Trauma Services BC

2017-18 Annual Report

Contents

Foreword

Whether measured in terms of lives lost or disrupted, disability endured, resources utilized or potential unrealized, the burden of injury sustained by British Columbians is substantial. This said, British Columbia (BC) is fortunate to have one of the most advanced trauma systems in Canada. It also has, however, some of the most difficult challenges. With a modest population of only 4.81 million distributed over nearly a million square kilometres of access- and weather-challenged geography, assuring optimal care for those suffering major trauma in all communities of the province is complex. In the rural and remote regions of BC, it is enormously problematic. When Trauma Services BC was established by BC's Provincial Health Services Authority (PHSA) six years ago, an important opportunity was created to tackle the challenge of controlling injury across our entire province.

Unlike many Canadian jurisdictions, the size and organization of BC's regional health authorities favours collaboration for generating solutions to the common challenges of trauma care, and Trauma Services BC has helped align the regional trauma programs in support of one another. Moreover, the co-location of Trauma Services BC with BC Emergency Health Services (BCEHS), Health Emergency Management BC (HEMBC), the BC Centre for Disease Control (BCCDC), and a host of provincial health care and public health programs under the common umbrella of PHSA affords an extraordinary opportunity to create one of the most effective and highly integrated trauma care and injury prevention systems in the world.

Adjacencies within PHSA have enabled Trauma Services BC to link data sets across organizations so effectively that the BC Trauma Registry, largely unchanged for 20 years since first implemented in 1992, has transformed into a trauma information management platform capable of providing far more intelligence about injury in the province than any other system in the country.

David Evans, MD, Provincial Medical Director

We have made tremendous strides and look forward to more development in the months ahead as this system is tailored to provide the information needed to drive performance. In 2017, Trauma Services BC produced reports on injury-associated mortality, length of stay and complications of trauma care.

There were many accomplishments over the year. These include establishment of the Trauma Services BC Performance Improvement and Patient Safety Committee and the launch of a secure web-based platform to conduct case-based inter-organizational quality reviews at the provincial level. A comprehensive mortality review strategy was innovated to better identify preventable deaths and system-level opportunities for improvement. Responding to regional variability in care delivery models, Trauma Services BC generated recommendations for comprehensive trauma care delivery at designated trauma referral centres.

Continuing the work initiated in 2016 with an award of nearly $1 million from the Doctors of BC Specialist Services Committee physician engagement initiative, Trauma Services BC furthered development of a proposed BC Trauma Specialist Advisory Network to promote equitable access to specialized trauma care across all regions of the province. Trauma Services BC also continued its active support for coordinated injury prevention in BC through collaboration with the BC Injury Prevention Advisory Committee, and helped facilitate an enormously successful meeting of the Trauma Association of Canada in Vancouver.

Trauma Services BC continues to work hard at strengthening the foundation for a world-class trauma system in BC. Much of its success has been thanks to the leadership of its first Executive Director, Catherine Jones, in collaboration with Trauma Services BC's strong and productive team, clinicians and managers dedicated to trauma care across BC. We look forward to continued success in the year ahead.

Kathy Steegstra, Senior Provincial Executive Director

Executive Summary

Trauma Services BC was established in 2012 as a program of the Provincial Health Services Authority (PHSA) to work with key provincial partners to advance optimal performance of the BC trauma system. Trauma Services BC provides oversight and coordination of the provincial trauma system by focusing on three pillars of work:

1. Strengthening organizational partnerships to improve the coordination of clinical services and other activities that enhance outcomes for major trauma across BC.
2. Strategic planning to design structures and processes that support the mission and vision of Trauma Services BC as overseer of the BC trauma system.
3. Development of a robust information management system to enable monitoring and evaluation of performance across the trauma system.

With the goal of improving outcomes for trauma patients, Trauma Services BC works with the regional health authorities, responsible for delivery of care, and BC Emergency Health Services (BCEHS) responsible for transport of injured patients. In addition, Trauma Services BC supports and collaborates with other provincial organizations including the BC Injury Prevention Advisory Committee, the BC Coroner's Services, Health Emergency Management BC, and Population and Public Health (BC Centre for Disease Control and BC Injury Research and Prevention Unit) to reduce the incidence of trauma in BC.

