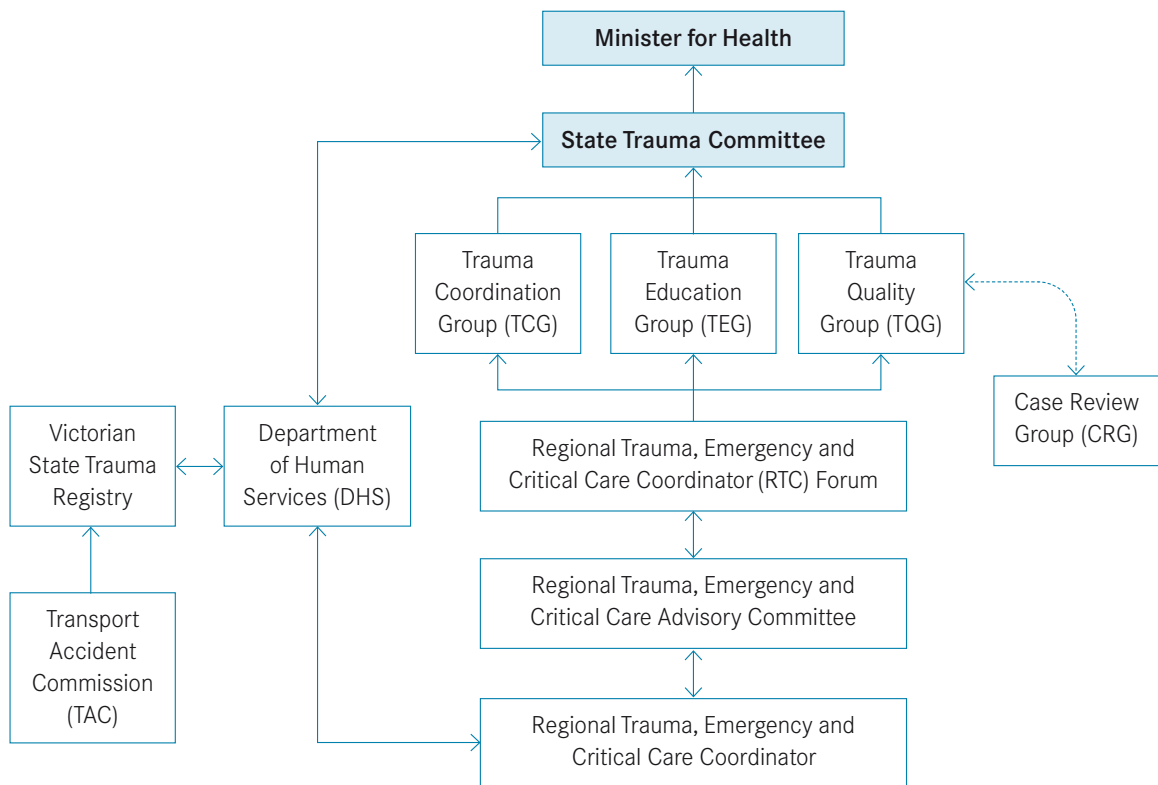
The Regional Trauma, Emergency and Critical Care Coordinators (RTC) roles are varied, but the main responsibilities are the collection of Victorian State Trauma Registry data, liaison between regional trauma services and the department and the development and implementation of education and training courses. The coordinator positions are funded by the department and are located in each of the department's five rural regions.

Each departmental region convenes a Regional Emergency and Critical Care Advisory Committee (RECCAC), with members drawn from relevant regional hospitals and trauma services. The committees are forums for addressing region-specific emergency care issues.

The Regional Trauma, Emergency And Critical Care Coordinator (RTC) Forum, comprising all regional coordinators, promotes discussion of regional issues impacting on the VSTS and dissemination of statewide trauma issues to a regional level. RTC forum members participate in each of the STC subcommittees so information is communicated from regions through the subcommittees to the STC as required.

Refer to Figure 4.

Figure 4:
State Trauma Committee and working groups' governance arrangements



4.1.4 Victorian State Trauma Registry

The VSTR was established in 2001 to monitor the effectiveness of the VSTS. The registry is funded by the department and the TAC.

Metropolitan and regional data coordinators are responsible for collecting quarterly trauma data from the 140 hospitals and health care facilities that manage trauma patients in Victoria. The registry is currently based at the Department of Epidemiology and Preventive Medicine, Monash University, and managed by the VSTORM Group.

The fact that the registry has been in place since the inception of the VSTS means that it now provides a rich source of data with which to assess trends in patient characteristics, management and outcomes. Sections 2.2 and 4.2 of this report summarise the key data.

4.1.5 Trauma Advice and Referral Line

The Trauma Advice and Referral Telephone Line, facilitated by ARV, provides clinical advice and support to clinicians managing major trauma patients and coordinates the referral and transfer of patients to the MTSs. Clinicians can call a statewide telephone number (1800 700 001) to speak with a senior trauma consultant at either of the adult MTSs or the Royal Children's Hospital.

4.1.6 Trauma Appropriateness Payment

The transfer of major trauma patients to MTSs is integral to the success of the VSTS.

In recognition of the financial impact on public hospitals that refer and transport trauma patients, and to provide an incentive for appropriate transfer, the department provides a Trauma Appropriateness Payment (TAP) to hospitals that transfer major trauma patients directly to a MTS. Under this funding agreement:

- Metropolitan hospitals are allocated \$2000 per major trauma patient.
- Regional hospitals are allocated \$3000 per major trauma patient.

Payment of the TAP requires hospitals to provide trauma data to the VSTR.

4.2 Impact on patient management and outcomes

Reports based on VSTR data are published annually. Highlights from the 2006–07 annual report are noted below³.

4.2.1 Patient triage and transportation

The aim of the VSTS is to ensure that trauma patients reach the most appropriate hospital for management in a timely fashion. Overall, there has been a significant increase in the percentage of major trauma patients transferred to the hospital of definitive care directly from the scene, from 63 per cent in 2001–02 to 70.8 per cent in 2006–07⁴. This reflects the recognition of these hospitals as MTSs and improvements in pre-hospital triage. Inter-hospital patient transfer patterns indicate patients were being transferred to a trauma service with a higher designation. Most transferred patients (85.7 per cent) received their definitive treatment at an appropriate trauma service based on the trauma triage guidelines. Regional trauma services provided the highest number of patients with initial care prior to transfer to a MTS.

The vast majority of major trauma patients now receive their definitive care at a MTS. In 2006–07, 82.2 per cent of patients received their definitive care at an appropriate trauma service, based on the trauma triage guidelines.

4.2.2 Pre-hospital care

Ambulance

In 2006–07, 59.8 per cent of major trauma patients had a scene time of more than 20 minutes. Scene times have increased since 2000–01, with more procedures being performed on-scene. Longer scene time has also been influenced by an increased reliance on air transport.

The proportion of major trauma patients with a total pre-hospital time of more than one hour has also increased over time. In 2006–07, 44.3 per cent of non-entrapped patients and 73.7 per cent of entrapped patients had a total time (from receipt of the ambulance call to arrival at emergency department) of more than one hour.

Patients serviced by AAV generally had a longer scene time, which may reflect the severity of injuries sustained by patients requiring air transport. Longer scene times may be influenced by an increased reliance on air transport and aircraft availability.

3 Monash University: Victorian State Trauma Outcome Registry and Monitoring Group, 2008, Victorian State Trauma Registry, 1 July 2006 to 30 June 2007, Summary report. Published by the Victorian Government Department of Human Services, Melbourne, Victoria, Australia.

4 The percentage of patients transferred directly from the scene to:

- The Alfred Hospital has increased from 60.5 per cent in 2001–02 to 69.6 per cent in 2006–07.*
- The Royal Melbourne Hospital has increased from 55.3 per cent in 2001–02 to 70.8 per cent in 2006–07.*
- The Royal Children's Hospital has increased from 27.8 per cent in 2001–02 to 43.3 per cent in 2006–07.*

4.2.3 Major trauma outcomes

Outcome measures monitored by the registry include hospital length of stay, discharge status and functional measures at discharge and six months post-injury. Unless otherwise stated, the data presented in this section relate to the hospital that provided definitive treatment.