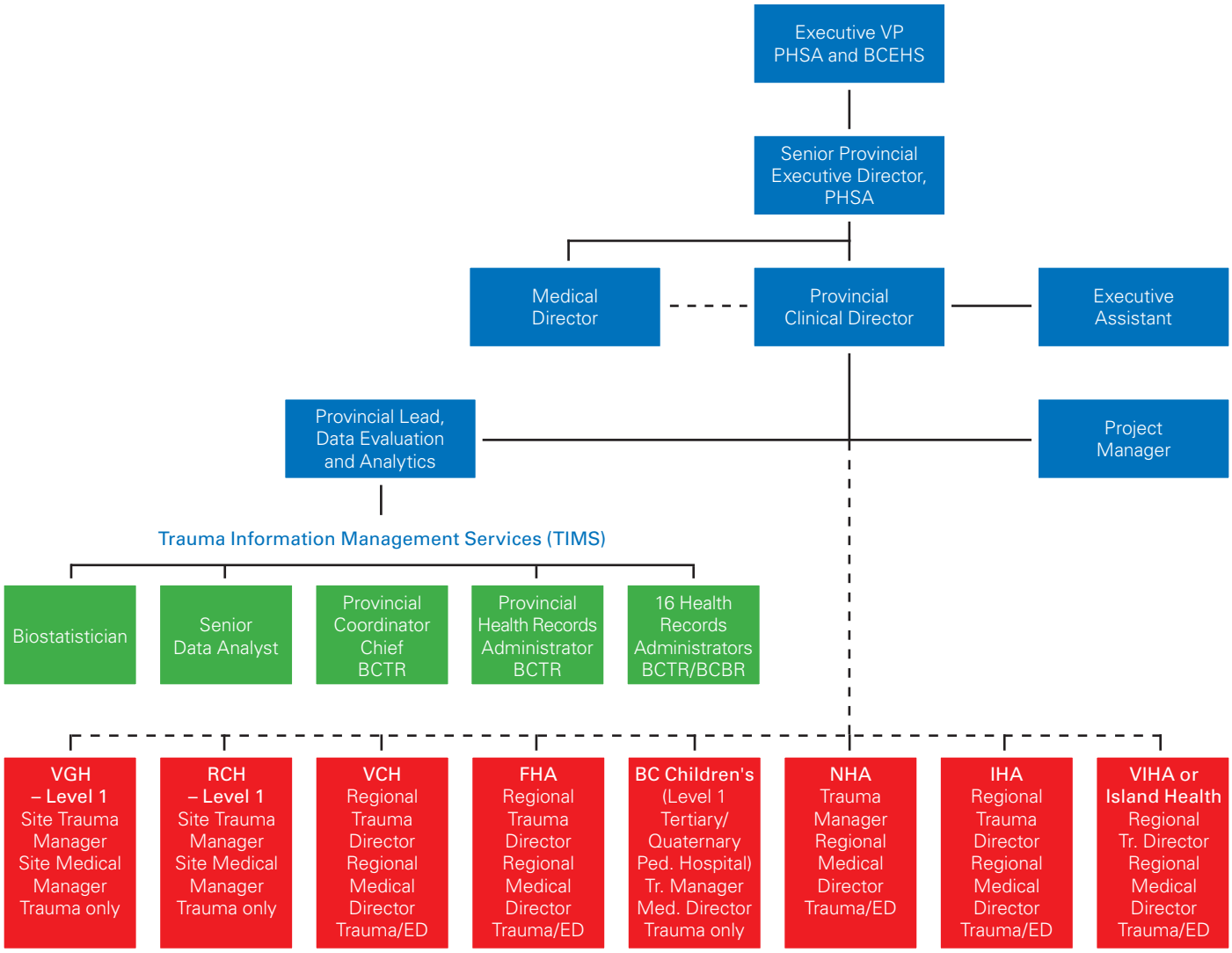
Foundational to all of Trauma Services BC's work is a commitment to promote consensus through discussion with its partners and to ensure accountability for the performance of BC's trauma system. Trauma Services BC provides leadership in developing and reviewing province-wide standards and processes related to a range of issues in the delivery of trauma care. Through its Performance Improvement and Patient Safety (PIPS) Program, Trauma Services BC has established a Provincial PIPS Committee which reviews incidents with system-wide opportunity for improvement, monitors performance trends and makes recommendations to improve quality of trauma care.

Trauma Services BC sets provincial priorities through engagement with leadership from all regional trauma programs and BCEHS through its Council. In addition to the Council, Trauma Services BC oversees the BC Trauma Registry and working groups, such as the TSBC PIPS Committee and the Interdisciplinary Trauma Network of BC (ITNBC).

In its first five years, Trauma Services BC has focused heavily on consolidating a strong foundation for a reliable and sustainable provincial trauma system. Key accomplishments include:

- Streamlining BC Trauma Registry operations with expansion into the BC Trauma Information Management Services (BCTIMS) linking multiple datasets on one platform through information sharing agreements and providing analytical services
- Service funding agreements between Trauma Services BC and the regional health authorities to uplift regional trauma clinical program delivery
- The establishment of a provincial PIPS Committee to promote quality assurance activities that support improved outcomes in trauma care across BC
- The establishment of a BC Specialist Trauma Advisory Network, with competitive funding support from Doctors of BC, to improve access to specialized trauma care in all regions of the province.

Trauma Services BC Council Organizational Chart



BCTR – BC Trauma Registry
BCEHS – BC Emergency Health Services
PHSA – Provincial Health Services Authority
TSBC – BC Trauma Services BC

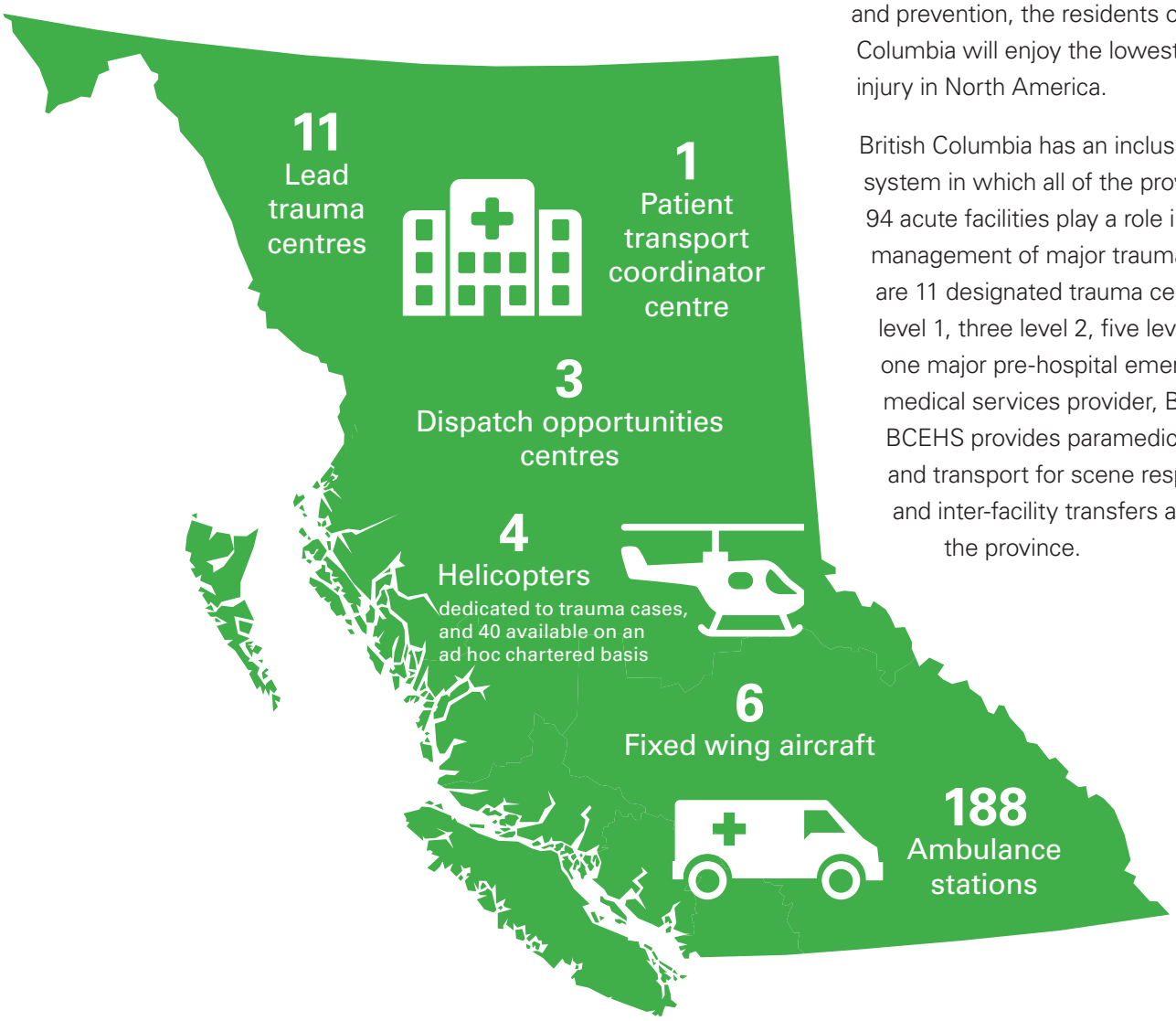
Partners

- BC Emergency Health Services
  - BC Ambulance Service
  - BC Patient Transfer Network
- Mobile Medical Unit
- Health Emergency Management BC
- Emergency Services Advisory Council
- BC Coroner Services

Organized Trauma Care in British Columbia

A coordinated approach to trauma care has existed in BC since the establishment of the BC Trauma Advisory Committee (BCTAC) in 1999 when lead trauma hospitals were first identified based on Trauma Association of Canada guidelines. At the same time, limited funding was made available to support key leadership positions in five regional trauma programs. The BC Trauma Registry was established in 1992 to collect data on major trauma from designated level 1-3 trauma centres.

Prompted in 2007 by a formal proposal from BCTAC recommending the creation of a provincial trauma coordinating office, BCTAC was dissolved in 2012 and Trauma Services BC was established within PHSA as the lead oversight body for trauma management across the province. Trauma Services BC's operational model ensures engagement and participation of regional trauma programs in setting provincial priorities through Trauma Services BC's council.[1] Trauma Services BC's mission is to ensure optimal performance of the BC trauma system. Its vision is that, through injury care, control and prevention, the residents of British Columbia will enjoy the lowest burden of injury in North America.



British Columbia has an inclusive trauma system in which all of the province's 94 acute facilities play a role in the management of major trauma. There are 11 designated trauma centres (three level 1, three level 2, five level 3) and one major pre-hospital emergency medical services provider, BCEHS. BCEHS provides paramedic support and transport for scene responses and inter-facility transfers across the province.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BC Trauma Statistics

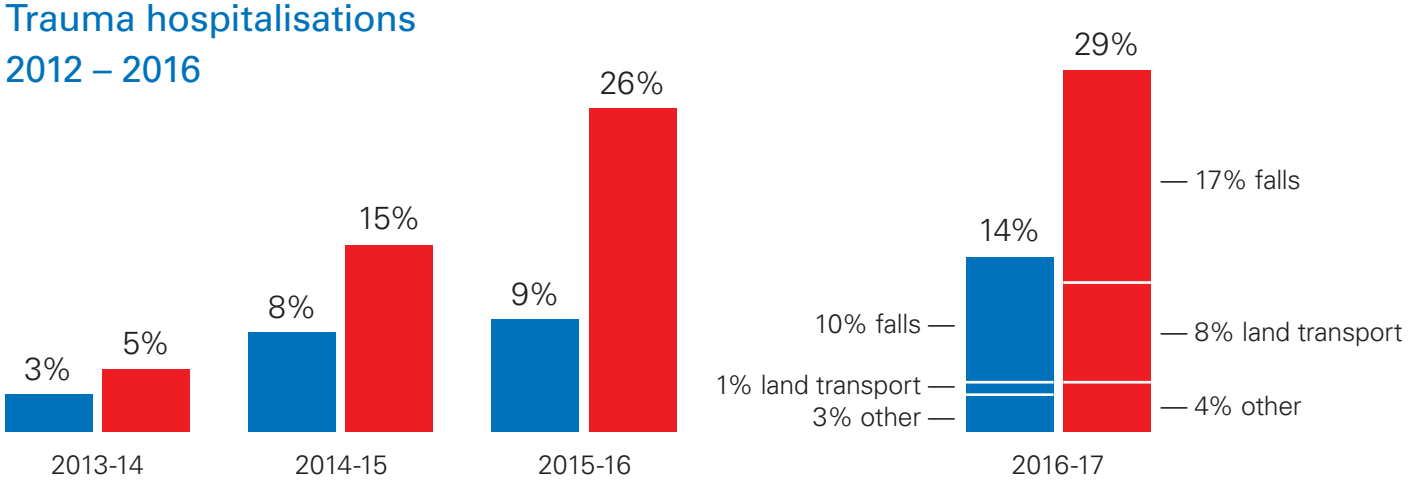
To better understand performance in trauma care provincially, Trauma Services BC monitors thirteen key system indicators[2] which are a composite of Accreditation Canada Trauma Distinction Indicators and consensus-based indicators selected by Trauma Services BC Council.

These indicators are available to regional leaders through a provincial dashboard, a self-serve reporting tool designed to facilitate informed decision making in the planning and management of trauma care. Through provincial meetings, Trauma Services BC engages key stakeholders to monitor system trends, review performance metrics and collaborate on system level opportunities for improvement.

Between 2012 and 2016, trauma hospitalisations increased 13.8%. Hospitalisations for severe injury increased by 29%, mostly due to injury associated with falls and land transport crashes.

Trauma Services BC conducted a risk-adjusted mortality analysis of 11 designated trauma sites in BC compared to major trauma centres across Canada. The analysis found that BC has a lower risk-adjusted mortality rate than the Canadian average.[4] There is a some variation in risk-adjusted mortality between the 11 designated trauma sites in BC for which further analysis is warranted. In all 11 designated trauma hospitals, time to rehabilitation care currently sits at four days, substantially below Accreditation Canada's average of eight days as captured by the time to rehabilitation indicator.