Length of stay: Since the registry was established, there has been a significant decrease in major trauma patients' average length of stay at the hospital where they received their definitive care—from 8.8 days in 2001–02 to 7.6 days in 2006–07. This is consistent with a trend towards shorter stays for hospital patients generally, but might also reflect changes in patients' acuity levels (see Section 2.2) and better management of traumatic injuries.

Discharge status: Table 4 shows the status of major trauma patients when they were discharged from the hospital providing their definitive hospital care. As shown, the percentage of patients discharged home has increased over time, from 39.5 per cent in 2001–02 to 46.2 per cent in 2006–07. Conversely, the percentage of patients discharged to rehabilitation has decreased over time; this may be due to improved outcomes at discharge, changes in patient acuity or increased use of rehabilitation in the home.

Functional measure at discharge: The registry commenced collecting functional measure data from the adult MTs in the second quarter of 2003–04. The functional measure includes items related to locomotion, feeding and expression measured on a four-point scale from total dependence to complete independence. Most major trauma patients (84.9 per cent in 2006–07) are discharged from hospital performing the activities of locomotion, feeding and expression independently. In 2006–07, less than two per cent of patients were requiring full assistance for these key activities of daily living at discharge and most of these patients were discharged to an inpatient rehabilitation centre.

While there has been no significant change in the proportion of fully and partially independent patients, the proportion of patients classified as totally dependent has shown a decreasing trend (1.8 per cent in 2006–07 compared with 3.3 per cent in 2003–04).

Outcomes six months following major trauma: Telephone follow-up of surviving major trauma patients at six months following injury commenced in 2003-04 for adult major trauma patients definitively managed at an MTS. This was extended to all adult major trauma patients across the state in 2005-06.

Key data collected at the six-month follow-up include the patient's level of function according to the Glasgow Outcome Scale – Extended (GOS-E) and return to work or study for those who were working or studying prior to injury. During 2006-07, additional instruments were added to the follow-up interview to capture health-related quality of life, pain and further work and general disability; these will be included in future reports.

Three per cent of major trauma patients died following discharge. Of the patients followed-up, 76 per cent of major trauma patients in 2005-06, and 65 per cent in 2006-07, were living independently by six months post injury. A full return to pre-injury function was experienced by 22.2 per cent of patients in 2005-06 and 15.8 per cent of patients in 2006-07. The differences across the years are largely explained by the improved follow-up rates in 2006-07 and a higher percentage of patients in the 2006-07 cohort with a serious head injury.

Younger patients, males and patients with lower levels of injury severity were significantly more likely to have returned to independent living six months following injury.

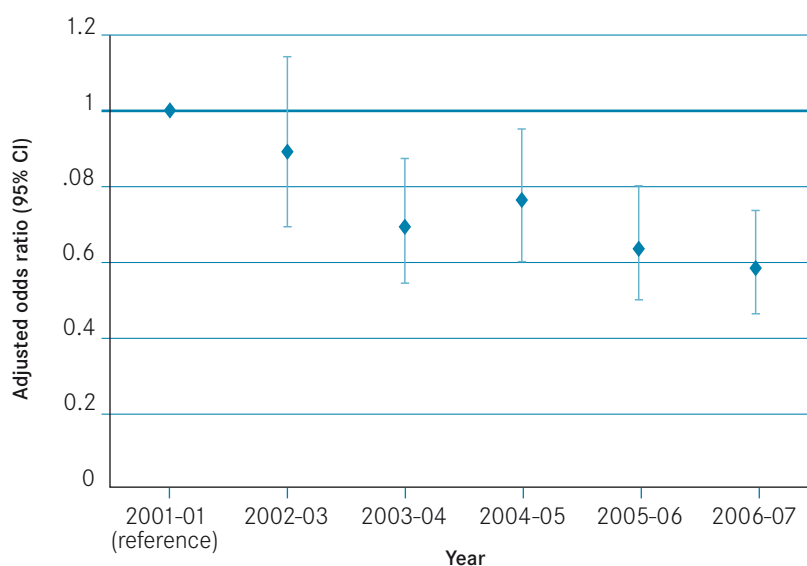
In 2006-07, 63.8 per cent of the follow-up patients were working prior to the injury and 58.5 per cent had returned to work six months afterwards. These percentages were similar to those reported for the previous year.

Table 4: Discharge status of major trauma patients

Discharge status from definitive hospital of care	% of patients					
	2001-02	2002-03	2003-04	2004-05	2005-06	2006-07
Home	39.5	40.4	42.1	44.3	47.5	46.2
Rehabilitation centre	41.4	40.3	40.0	37.1	35.2	35.9
Dead	14.8	13.2	12.6	13.3	11.9	12.5
Other hospital	2.8	4.1	3.1	3.4	2.8	2.6
Other	1.1	1.5	0.8	1.1	1.5	1.8
Nursing home	0.5	0.3	1.0	0.6	0.9	0.8
Special accommodation	0.1	0.1	0.5	0.2	0.2	0.2

Deaths: The overall death rate due to major trauma in Victoria was 21.5 deaths per 100,000 population. Overall, the registry recorded 297 deaths, corresponding to a death rate of 12.5 per cent among the hospitalised major trauma patients. Deaths post-discharge are captured through follow-up and linkage with the Victorian Registry of Births, Deaths and Marriages and these are reported in the six-month follow-up outcomes (see above).

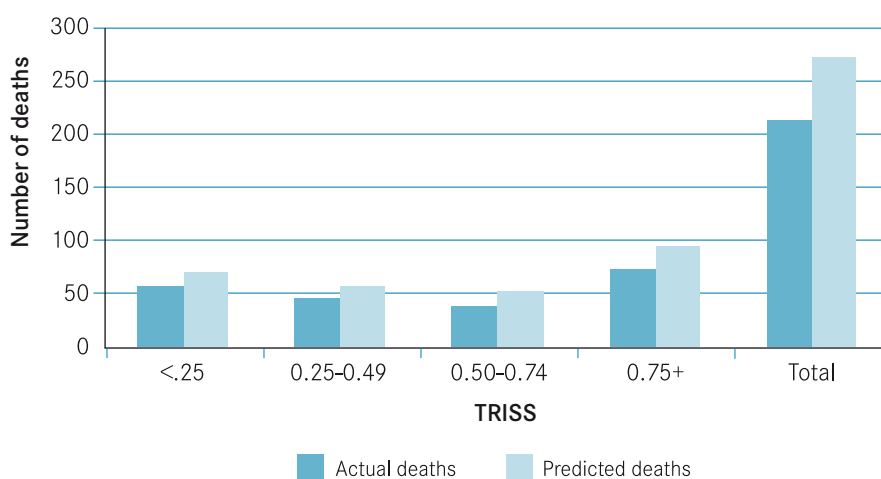
Risk-adjusted death rates: The percentage of hospitalised major trauma patients who died during their hospital stay has fallen from 14.8 per cent in 2001-02 to 12.5 per cent in 2006-07. Adjusted for key predictors of mortality (age, injury severity, head injury status and mechanism of injury), the risk of mortality has decreased significantly for hospitalised major trauma in Victoria since 2001-02 (see Figure 3). There has been a particularly significant decrease in the risk of mortality for major trauma patients with an injury severity score greater than 15; this has fallen from 14.6 per cent in 2001-02 to 11.3 per cent in 2006-07.

Figure 3: Trends in the risk-adjusted death rate of hospitalised major trauma patients

Unexpected deaths: The Trauma Injury Severity Score (TRISS) is the standard international method of combining age, mechanism of injury, injury severity and key physiological observations to estimate the probability of survival for individual patients and the rate of unexpected deaths. A TRISS less than 0.50 indicates a patient who could reasonably be expected to die.

Figure 5 shows a comparison of the observed and expected numbers of deaths, according to TRISS methodology. Similar to previous years, the observed number of deaths in 2006–07 was significantly less than expected.