Trauma hospitalisations 2012 – 2016

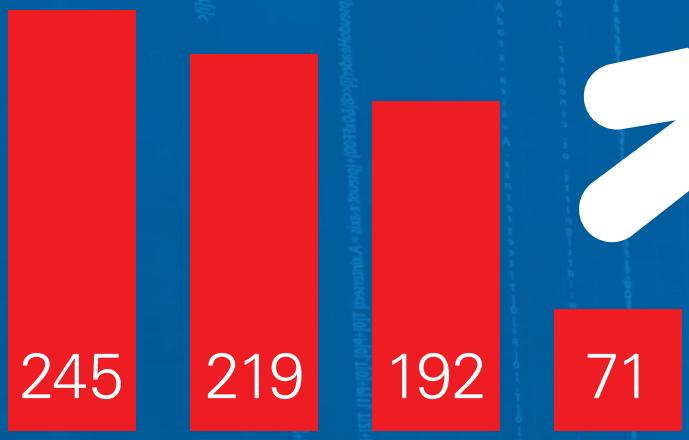


All hospitalisations % increase from 2012/13

BCTR hospitalisations (moderate to severe injuries) % increase from 2012/13

Trauma by the numbers

Top four causes of injury-caused mortality out of hospital



Transport related (land, air and water)

Suffocation and strangulation

Falls

Firearms

Fiscal 2014/15

Trauma related mortality rates by location

	Health care facility (hospitals, acute care, extended care, rehab, etc.)	Private home	Other location (street, highway, etc.)
Metro	254 (8.5*)	136 (4.5)	95 (3.2)
Urban/Rural	366 (19.7)	131 (7.1)	185 (10.0)
Rural and Remote	72 (12.4)	67 (11.6)	155 (26.7)

Fiscal 2014/15 *(per 100,000 population)

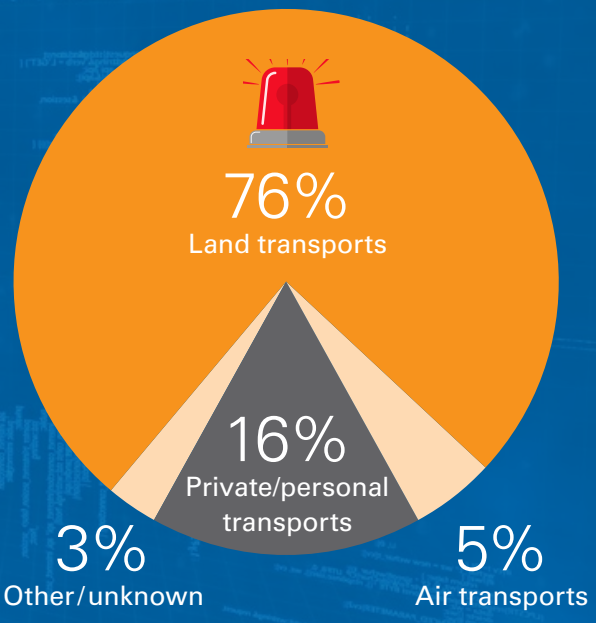
Triage and Transport

Outcome		2016	2015
Mortality (AC)	↑	11.2%	10.8%
Readmission Rate – 30 Days	↓	7.9%	8.3%
Acute Care Length of Stay (AC) (days)	↓	15.5	16.7
Complications during Hospital Stay (AC)	↓	22.8%	23.2%

148,531	Ambulances responding to trauma 9-1-1 calls (30% of all 9-1-1 calls)
116,398	Ambulance transports from scene
10,729	Personal transports from scene admitted to hospital
6,884	Inter facility transfers
382	Air ambulance transfers

Fiscal 2016/17

Mode of transport of patients admitted to hospital for moderate/severe injuries



Trauma Admission Rate

per 100,000 population (ISS >= 9)

2016	2015
113.75	108.69

Population – 4,740,124

Admissions – 5,383

Hospital Care

Mechanism (Top 10)		2016	2015
Falls	↑	2,716	2,663
Land Transport – Motor Vehicle	↑	615	565
Land Transport – Pedal Cycle	↑	332	305
Land Transport – Pedestrian	↑	303	266
Land Transport – Motorcycle	↑	248	214
Cutting and Piercing	↑	194	154
Struck by or against Objects or Persons	↑	152	138
Assault	↑	150	142
Land Transport – All Terrain Vehicle	↓	150	152

(adults and children)

Emergency Room visits

~420,000* Injury-related emergency room visits

National Ambulatory Care Reporting System (NACRS)

Injury-related hospital admission

32,074* Acute care admissions only

Discharge Abstract Database (DAD)
excludes re-admissions, includes miscoded[5] trauma cases

3.8%	62	12.4
Mortality rate	Average age	Average length of stay

* Estimated due to incomplete data

Injury admissions

(major injury in hospitals supported by BC Trauma Registry)

8.0%**	55	5,508
Mortality rate	Average age	Admissions

11.9	65,687
Average length of stay in hospital	Total days

2,555	2.3
Surgical patients	Average number of procedures in operating room for surgical patients

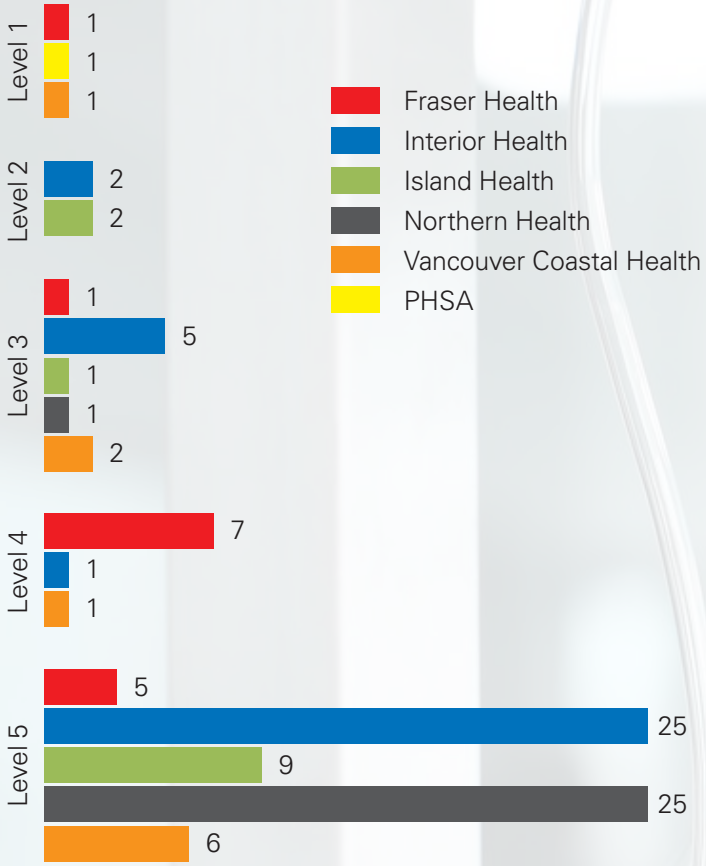
7.0	6,131
Average length of stay in Intensive Care Unit	Total days

14.2	5,714
Average potential years of life lost	Total years of life lost

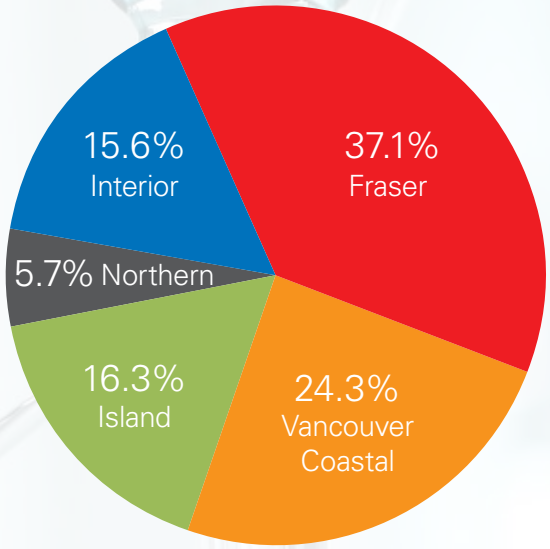
** Mortality rates for both DAD and BCTR are episode-based.


FLIGHT
PARAMEDIC
AMBULANCE
BRITISH COLUMBIA
FOR PROFESSIONAL USE ONLY

BC trauma facilities



2017 BC population by region



2017 BC population demographics by age group

Health Authority	0 – 14	15 – 24	25 – 44	45 – 64	65 – 90+	Total
Fraser	297,733 (16.5%)	245,761 (13.6%)	495,963 (27.5%)	486,056 (26.9%)	278,958 (15.5%)	1,804,471
Interior	103,410 (13.7%)	81,295 (10.7%)	170,828 (22.6%)	226,919 (30.0%)	174,493 (23.1%)	756,945
Island	104,047 (13.1%)	89,325 (11.3%)	186,993 (23.6%)	228,642 (28.8%)	184,173 (23.2%)	793,180
Northern	51,701 (18.5%)	35,836 (12.8%)	73,439 (26.3%)	78,394 (28.1%)	40,047 (14.3%)	279,417
Van. Coastal	141,309 (11.9%)	151,113 (12.8%)	358,105 (30.3%)	330,243 (27.9%)	202,377 (17.1%)	1,183,147

Trauma hospitalisation statistics

	Fraser Health	Interior Health	Island Health	Northern Health	Vancouver Coastal	BC Children's (PHSA)
# Adult Major Injury* hospitalisations (% per 100,000 population)	1,206 (82.2)	925 (145.5)	1,022 (151.9)	224 (100.7)	1,840 (180.7)	10 (N/A)
# Pediatric Major Injury* hospitalisations (% per 100,000 population)	31 (9.8)	32 (29.3)	40 (36.4)	10 (18.5)	7 (4.6)	170 (N/A)
In Hospital Mortalities (% per 100,000 population)**	112 (6.3)	56 (7.5)	103 (13.2)	10 (3.6)	133 (11.4)	9 (N/A)
Injury Caused Mortalities in all BC hospitals or other health facility (% per 100,000 population)***	259 (15.1)	183 (25.0)	103 (13.5)	31 (10.9)	116 (10.1)	****
Injury Caused Mortalities in private homes (% per 100,000 population)***	111 (6.5)	74 (10.1)	59 (7.7)	24 (8.4)	66 (5.7)	****
Injury Caused Mortalities in other locations (street, highway, etc.) (% per 100,000 population)***	94 (5.5)	167 (22.8)	49 (6.4)	69 (24.2)	56 (4.9)	****
% Mode of Transport from Scene by Air	5.6	9.0	3.0	0.9	3.4	7.2
% Mode of Transport from Scene by Land Ambulance	80.1	73.2	79.0	77.8	77.0	47.2
% Mode of Transport from Scene by Personal / Private Transport	13.2	17.4	14.8	18.9	15.3	33.9
% Trauma Team Activation Compliance for BC Trauma Registry Hospitals (Number of Activations)*****	85.9 (256)	89.1 (640)	67.7 (341)	85.9 (85)	89 (482)	89.8 (59)

* Major Injury is defined as all injuries in the BC Trauma Registry with an Injury Severity Score of 9 or higher.

** Mortality data and rates from BC Trauma Registry's 11 hospitals only.

*** Data is based on latest complete fiscal year data available which is 2016/17 BC Trauma Registry data with the exception of injury caused deaths, which is based on 2014/15 Vital Statistics data.

**** Reported under VCH.

***** Trauma Team Activation (TTA) compliance rate is defined as the number of patients who had a Trauma Team Activation divided by the number of patients who met Trauma Team Activation criteria.

Provincial initiatives

Trauma Services BC undertakes strategic planning in collaboration with provincial partners at the Trauma Services BC Council. The plan articulates system goals for the trauma system for a period of three to five years with defined annual deliverables. Trauma Services BC monitors progress towards these goals and provides reports to its partners during its provincial council meetings.