Figure 5: Comparison of observed and expected deaths, 2006–07



Comparison of death rates with an international standard: The registry’s 2006–07 annual report compares risk-adjusted death rates, based on TRISS, under the Victorian State Trauma System (VSTS) with corresponding data from major North American trauma centres (reported in the National Trauma Data Bank 5.0 of the American College of Surgeons). This indicates that the state trauma system has a lower adjusted death rate than the major North American trauma centres reporting outcomes during 2006–07.

Management deficiencies and preventable deaths: As well as the data reported above from the VSTR, evidence that the VSTS has led to improved patient outcomes comes from a study by the Consultative Committee on Road Traffic Fatalities. The study, described in Table 5, compared samples of road traffic deaths before and after the introduction of the new trauma system in Victoria. Expert multidisciplinary panels, using evaluation criteria derived from relevant clinical practice guidelines, assessed deficiencies in the management of these cases—including those that contributed to preventable or potentially preventable deaths.

The researchers concluded that the marked improvement in patient management and reduction in preventable or potentially preventable deaths had been largely due to the increase in admissions to expanded MTSs after the introduction of the VSTS.

Table 5: Management deficiencies and death preventability of road traffic fatalities before and after a new trauma care system in Victoria—summary of research findings⁵

Research method:

- The emergency and clinical management and death preventability of 245 consecutive road fatalities occurring as a result of road traffic accidents before the Victorian State Trauma System (January 1, 1997 to December 31, 1998) were compared with outcomes for 193 consecutive eligible fatalities after the introduction of the new system (July 1, 2002 and October 14, 2004).

Key findings:

- Emergency department admission rates to Major Trauma Services were almost double in the 2002–04 group compared with the 1997–98 group (62 per cent and 34 per cent respectively).
- Compared with the pre-VSTS group, more patients were attended by Advanced Life Support paramedics in 2002–04.
- Scene times increased after the introduction of the VSTS, as did the mean time from the scene to the emergency department.
- The mean number of identified ‘management deficiencies’ per patient, including those contributing to death, decreased significantly (from 8.7 in 1997–98 to 6.7 in the 2002–04 group).
- The rate of deaths assessed as ‘preventable or potentially preventable’ (P/PP) decreased from 36 per cent to 28 per cent, representing a 22 per cent relative risk reduction after the introduction of the new trauma system. The P/PP rates were significantly less at MTSs than in other hospitals. In 2002–04 the P/PP death rates were as follows: major trauma centres, 25 per cent; metropolitan trauma centres, 33 per cent; rural trauma services; 50 per cent and urgent care centres, 83 per cent).

Conclusions:

- The researchers concluded that the marked improvement in patient management and reduction in P/PP deaths had been largely due to the increase in admissions to expanded MTSs after the introduction of the VSTS.

⁵ *McDermott, F, Cordner, S, Cooper, D, and Winship, V, 2007, Management Deficiencies and Death Preventability of Road Traffic Fatalities Before and After a New Trauma Care System In Victoria, Australia, Journal of TRAUMA®Injury, Infection and Critical care, Volume 63, Number 2, August 2007.*

4.3 Stakeholder feedback

In April and May 2008, Department of Human Services' staff conducted interviews with 16 individuals representing the following VSTS 'stakeholder groups':

- The three MTSs.
- Key regional trauma services.
- Metropolitan Ambulance Service.
- ARV.
- VSTORM Group.
- TAC.

Appendix 4 provides the names and position details of the people interviewed.

In addition to these interviews, there was wide consultation with the STC, STC subcommittees, and regional and rural stakeholders.

The interviews were semi-structured and focused on the following main questions:

- What have been the successes of the VSTS?
- What have been the most significant changes in terms of patient outcomes, communication, system integration and coordination and governance?
- Are there areas that have not worked so well? What are they? What factors have contributed to these things not working so well?
- Are there opportunities to improve in this area? What needs to happen for this improvement to occur?
- Have there been other missed opportunities?
- How would you like the system to look in five years?

On most issues, there was a high level of congruence in the feedback given by the various interviewees. It is notable that many issues raised reflect the findings of the Consultative Committee on Road Traffic Fatalities review of trauma system operations *Changing practice: The Consultative Committee on Road Traffic Fatalities interactive strategy to improve trauma care 2002-05 (2006)*⁶. The main themes of the feedback are discussed below.

⁶ McDermott, F, Cordner, S, Cooper, D, and Winship, V, 2006, *The Consultative Committee on Road Traffic Fatalities. Changing practice: The Consultative Committee on Road Traffic Fatalities interactive strategy to improve trauma care 2002 -05*. Victorian Institute of Forensic Medicine.

4.3.1 Achievements of the system

The interviewees were unanimous that the VSTS had been highly effective in improving the clinical management and outcomes of major trauma patients. Many of those interviewed expressed pride in Victoria's trauma system and described it as representing 'leadership' or 'best practice' in trauma management.

The establishment of a coordinated, statewide trauma system was considered to be a substantial achievement. The following factors were considered to be critical to the success of the system:

- The designation of three MTSs. The consequent development of specialised trauma expertise and centres of excellence was believed to have led to faster and better treatment of trauma patients.
- 'Systemisation' of the trauma response, based on clear and consistent processes for ensuring patients receive definitive care at an appropriate service. (One interviewee commented that the existence of standardised processes for patient triage and transfer ensured there was 'no battle for patients'; another echoed this theme, saying that there was 'no argy bargy' in the current system).
- A solid and objective evidence base (via the VSTR) to monitor the system and provide high-quality data to inform system improvements. The data monitoring system was seen as an integral part of the VSTS: the fact that it was in place when the VSTS was first introduced means that impact of the service changes can be clearly identified.

The new ARV (see page 15) was thought to be a considerable improvement on the previous retrieval system and to be already delivering more timely and efficient responses. Stakeholders were supportive of the ARV structure, which brings together clinical advice, retrieval and critical care bed-finding functions. The increased government investment in air ambulances, including the new helicopter in south west Victoria, was also mentioned as providing opportunities to improve patient outcomes.

Some interviewees commented that the statewide governance structure for the VSTS, namely the STC and its subcommittees, had allowed for stakeholder engagement in the development, implementation and monitoring of the system. The TQC was considered to have had an important role in quality assurance of the system. The recent re-structure of the STC subcommittees, and the development of workplans for the groups, was seen as a positive change.

It was noted also that research funding by the TAC and other organisations had allowed for 'world class' research into trauma management.

Consistent with the data presented in Section 4.2, stakeholders were aware of the gains in patient outcomes that had been achieved since establishing the VSTS. They noted the following key improvements:

- Eighty per cent of all major trauma patients were treated at a MTS.
- An overall reduction in mortality rates. (One interviewee commented that although the system was still making gains after nearly seven years, some ‘plateau effect’ could be expected over the next few years).
- Fewer observed than expected deaths according to the TRISS international benchmark.
- Good trends in preventable deaths.
- Reduced lengths of stay in hospitals as a result of better patient management.

4.3.2 Areas for development and improvement

Education and training

The area of clinical education, training and professional development was the most frequent ‘opportunity for improvement’ mentioned by stakeholders.

It was recognised at the time of establishing the VSTS that the designation of three MTSs would mean that other services would have reduced exposure to major trauma cases and that there might be some deskilling of staff at non-MTSs. To some extent, stakeholders accept this as a necessary trade-off for the improved efficiencies and quality of care delivered by the new system. However, they offered a range of suggestions about ways to minimising deskilling of non-MTS staff. These included:

- Strengthening the role of the adult MTSs in supporting education and professional development at other health services. It was noted that the ROTES report recommended that MTS and RTS hospitals should function as resource centres for the dissemination of trauma education, and that the provision of statewide education and training is part of the MTS’s funding agreement with the department. However, currently only the Royal Children’s Hospital has an active role in providing education and training to other health services.
- Improving the ability of non-MTSs (particularly in rural settings) to recruit and retain emergency medicine registrars and fellows by requiring MTS to provide access to staff rotations.
- Reviewing the implementation effectiveness of Victoria’s trauma education strategy (*A trauma education framework for Victoria*).
- Increasing access to existing successful training courses through reimbursement of course fees and back-fill for staff attending the training.
- Making better use of technology (for example, videoconferencing and simulation) in delivery of training.