TSBC has three key program pillars: system planning, surveillance and monitoring and quality improvement. Strategic goals for 2016-19 are:

1. Develop integrated monitoring and evaluation tools targeting key system performance challenges.
2. Implement a provincial Specialist Trauma Advisory Network (STAN) to optimize the management of complex trauma including improved access.
3. Implement a staged provincial performance improvement and patient safety program for trauma.
4. Develop an integrated provincial Trauma System plan for BC.
5. Define and develop a provincial trauma education.

Trauma Services BC has made good progress towards meeting its strategic priorities. Some key highlights for 2017 include:

1. Launch of a provincial **trauma dashboard** to help monitor trauma performance. This web-based portal monitors a set of 13 Accreditation Canada and BC specific performance metrics which will help decision makers better understand trauma care delivery in their regional system or at a site by providing tools to identify issues and investigate root causes. Using this information, Trauma Services BC supported clinicians to complete patient chart reviews to assess if patients with key injuries went to the right hospital.
2. A **provincial resource inventory** of 94 trauma receiving facilities across BC was completed. The data collected will be helpful to support ongoing system planning, care delivery and inform the framework for trauma system planning in BC.
3. Advancing its work on system improvement, Trauma Services BC collaborated with Patient Safety Learning System (PSLS) to launch an online platform to **review trauma mortalities**. The PIPS program has established a provincial committee to review annual mortality rates and look for opportunities to improve care. In addition, this committee will examine select cases and associated recommendations from the regional trauma programs to support system-wide learning and continuous improvement.
4. Trauma Services BC secured funding from the Shared Care and Specialist Services Committee to evaluate **models of care for Trauma in BC**. This project proposes models of comprehensive care expectations for patients with major injury admitted to designated trauma facilities across BC.
5. Trauma Services BC through its Trauma Information Management System (TIMS), produced **risk-adjusted analytic reports** on trauma length of stay and mortalities across designated trauma sites in BC. These reports will help sites compare their performance to similar sites in BC while also helping identify opportunities for improvement.

More injuries related to winter sports are being recorded in the province.

Performance improvement and patient safety

A high-functioning trauma system requires continuous quality improvement with committed engagement across organizations and regional jurisdictions that are both responsive and reactive. Trauma Services BC Performance Improvement and Patient Safety (PIPS) Program is designed to meet this important system requirement. The program aims to monitor, evaluate and generate system-level recommendations to ensure a baseline performance standard for quality of care in all phases of management across the continuum, and assure optimal functioning of key system-wide processes required to deliver appropriate care to patients.

Performance Improvement and Patient Safety Committee

The TSBC PIPS Committee monitors and evaluates performance of BC's provincial trauma system and advance recommendations for system-level improvement to the Trauma Services BC Council. This committee is protected under s.51 of the BC Evidence Act, and endorsed by the quality structures of all six participating health authorities with formal information sharing and confidentiality agreements.

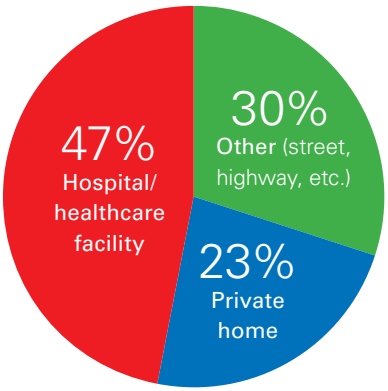
Over the past year, the TSBC PIPS Committee has focused on establishing a provincial process for reporting and reviewing trauma mortalities. The Committee developed a provincial mortality review form and defined a three-tier review process encouraging multidisciplinary review at site, regional and provincial levels. At each level, mortality review committees account for trauma deaths concurrently using institutional processes or retrospectively prompted by low-probability (potentially unexpected and preventable) death reporting generated by the BC Trauma Registry.

Highlights of the PIPS Committee's progress include:

- Operationalization of a secure multi-jurisdictional forum to discuss and review quality of care and process issues relating to the management of major trauma in BC
- Annual reporting on all deaths due to injury in BC that links the BC Trauma Registry and hospital discharge data, and, where possible, BC vital statistics
- Quarterly tracking of all hospital deaths due to injury
- Annual auditing by the BC Trauma Registry of low-probability trauma deaths
- Monitoring of trauma centre compliance to mortality reviews
- The creation of a web-based mortality reporting tool using the provincial PSLS platform and integrating data support from the BC Trauma Registry
- The approval of an annual pediatric trauma death review
- The identification of quality of care indicators for provincial-level tracking

In 2018, the PIPS Committee plans to more fully operationalize the mortality review process. Trauma centres will be encouraged and supported to adopt the mortality process and refer appropriate cases forward for multi-disciplinary review at both the regional and provincial level. An expedited review process is planned in order to facilitate documentation of expected deaths without anticipated system-level performance improvement learnings. The aim of expedited reviews is to capture causes of injury-related death and any relevant insight into local processes. In addition, the PIPS Committee looks to design a similar quality review process for assessing trauma complications.

Where do trauma patients die?



BC Specialist Trauma Advisory Network

Members listed in Appendix iii on page 36

In 2016, the Doctors of BC Specialist Services Committee awarded funding to Trauma Services BC for the engagement of physicians in a province-wide strategy to assure optimized access of patients to complex trauma care. The project, *Streamlined Specialized Care Strategies for Complex Trauma in BC*, aligns with health ministry and regional health authority strategic priorities for improving access to surgical services, particularly for rural residents of BC. The objective is to implement a self-sustaining Specialist Trauma Advisory Network (STAN) of regionally representative Specialist Advisory Groups (SAGs) able to promote optimal care for complex trauma across the province. The initiative has made considerable progress and continues through to March 2019. The BC Specialist Trauma Advisory Network is a unique innovation among recognized trauma systems.

Currently, eight Specialist Advisory Groups (SAGs) targeting 10 specific key injury groups have been initiated:

1. Diagnostic Imaging
2. Complex Orthopedic Surgery
3. Thoraco-Abdominal Surgery
4. Burns
5. Complex Plastic and Reconstructive Surgery
6. Spine Surgery
7. Pediatrics Trauma
8. Neurotrauma

Key output of the current phase of work include clinical practice guidelines, imaging guidelines, and destination guidelines. Additionally, the project will develop a data management and reporting platform for use by the Specialist Trauma Advisory Network to monitor system performance and assess the impact of the guidelines developed.