As well as the need for trauma education and training at non-MTSs, stakeholders argued that more attention needs to be provided to the education and support of MTS clinicians, as not all staff at these services are well trained in trauma. One interviewee suggested that the trauma system requires a framework specifying the skills required by different types of staff involved in trauma care.

While recognising that neither health services nor the department control pre-employment training for health professionals, several interviewees perceived a need for additional trauma content in undergraduate and speciality courses (for example, surgeon training). One interviewee proposed the development of a post-graduate trauma course for nurses.

It was noted that although the responsibility for leadership, training and education was implicit in the designation of an MTS, there was no clear funding to support the development and presentation of education programs. It was suggested that a metropolitan trauma coordinator position could be created to better support this MTS education role.

Advice and feedback to referring hospitals

The provision of feedback to referring hospitals was mentioned as one area in which current system management processes could be strengthened. It was argued that services referring patients to an MTS need better feedback about their initial management of the patient (for instance, whether the correct treatment was provided) and about what happened to the patient after referral. According to one interviewee, more clarity is required about responsibilities for following up with the referring service if there is a concern. Feedback processes were regarded as important, both for quality assurance purposes and for the education of referring service providers.

It was noted that the 1800 Trauma Advice and Referral Line could be more extensively promoted to improve uptake. A number of interviewees questioned whether this function could be performed more efficiently via integration with ARV, thereby providing a 'one stop shop' for trauma advice.

Triage and transfer guidelines

Current triage and transfer guidelines (see Table 3 on page 24) require major trauma patients to be triaged directly to a MTS when the travel time is less than 30 minutes; if a MTS is not within 30 minutes travel time, patients are triaged to the next highest-level trauma service within 30-minutes from the accident site.

A number of stakeholders argued that the 30-minute timeframe could be extended, for example to 45 or 60 minutes, to create additional efficiencies in the trauma system without jeopardising patient outcomes. One interviewee noted that major trauma patients who are sent to peripheral hospitals often undergo diagnostic procedures that may be repeated once they are transferred to a MTS. It was recognised, however, that extending the 30-minute rule would create an additional burden on ambulance services.

It was also questioned whether the current triage guidelines are overly inclusive, leading to the transfer of some patients to an MTS when appropriate services could be provided more locally at a large regional health service or a non-MTS metropolitan service. There was a view that the guidelines focus too much on factors such as entrapment and vehicle speed, and require more emphasis on physiological indicators of the patient's condition. A number of interviewees argued that more could be done at the accident scene in some cases, making transfer to a non-MTS metropolitan hospital a more viable option. However, others argued that the number of 'things' paramedics do at the injury scene should be contained, as this contributes to increased transfer times.

The six-hour target for retrieval of patients from non-MTS hospitals was also raised as being possibly unrealistic.

Clinical guidelines and protocols

There were varying views about the need for further development and standardisation of guidelines and protocols on the management of particular patient groups (for example, those with pelvic fractures, head injuries or requiring extensive resuscitation or transfusion) or trauma processes (for example, early management and stabilisation of the trauma patient). Some stakeholders considered that the current situation, in which different services (including the two adult MTSs) have different protocols and guidelines, may impact on patient safety and service quality. They noted that the New South Wales trauma system has invested in the development of standardised clinical guidelines and protocols in many aspects of trauma management. However, a number of Victorian stakeholders argued that the relative lack of standard protocols in this state is largely a 'theoretical' issue and has little impact on patient outcomes.

In discussing the issue of clinical guidelines and protocols, interviewees also raised questions about who should develop these documents, keep them up to date and monitor how well they are being adhered to.

Quality assurance

The issue of case review and auditing was raised in a number of interviews. While these functions are the responsibility of health services, several stakeholders felt that there was a need for more clarity (based on broadly accepted guidelines) within health services about roles and responsibilities for monitoring care quality and outcomes. The limitations of hospital-based clinical auditing was noted for a statewide system and it was suggested that VSTS could engage better with the State Coroners Office in the analysis of outcomes. One interviewee suggested that the College of Surgeons should develop a common auditing framework for trauma surgery.

The department is currently developing a clinical governance policy that will clarify the roles and responsibilities of health services and guide their oversight and management in the areas of clinical effectiveness, effective workforce, risk management and consumer participation.

Management of paediatric trauma

The paediatric trauma system is considered to be very effective overall. The Royal Children's Hospital is the MTS for paediatrics. The hospital has adopted a flexible model for the management of major trauma with no permanent trauma team and all patients received through the emergency department. However, the hospital does have a dedicated Director of Trauma and Trauma Coordinator. Specialists are on call as required. It was felt this approach improved communication, organisation and the coordination of services and expertise across the hospital. It has also resulted in the up skilling of a broad group of Royal Children's Hospital staff in trauma management.

The Paediatric Emergency Transport Service was thought to work well in concert with the 1800 TRAUMA phone line for clinician support and patient management coordination activities. It was suggested that there is a need to further reinforce paediatric triage guidelines, particularly in rural areas, to ensure timely transfer of patients.

Royal Children's Hospital has a strong commitment to providing training in the treatment and management of paediatric trauma patients to other services in the VSTS.

Royal Children's Hospital is also one of the main providers of the Victorian Paediatric Rehabilitation service (VPRS). It provides one of two specialised paediatric inpatient rehabilitation services, in addition to ambulatory rehabilitation services.

Management of severe burns

The Victorian mass casualty disaster plan identifies the Royal Children's Hospital and the Alfred Hospital as the state's paediatric and adult tertiary burns treatment services. Major burns demand a significant health service response such as emergency medicine, operating suites and critical care. Severe burns, by their nature, require prolonged periods of care and a high level of multidisciplinary staff specialisation. The management and coordination of severe burns needs to be considered in the context of MTSs and form part of the wider trauma system.

Work has commenced to enhance statewide burns services in Victoria, however this needs to be achieved in concert with the VSTS. The designation of the Royal Children's Hospital and the Alfred as burns services needs to be clearly acknowledged by the VSTS with supporting triage and transfer guidelines and incorporation into education and training formats.

Sub-acute and rehabilitation services

A common theme of the interviews was the need for greater consideration of the longer-term (post-acute) impact of trauma. For example, it was argued that the conceptualisation of the 'trauma system' should be broadened to include the rehabilitation and sub-acute sectors, and that there should be a stronger focus on developing an 'evidence-based' approach to trauma rehabilitation (for instance, a better understanding of what works and what does not work). A key element of this would be expanding patient journey data collected by the VSTR to include the sub-acute and rehabilitation phases and more comprehensive patient outcome information for analysis. It was also suggested that patient transfer and transition back into their communities should be better monitored and coordinated. Additionally, pain management was raised as an area that required further analysis.

Stakeholders also expressed a desire for a greater emphasis on longer term outcomes in the governance and monitoring of the trauma system, as noted below.

Governance structures

While current governance arrangements were generally thought to work well, several interviewees made suggestions about how the role of the STC could be strengthened. The following comments were made on this matter:

- There is a need for more widespread communication of the STC's role as it is not visible to most people working in the trauma system.
- The business of the committee should be more transparent—for example, committee agendas, minutes and key papers should be published on the department's trauma website and there should be better communication about the avenues for adding items to the STC agenda.
- There should be greater involvement of non-MTSs in the committee's decision-making processes, particularly in regard to activities that impact on non-MTSs.
- The STC needs to consider its role in advocating for resources to the department.
- The STC should include additional representation (a number of specific suggestions were made, including the College of Surgeons, nurses, and rehabilitation and sub-acute services).

Data collection and reporting

Interviewees made the following comments and suggestions about ways of strengthening the VSTS' current data collection and reporting framework:

- While there are excellent data about patient outcomes for up to six months after the trauma incident, we need to consider outcomes beyond that period (for example, up to 24 months post-injury).
- Outcome monitoring to date has focused on preventable death and serious physical disability following major trauma; we now need to develop a broader understanding and analysis of trauma outcomes. For example, outcomes monitored should include a range of quality-of-life indicators, such as psychosocial adjustment and community engagement.
- The registry should collect and analyse more detailed information about patients' clinical outcomes.
- More could be done with the data currently collected by the VSTR. For example, more sophisticated analysis is required to determine how much of the observed decline in death rates is because of a reduction in severe head injury (due to airbags and safer cars) rather than better system performance.
- Reports from the VSTR should be disseminated more widely to increase the profile of the VSTS.
- Linking data with other datasets such as the Victorian Integrated Non Admitted Health (VINAH) dataset, which the sub-acute ambulatory care services collect and report, as well as disability services datasets.

System issues and resources

Several of the people interviewed noted that the policy of transferring most major trauma patients to MTSs had placed pressure on other hospital resources—such as intensive care units and surgical theatres—at the designated hospitals. One interviewee questioned whether government funding arrangements had fully taken account of the additional resource demands at the MTS.

It was also noted that the number of critical care beds per head of population in Victoria is low relative to other states, which impacts on bed-finding for trauma patients.

Opportunities for increased cooperation and resource sharing between the two adult MTSs were observed by a number of interviewees.

Many parties consulted identified the need to revisit the hospital and health service trauma designation guidelines.

The VSTS in five years

When asked to comment on how they thought the VSTS should be operating in five years time there were an interesting range of responses from interviewees with many points raised in their discussions of how the system could be improved. A strengthening of education and training was raised by several people with a more statewide approach to development and delivery and utilising technology with simulation, telemedicine and teleconferencing. A strengthening of the relationships between large metro health services and regional health services was identified. Clinical placements and rotations for staff through the MTSs was suggested by several interviewees, as well as working to attract and retain trauma surgeons. Improved resourcing of intensive care and emergency departments was suggested to ensure the health system can continue to respond appropriately to major trauma incidents.

There were also comments regarding the overall trauma system, that injury prevention should be better addressed and that data, audit and case review processes should inform system improvement processes so as to not just focus on mortality but gain a better understanding and assessment of morbidity and quality-of-life outcomes.

5. Towards 2014 recommendations

As the information presented in Sections 3 and 4 indicates, the Victorian State Trauma System represents a successful implementation of the *Review of Trauma and Emergency Services* (ROTES) recommendations and has achieved demonstrable improvements in patient management and outcomes. There is a high level of consensus among stakeholders that future directions should involve refinement and strengthening of the current system, rather than radical overhaul.

The following future directions have been identified through this review and consultation process:

Education and training

- Promulgate the findings of the TEG's performance stocktake of *A trauma education framework for Victoria*.
 - Update *A trauma education framework for Victoria* based on the stocktake outcomes.
 - Develop a marketing strategy for the revised framework.
 - Consider conducting a trauma education and training needs analysis.
 - Identify appropriate skill set requirements for staff at different designated trauma services.
 - Consider methods to improve the coordination of trauma education and training.
- Clarify roles and responsibilities to strengthen Major Trauma Services education and training leadership role.
- Clarify funding for trauma education and training.
 - Clarify funding sources to support trauma education and training.
 - Develop pathways to assist health sector staff to access education, training, research and funding information and assistance.
- Support the forging of partnerships between Major Trauma Services and rural/regional health services to foster rotation of medical and nursing staff to broaden and develop major trauma knowledge and experience.
 - Assist MTS and regional/metropolitan trauma services in developing a rotational roster system for trauma staff to gain broad trauma clinical experience.
 - Consider and evaluate other jurisdictions and international trauma education and training systems with staff rotation elements.
- Develop strategies to support workforce recruitment and retention for rural/regional health services and metropolitan trauma services that incorporate education and training programs.
- Explore opportunities to best promote medical workforce sustainability through collaboration, training and education, particularly to support sub-specialty service provision.
- Improve utilisation of technology to support the delivery of effective training and education programs to non-MTS trauma health professionals.

Advice and feedback to referring hospitals

- Implement the MTS feedback protocols developed to better inform referring hospitals of patient trauma management outcomes.
- Improve the promotion and utilisation of the 1800 TRAUMA and Adult Retrieval Victoria clinician advice and referral phone numbers.
- Identify opportunities to utilise telemedicine formats to support clinical decision making and patient management.

Triage and transfer guidelines

- Review the *Victorian major trauma triage and transfer guidelines*, including the specialist trauma triage and transfer directions, criteria and targets to ensure the most appropriate and timely responses in line with international experience and evidence-based clinical practice.
- Identify methods to improve and reinforce the promulgation of trauma triage and transfer guidelines across the state.
- Broaden the designation of specialist health services to include the statewide burns management services and other statewide clinical management centres, as appropriate.
- Continue to monitor and support the access and coordination role of ARV to transfer trauma patients with appropriate access to required services, such as intensive care and surgery.

Clinical guidelines and protocols

- Review the current trauma-related practice guidelines with a view to:
 - Identifying gaps.
 - Developing additional guidelines in identified high-priority areas.
 - Developing and promoting a database of relevant clinical guidelines.
- Determine roles and responsibilities for the ongoing management and review of clinical guidelines and protocols.

Quality assurance

- Clarify quality assurance responsibilities and protocols for case reviews of patients managed through the trauma system by more than one health service provider.
 - Strengthen the identification, review and analysis of 'outlier' cases.
 - Strengthen 'sentinel event' monitoring at a statewide level through improved processes and reporting to the department's statewide health services incident database.

Sub-acute and rehabilitation

- Explore options for extending the vision and focus of VSTS to incorporate the sub-acute and rehabilitation aspects of a patient's journey and their quality-of-life outcomes. This includes bed based rehabilitation, sub-acute ambulatory care services and burns services.
- Explore opportunities to enhance the alignment of trauma patients' acute management with the sub-acute service system.
- Support the inclusion of appropriate subacute, rehabilitation burns patient data to the Victorian State Trauma Registry (VSTR).
- Investigate opportunities to interface VSTR with complimentary databases, such as those maintained by the TAC and rehabilitation services, to improve analysis of trauma patient outcomes.
- Explore options for enhancing analysis of quality of life and functional outcomes for trauma patients through their accessing of services such as rehabilitation, remedial therapies and pain management services.

Governance

- Review the membership of the State Trauma Committee (STC) and consider broadening it to include professional bodies, burns services, subacute and rehabilitation expertise.
- Improve the promotion of the VSTS and its governance arrangements:
 - Revise the trauma website to better inform stakeholders of STC governance, membership, subcommittees and their activities.
 - Identify and develop strategies to promote and improve stakeholder awareness of the trauma system and its outcomes.
- STC and the department should consider broader strategic development and future management directions for VSTS and trauma services.

Data collection and reporting

- Consider expanding the data collection window beyond six months post-trauma incident to enable better analysis of post injury outcomes for patients.
- Adjust data collection to facilitate improved analysis and understanding of major trauma patient clinical outcomes, such as quality of life and community engagement.
- Investigate the applied analysis of VSTR data to better understand major trauma and inform the development of prevention strategies.
- Greater promotion of VSTR and wider promulgation of VSTR reports.

System issues and resources

- Review the *Statewide health service trauma role delineation guidelines*.
- Investigate opportunities for increased collaboration, cooperation and resource sharing between the two adult MTSs.
- Investigate opportunities for increased collaboration and cooperation between the MTSs, burns services, sub-acute and rehabilitation services.
- Review system-wide trauma funding to ensure sustainability and capability.
- Review the effectiveness and continuing need for the trauma appropriateness payment.
- STC develop a trauma workforce strategy.
- That the department strengthen policy development linkages between trauma and other relevant programs, such as emergency, critical care, statewide surgical services, burns services, sub-acute and rehabilitation services.