11% of patients admitted to hospital with major injuries, have sustained injuries to multiple body systems.

Models of Trauma Care for BC

In May 2017 Trauma Services BC was awarded one year's funding for a proposal submitted to the *Shared Care and Specialists Service Committee Redesign Funding for Physician Engagement initiative*. The project, entitled *Recommendations on a strategy for the sustainable delivery of comprehensive care to injured patients admitted to designated trauma receiving facilities in BC*, aimed to address problematic practice variation in trauma care delivery across BC's level 1, 2 and 3 trauma centres.

Under the leadership of medical and operational leaders across all health authorities, data on trauma centre volumes, patient acuity, and admitting/discharge profiles were evaluated, and a survey of patient care practices among 10 adult sites was completed. Important variation in the types of physicians involved in all phases of acute trauma care across trauma centres was documented, as were practical challenges to the delivery of a common standard of care across sites. Based on findings, recommendations were made for sustainable and appropriate care delivery models to assure optimal trauma care management. A TSBC white paper will be outlining these recommendations in 2018.

Provincial inventory of resources for trauma

An integrated provincial plan requires a full current state description of how trauma care is currently administered and managed provincially, including system objectives, partner roles, inter-organizational relationships, governance, accountability and operational resources.

To advance this objective, Trauma Services BC designed a trauma resource inventory based in part on the American College of Surgeons Resources for Optimal Care of the Injured Patient (2014) and the Trauma Association of Canada Accreditation Guide. The inventory was completed in all acute care facilities in BC to capture important human, structural and procedural resources, including specific capabilities relating to general and specialized care of injured patients.

A total of 94 sites participated and the data collected is currently being validated. An analysis of the completed inventory will inform our approach to develop a provincial trauma system plan for BC.

One third of severely injured patients needing hospitalisations had a head injury.

Interdisciplinary Trauma Network of BC

Members listed in Appendix ii on page 35

Mirroring the Trauma Association of Canada's (TAC) Interdisciplinary Trauma Network Committee (ITNC) the Interdisciplinary Trauma Network British Columbia (ITNBC) was formally struck in 2015 as a working group of Trauma Services BC. The working group membership is comprised of Trauma administrative leaders, educators, case managers and coordinators who provide the hands-on care for trauma patients in acute care facilities across BC. Their roles extend to coordination of services, patient follow-up, data collection and registry support, quality review, education, provider support and local program management. In 2016-17, ITNBC worked on two major initiatives:

Provincial Trauma Transfer Form and Checklist

Based on earlier work, a standardized form was developed to provide accurate communication of care provided at initial receiving sites prior to secondary transfer of trauma patients. At a minimum, it is anticipated that this new form, once uniformly implemented, will help to reduce unnecessary delays. ITNBC is currently piloting this checklist capturing important information required by the receiving facility prior to patient transfer.

Provincial Trauma Nurses Assessment Record

The Trauma Nursing Assessment Record (TNAR) has existed since 2004. Despite wide uptake of similar forms at higher level trauma centres, variation existed in information captured leading to the inconsistent communication of clinical information. In 2017 a working group representing urban and rural sites in all health authorities convened under ITNBC to update and standardize the TNAR to reflect current practices in trauma care across BC. Additionally, they sought to identify performance and compliance metrics. ITNBC membership moved to implement the revised TNAR in all sites across BC beginning in May 2018.

Injury prevention

Trauma Services BC is represented on the BC Injury Prevention Committee which convenes regional public health officers, the BC Centre for Disease Control (BCCDC), and the BC Injury Research and Prevention Unit. The Committee advises the health ministry on injury prevention issues and assists with priority setting for new and ongoing initiatives. The newly launched BC Health Observatory, under the BCCDC, collaborated with Trauma Services BC to complete a report exploring the use of Trauma Services BC's Trauma Minimum Data Set to inform work on a provincial injury surveillance strategy. Trauma Services BC is committed to a strong provincial injury surveillance system as a critical element of injury burden control. Trauma Services BC also contributed to the Committee's effort to identify feasible injury prevention indicators for BC, and it supports Vision Zero and the BC Road Safety Strategy through ongoing participation in its Research and Data Working Group.

Moreover, Trauma Services BC, collaborated with provincial and regional public health/injury prevention partners by sharing high level trauma data for injury surveillance and epidemiology in:

- Supporting motor vehicle deaths prevention, seniors falls prevention, winter sports safety, and pediatric falls from windows prevention (Provincial Health Services Authority)
- Understanding motor vehicle deaths and supporting mountain biking safety initiatives (Vancouver Coastal Health)
- Understanding all-terrain vehicle (ATV) and off-road biking injuries (Vancouver Island Health Authority)
- Understanding equestrian-related injuries (Fraser Health Authority)

Falls are the most common cause of injury in BC and most falls are preventable.

Trauma Information Management Services

Trauma Information Management Services (TIMS), which includes the BC Trauma Registry, collects a wide range of data from its key partners on trauma injury, mortality and care delivery across BC. This data is analyzed to identify trends and gaps in care to support quality improvement and set benchmarks for minimum standards of trauma care for all British Columbians.

BC Trauma Registry

The BC Trauma Registry made improvements in both the Comprehensive Data Set (CDS) and the Minimum Data Set (MDS).

The core function of the BC Trauma Registry CDS is to evaluate the care of severely injured patients with timely data collection. Annual increases in volumes of hospitalised patients over the past five years has increased the BC Trauma Registry CDS workload and challenged data concurrency. In 2017 the BC Trauma Registry CDS refined its criteria to reduce data collection effort by excluding low Injury Severity Score transfers ISS<9 and non-trauma related mortalities. The BC Trauma Registry enhanced the MDS to ensure data is available on this excluded population.

The purpose of the MDS is to help describe the impact of trauma admissions in all provincial hospitals, support injury surveillance, understand overall injury trends, support injury prevention and ensure that the right population is captured in the BC Trauma Registry CDS. TIMS enhanced its MDS in 2017 to include BCEHS data on trauma-related 9-1-1 calls, ambulance transfer data and inter-facility transfer data. TIMS also added Vital Statistics Data to better understand trauma-related mortality before first responders arrive, as well as mortality after care is provided.