6. Next steps

Once endorsed by the State Trauma Committee, an implementation plan will be developed for the Victorian State Trauma System's future directions, identifying priorities and responsibilities. Implementation of future directions initiatives will be overseen by the STC, in partnership with the Department of Human Services.

Appendix 1: Implementation status of ROTES recommendations

Recommendation area	Key recommendations and broad responses
Trauma system structure	<p>The Victorian State Trauma System (VSTS) recommended by the taskforce was based on the designation of two adult and one paediatric hospitals as Major Trauma Services (MTS) with statewide responsibility for trauma care. It was envisaged that the MTS would function as the hub of an integrated system in which all hospitals were designated to levels within a tiered structure to provide different complexities of care (based on clinical capability and geographical considerations).</p> <p>The service system structure recommended by the taskforce was fully implemented by 2002. Most major trauma patients now receive their definitive treatment at an MTS, with others treated by a service that is appropriate to the level of care needed.</p>
System organisation and management	<p>The taskforce made several recommendations about the establishment of advisory and coordination bodies for the new trauma system.</p> <p>In line with the recommendations, the State Trauma Committee (STC) was established to provide specialist advice to the department. In addition, the process of establishing the VSTS was supported by:</p> <ul style="list-style-type: none"> • The Ministerial Emergency and Critical Care Committee (between 2000 and 2002). • The Trauma System Coordination Unit in the Department of Human Services (established in 2000). • Regional consultative committees on Emergency and Critical Care Services. • The appointment of five regional and three MTS trauma coordinators who undertake data collection and education. <p>While the governance structure proposed by the taskforce was fully implemented, there have been some changes over the years to reflect evolving needs and priorities as the VSTS was progressively put in place. However, the STC and its various sub-committees/working groups continue to provide policy advice and system oversight.</p>
Triage and transfer	<p>The taskforce made detailed recommendations about the establishment of a process for the pre-hospital triage and transfer of trauma patients to the most appropriate hospital within an appropriate timeframe. It was proposed that this system would involve ambulance bypass of some hospitals within logistical and patient safety considerations.</p> <p>The triage and transfer processes recommended by the taskforce were fully implemented. The Department of Human Services introduced major trauma triage guidelines in July 2002. These include:</p> <ul style="list-style-type: none"> • Pre-hospital triage guidelines for ambulance services. • Interhospital transfer guidelines for patients requiring referral or transfer to a MTS and the associated process.
Trauma teams	<p>The taskforce recommended that all MTS have a formal trauma team, comprising clinicians with a range of specialist expertise, to receive major trauma patients and manage the initial response.</p>

Recommendation area	Key recommendations and broad responses
Role of Director of Trauma Services	<p>The taskforce recommended that all Major Trauma Services, metropolitan trauma services, regional trauma services and urgent care services have a designated person/s to fulfil the role of Director of Trauma Services.</p> <p>All relevant services have a designated Director of Trauma Services.</p>
Communication	<p>The taskforce recommended that Major Trauma Services establish a dedicated telephone number, staffed by a consultant-level clinician, to advise referring clinicians.</p> <p>The department established a Trauma Advice and Referral Line, 1800 700 001, in 2002. The line provides access to senior trauma physicians at each MTS, who give clinical advice about the management of trauma patients prior to their transfer to a MTS for definitive care, if required.</p> <p>There has been ongoing development of communication technology and processes regarding transferred patients, as also recommended by the taskforce.</p>
Retrieval and transfer	<p>The taskforce proposed a medical staffing model for a statewide retrieval service. It also recommended enhanced regional retrieval services to coordinate missions requiring treatment at regional hospitals.</p> <p>Until recently, the Victorian Adult Emergency Retrieval and Coordination Service (VAERCS) provided statewide retrieval and service coordination for critically-ill patients, including major trauma patients, requiring interhospital transfer.</p> <p>VAERCS fulfilled most, although not all, of the statewide functions recommended by the taskforce. Regional retrieval services were streamlined and improved. Retrieval services have been significantly enhanced through the establishment of the Adult Retrieval Service in November 2007.</p> <p>Paediatric retrieval services are coordinated by the Paediatric Emergency Transport Service, based at the Royal Children's Hospital.</p>
Quality management	<p>The taskforce made a range of recommendations about quality monitoring of VSTS. These covered areas such as the collection of epidemiological and system performance data, audits of process and outcomes and peer review.</p> <p>The large majority of these recommendations have been implemented. A comprehensive dataset is collected through the Victorian State Trauma Registry and referred to the State Trauma Committee and its Trauma Quality Group. However, in some areas, such as the linkage of the trauma database with police and ambulance data, progress towards full implementation is ongoing.</p>

Recommendation area	Key recommendations and broad responses
Education and training	<p>The taskforce made 17 recommendations for activities aimed at meeting the undergraduate, postgraduate and continuing education needs of staff involved in trauma care.</p> <p><i>A Trauma Education Framework for Victoria</i> was published in 2002, providing guidance for trauma education providers and coordinators.</p> <p>As part of their funding requirements, the three major trauma centres were given a role in providing system-wide education and training.</p> <p>However, as discussed in Section 4.3.2, there are further opportunities to improve the provision of trauma education and training.</p>
Research, service and technology developments	<p>Several recommendations were made about the development and maturation of technology to facilitate more effective functioning of VSTS.</p> <p>There has been ongoing development of telemedicine infrastructure, clinical information and communication systems and electronic diagnostic tools.</p>
Funding	<p>The taskforce noted that effective implementation of VSTS would require an appropriate level of resources. It recommended an investment strategy that prioritised funding for the following activities:</p> <ul style="list-style-type: none"> • System coordination mechanisms. • Targeted trauma education and training. • Enhancement of primary transport and secondary retrieval services. • Hospital staffing levels that meet the role delineation specifications. <p>The department funds the trauma system through a combination of special purpose payments/block funding and its standard activity-based funding mechanisms for public hospitals (in other words, weighted inlier equivalent separation funding).</p> <p>A Trauma Appropriateness Payment (TAP) to referring health services provides an incentive for appropriate triage and transfer of major trauma.</p> <p>As with other parts of the health system, there is ongoing refinement of the funding mechanisms for the trauma system.</p>

Appendix 2: Victorian State Trauma System trauma service level

Trauma service level	Hospital
Major trauma service	The Alfred Hospital Royal Children's Hospital The Royal Melbourne Hospital
Metropolitan trauma service	Austin Health (Austin Hospital) Southern Health (Dandenong Hospital) Eastern Health (Box Hill Hospital, Maroondah Hospital) Southern Health (Monash Medical Centre, Clayton campus) Peninsula Health (Frankston Hospital) Northern Health (The Northern Hospital) St Vincent's Hospital (Melbourne) Western Health (Footscray Hospital)
Metropolitan primary care service	Eastern Health (Angliss Hospital) Epworth Hospital Knox Private Hospital Southern Health (Monash Medical Centre, Moorabbin Campus; Monash Medical Centre, Casey Campus) Peninsula Health (Rosebud Hospital) Bayside Health (Sandringham and District Memorial Hospital) Western Health (Sunshine Hospital) Werribee Mercy Hospital Western Health (Williamstown Hospital)
Barwon South West Region	
Regional trauma service	Barwon Health (Geelong Hospital) South West Health Care (Warrnambool Campus) Western District Health Service (Hamilton)
Urgent care service	Casterton Memorial Hospital Colac Area Health (Colac) Coleraine District Health Services Hesse Rural Health Service (Winchelsea) Lorne Community Health Moyne Health Services Otway Health and Community Services Portland District Health South West Health Care (Camperdown Campus) Terang and Mortlake Health Service (Terang) Timboon and District Healthcare Service

Primary care service	<p>Balmoral Bush Nursing Centre Cobden District Health Services Colac Area Health (Birregurra Community Health Centre) Dartmoor and District Bush Nursing Centre Inc. Hesse Rural Health Service (Rokewood, Beeac) Heywood Rural Health South West Health Care (Lismore) Terang and Mortlake Health Service (Mortlake) Western District Health Service (Penshurst)</p>
Loddon Mallee Region	
Regional trauma service	<p>Bendigo Health Care Group Ramsay Health Care (Mildura Base Hospital)</p>
Urgent care service	<p>Cohuna District Hospital Echuca Regional Health Kerang District Health Kyabram and District Health Service Kyneton District Health Service Maryborough District Health Service Swan Hill District Hospital</p>
Primary care service	<p>Boort District Hospital Dingee Bush Nursing Centre Inc. Inglewood and District Health Service Lockington and District Bush Nursing Centre Mallee Track Health and Community Service Managatang and District Hospital McIvor Health and Community Services Mt Alexander Hospital Robinvale District Health Services Rochester and Elmore District Health Service Sea Lake and District Health Service Inc.</p>

Gippsland Region	
Regional trauma service	Latrobe Regional Hospital
Urgent care service	Bairnsdale Regional Health Service Bass Coast Regional Health (Wonthaggi) Central Gippsland Health Service (Sale) Gippsland Southern Health Service (Leongatha, Korumburra) Orbost Regional Health South Gippsland Hospital Warley Hospital West Gippsland Health Care Group (Warragul) Yarram and District Health Service
Primary care service	Buchan Bush Nursing Association Cann Valley Bush Nursing Centre Dargo Bush Nursing Centre Inc. Gelantipy District Bush Nursing Centre Heyfield Hospital Inc. Mallacoota Medical Centre Neerim District Soldiers Memorial Hospital Omeo District Hospital Swift's Creek Bush Nursing Centre Inc
Grampians Region	
Regional trauma service	Ballarat Health Services Wimmera Health Care Group (Horsham)
Urgent care service	East Grampians Health Service (Ararat) East Wimmera Health Service (St Arnaud) Edenhope and District Hospital Hepburn Health Service (Daylesford) Rural Northwest Health (Hopetoun, Warracknabeal) Stawell Regional Health St John of God Health Care (Ballarat) West Wimmera Health Service (Nhill)

Primary care service	<p>Ballan and District Soldiers' Memorial Bush Nursing Hospital</p> <p>Beaufort and Skipton Health Service (Beaufort, Skipton)</p> <p>Djerriwarrh Health Services</p> <p>Dunmunkle Health Services</p> <p>East Wimmera Health Service (Birchip, Charlton, Donald, Wycheproof)</p> <p>Elmhurst Bush Nursing Centre Inc.</p> <p>Harrow Bush Nursing Centre</p> <p>Hepburn Health Service (Creswick)</p> <p>Lake Bolac Bush Nursing Centre</p> <p>Wimmera Health Care Group (Dimboola)</p>
Hume Region	
Regional trauma service	<p>Albury Base Hospital</p> <p>Goulburn Valley Health (Shepparton)</p> <p>Northeast Health (Wangaratta Base Hospital)</p>
Urgent care service	<p>Alpine Health (Bright, Mt Beauty, Myrtleford)</p> <p>Benalla and District Memorial Hospital</p> <p>Cobram District Hospital</p> <p>Kilmore and District Hospital</p> <p>Mansfield District Hospital</p> <p>Nathalia District Hospital</p> <p>Numurkah District Health Service</p> <p>Seymour District Memorial Hospital</p> <p>Upper Murray Health and Community Services</p> <p>Wodonga Regional Health Service</p> <p>Yarrawonga District Health Service</p> <p>Yea and District Memorial Hospital</p>
Primary care service	<p>Beechworth Health Service</p> <p>Chiltern Bush Nursing Hospital</p> <p>Euroa Hospital</p> <p>Falls Creek Medical Centre</p> <p>Mt Hotham Medical Centre</p> <p>Nagambie Hospital Inc.</p> <p>Tallangatta Hospital</p> <p>Violet Town Bush Nursing Centre</p> <p>Walwa Bush Nursing Hospital</p>

Appendix 3: Major trauma pre-hospital criteria

A. Adults

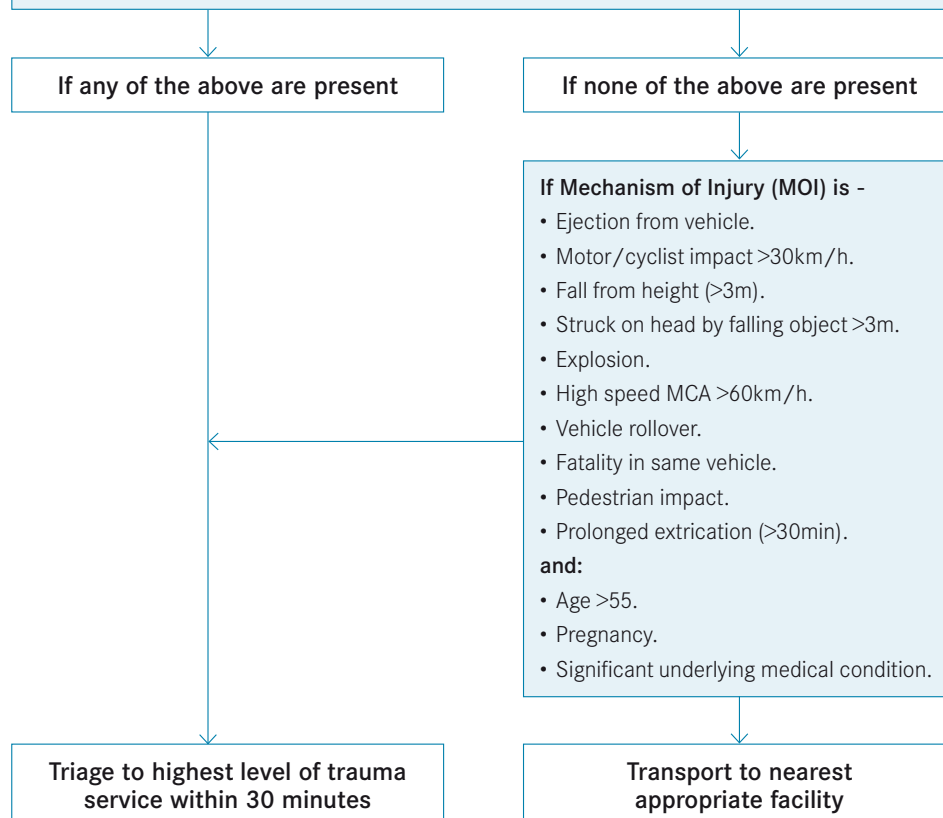
Vital signs (major trauma if any one of the following present):

- Respiratory rate <8 or >20/min.
- Hypotension <100 mmHg systolic.
- Pulse <50 or >100/min.
- Conscious state GCS <13.
- Oxygen saturation <90%.

Or:

Injuries (major trauma if any one of the following present):

- All penetrating injuries:
 - head/neck/chest/abdomen/pelvis/axilla/groin.
- Blunt injuries:
 - Patients with a significant injury to a single region: head/neck/chest/abdomen/axilla/groin.
 - Patients with injuries involving two or more of the above body regions.
- Specific injuries:
 - Limb amputations or limb threatening injuries.
 - Suspected spinal cord injury.
 - Burns >20% or suspected respiratory tract.
 - Serious crush injury.
 - Major compound fracture or open dislocation.
 - Fracture to two or more of the following: femur/tibia/humerus.
 - Fractured pelvis.

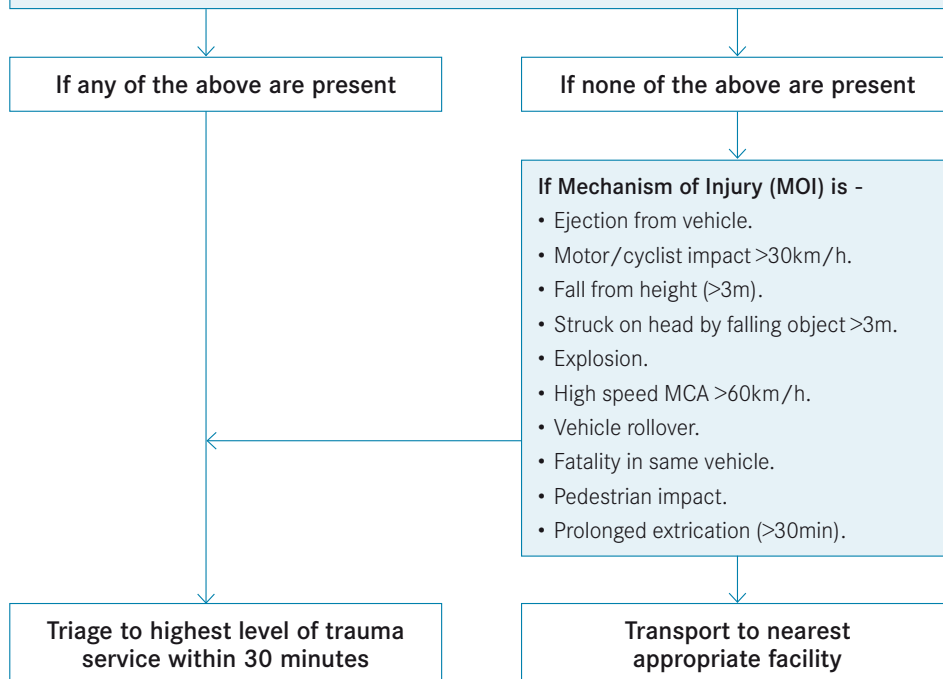


B. Children

Vital signs (major trauma if any one of the following present)				
	Newborn <2 weeks	Infant <1 year	Child 1–8 years	Older child 9–15 years
Respiratory rate	<40 or >60	<20 or >50	<20 or >35	<15 or >25
Hypotension	N/A	<60 mm Hg	<70 mm Hg	<80 mm Hg
Pulse	<100 or >170	<90 or >170	<75 or >130	<65 or >100
Conscious state GCS	<15 GCS	<15 GCS	<15 GCS	<15 GCS
Oxygen saturation	N/A	N/A	N/A	<90%
Skin	Cold/pale/clammy	Cold/pale/clammy	Cold/pale/clammy	Cold/pale/clammy

Or:

<p>Injuries (major trauma if any one of the following present):</p> <ul style="list-style-type: none"> • All penetrating injuries: <ul style="list-style-type: none"> - head/neck/chest/abdomen/pelvis/axilla/groin. • Blunt injuries: <ul style="list-style-type: none"> - Patients with a significant injury to a single region: head/neck/chest/abdomen/axilla/groin. - Patients with injuries involving two or more of the above body regions. • Specific injuries: <ul style="list-style-type: none"> - Limb amputations or limb threatening injuries. - Suspected spinal cord injury. - Burns >20% or suspected respiratory tract. - Serious crush injury. - Major compound fracture or open dislocation. - Fracture to two or more of the following: femur/tibia/humerus. - Fractured pelvis.
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Appendix 4: Consultations in the development of *Trauma towards 2014*

The following people were interviewed regarding *Trauma towards 2014*:

Organisation	Position	Name
State Trauma Committee	Chair	Mark Petty
Royal Melbourne Hospital	Director of Trauma Trauma Coordinator	Rodney Judson Kellie Gumm
Royal Children's Hospital	Director of Trauma	Joe Crameri
The Alfred	Acting Director of Trauma Deputy Director of ICU Head Intensive Care Research Trauma Coordinator	Chris Atkins Jamie Cooper Louise Niggemeyer
Adult Retrieval Victoria	Medical Director	Marcus Kennedy
Southern Health	Director Emergency Department	George Braitberg
Ambulance Victoria	General Manager Metropolitan Operations	Keith Young
Eastern Health (Box Hill)	Clinical Director	Debbie Leach
Bendigo Health	Director of Intensive Care	John Edington
The Victorian State Trauma Outcome Registry and Monitoring Group	Head	Peter Cameron
Transport Accident Commission	Snr Manager Health Research Director Health Services Research Snr Clinical Advisor	Alex Collie Peter Hardcourt Lisa Sherry

The following committees and organisations provided information and advice in the development of *Trauma towards 2014*.

- State Trauma Committee
- Trauma Coordination Group
- Trauma Education Group
- Trauma Quality Group
- Case Review Group
- Victorian State Trauma Outcome Registry and Monitoring Group
- Regional Trauma Education and Critical Care Coordinator Forum
- Regional Trauma Education and Critical Care Advisory Committee

The following organisations provided responses to the *Trauma towards 2014* draft report:

- Loddon Mallee Region, Department of Human Services
- West Wimmera Health Service
- Ambulance Victoria
- Gippsland Region, Department of Human Services
- Barwon South West Region, Department of Human Services
- Monash University
- Western District Health Service
- East Wimmera Health Service
- St Vincent's Health
- Consultative Committee on Road Traffic Fatalities
- Royal Australasian College of Surgeons
- Royal Melbourne Hospital
- Human Region, Department of Human Services
- Transport Accident Commission
- WorkSafe Victoria
- West Gippsland Healthcare Group
- Bass Coast Regional Health

Appendix 5:

A trauma education framework for Victoria audit outcomes

In 2008, implementation and outcomes of the framework were audited by the Trauma Education Group, State Trauma Committee. The following five principles were identified to underpin future training and education activities for Victoria's trauma workforce:

1. Target audience

When targeting the correct audience for trauma related education, the following has to be taken into consideration when structuring the program or timing of the program:

1. Location of the target audience.
2. Time, date and day-of-the-week considerations.
3. Identification of deficiencies of treatment or systemic knowledge in the area targeted for education.
4. Development of 'best reach' communication avenues.
5. Liaison with health services to seek the appropriate education for a particular group of people.
6. Suggest minimum education standards for the regional VSTS.

2. Content

When deriving the content for a trauma education course, two principle factors have to be taken into account; the potential benefit of the program to VSTS, and the potential benefit to the targeted audience. Furthermore, the contents must be derived from recognised bodies, syllabus and curricula and, in addition, education is to be multidisciplinary and in line with accepted place practices and techniques. The content should have a strong focus on the adaptation of the content for the possibility of statewide delivery. Multidisciplinary approaches will enhance the interaction and workability of the content to broaden the scope of potential attendees. The methods of delivery to ensure better retention rates should be delivered in a multidisciplinary, multi-focus, hands-on environment.

Course content should also give the attendee knowledge of how VSTS works and is enacted.

Training should be constructed to reflect the different levels of care provided within the VSTS. Regional and some metropolitan areas' content should reflect the early stages of clinical and systemic aspects of VSTS. Metropolitan, regional and Major Trauma Services should contain content for the entire trauma patient experience. The aim of this method is to educate different areas to different standards to develop skills to deal with the likely stages of trauma (and associated) patients they will treat.

3. Delivery

Delivery methods for trauma education should take into account distance, backfill, flexible learning delivery options, difference in degrees of standard and background of attendees.

To effectively gain participants, the onus is with health services to make allowances within budgets and employee agreements to allow for attendance to education courses. To effectively further the development of staff and invest in the future development of a health service, employers should actively assist in the development of their staff.

In the development of the delivery, education course providers are reminded to take into account the above 'content' requirements and, in addition, course providers are to work with health services and the TEG to develop course content, structure and delivery methods to suit regional and/or metropolitan potential attendees.

4. Responsibilities

Currently the department is constructing a five-year strategic policy for the VSTS. Provision will be made to develop trauma education under the five headings outlined within this document.

Further responsibilities are to be added.

5. Quality, standards and review

Major, metropolitan and regional designated trauma services are to annually revise systemic and clinical review processes. A clearly identified process for identification of systemic and clinical issues is to be in place and annually refined.

The Trauma Education Group is to advise the department on a wide range of educational issues for the sector.

The department, in conjunction with industry stakeholders, is to develop strategic directions for the sector and to form statewide analysis (via the VSTR and others) and direct policy to guide VSTS's future direction.