TIMS continues to advance its effort to synthesize and develop new data to enhance reporting, better understand trauma system performance and increase the efficiency of clinical audits. TIMS recently added predictive mortality scores, patient risk groups and key trauma injury groups to the BC Trauma Registry CDS; and estimated injury severity scoring, major injury groups, and methods to identify trauma in emergency department, BCEHS and vital statistics data.

TIMS continues to participate and lead discussions at a provincial and national level to enhance the value of the BC Trauma Registry. TIMS was recently a contributor to a pan-Canadian study to develop a benchmarking tool for trauma hospitals. This tool is now available on the TAC website under the TAC Performance Improvement Committee.

Trauma research

TIMS regularly provides data to researchers to enhance clinical and administrative knowledge. In 2017, TIMS provided data to support 11 research projects and an additional 16 quality improvement and injury prevention projects. Some of these include:

- Trauma service evaluation in Fraser Health Authority
- Feasibility of collection for patient-reported outcomes
- Surveillance of equestrian injuries in BC
- Epidemiology of penetrating injuries in BC
- Clinical impact of 24/7 radiologist coverage in Vancouver General Hospital
- Surgeon vs non-surgeon trauma team leader multi-centre cohort study
- Pre-hospital blood product resuscitation for trauma

Standardized provincial reporting

A review of provincial and regional quality indicators in 2014 found that almost half of the provincial indicators were widely used and less than five per cent of the regional indicators were common across health authorities. Based on national and international review of quality indicators that support trauma system performance, TIMS built a provincial trauma dashboard using agreed upon new key performance indicators that were aligned with Accreditation Canada's Trauma Distinction indicators.

Statistical analysis

Statistical analysis is a key tool used by TIMS to understand if variations in processes or outcomes are significant. It's used to compare (benchmark) facilities taking into account the different types of injuries and patients they see. It's also used to prove or refute key quality of care questions or hypotheses so that Trauma Services BC and its partners can focus efforts on key issues that have the greatest impact to patient care.

TIMS produced three analytical reports in 2016-2017:

- Provincial Mortality Report: summarizing trends in observed mortality and risk adjusted mortality
- Provincial Complication Report: summarizing trends in trauma patient complications and risk adjusted complications
- Provincial Length of Stay Report: summarizing trends in trauma patient length of stay and risk adjusted length of stay

The analyses used risk adjustment methodologies specific to trauma that has been developed in Quebec. All three analyses looked beyond the individual sites with a focus on the patient's journey.

While these analyses are important, they have some limitations. Trauma Services BC is working with health authority partners to interpret the findings to ensure that patient care quality improvement efforts are effective. In the future, Trauma Services BC is planning a deeper analytic approach using better data collection, expanded research and collaboration with other national jurisdictions.

60% of majorly injured patients needing hospitalisations are over 65.

Partners

BC Emergency Health Services

British Columbia Emergency Health Services (BCEHS) provides out-of-hospital and inter-hospital health services throughout BC. Paramedics in both ground and air ambulances, as well as dispatchers and staff who arrange inter-facility patient transfers provide valuable services across BC every day. BCEHS employs over 4,750 staff who support air and ground ambulances (including call takers and dispatchers), and hospital staff (including nurses and physicians) by managing inter-facility transfers of patients and 188 ambulance stations including six aircraft bases. BCEHS provides pre-hospital emergency care and air ambulance patient transfers province-wide, covering nearly 950,000 square kilometres. BCEHS is also improving pre-hospital patient care, in partnership with local health care providers through the Community Paramedicine program, in which paramedics provide basic health care services to patients in their homes and communities.

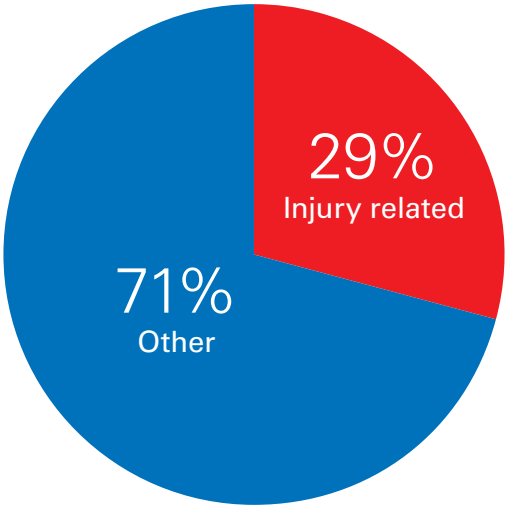
In 2017, the BC Ministry of Health approved the ability for paramedics to assess, treat and release patients meeting specific clinical criteria, and permitted BCEHS to hear and treat or hear and refer a patient. These changes are fundamental to the transformation of BCEHS and critical to introducing new practices for the appropriate triaging of patients with varying needs in the upcoming years. An action plan is under way to meet four objectives:

1. Improve emergency response time for high acuity patients in all communities.
2. Improve service and provide sustainable employment in rural and remote communities.
3. Provide more appropriate clinical responses to low acuity patients.
4. Increase the resources available for emergency responses.

Ambulances were dispatched approximately 600,600 times in 2016/2017 of which 503,500 were 9-1-1 events and 97,100 were inter-facility patient transfers. In the same year, BCEHS air ambulances responded to over 6,800 calls. 148,531 primary 9-1-1 events are injury-related.

Primary 9-1-1 Events

(n=503,500)



BCEHS has been working in collaboration with Trauma Services BC to improve the provincial trauma system through quality assurance and build processes to improve access to trauma care in BC. BCEHS has been sharing dispatch and paramedic-recorded patient care data with Trauma Services BC to detail the patient's complete journey through the trauma system from injury to rehabilitation. The goal is to have a linked dataset which allows pre-hospital trauma care information to be included in any analysis related to trauma. With data integration under way, both agencies are also working on standardizing trauma destination protocols across the province in close partnership with the regional health authorities.

Regional Trauma Programs

Fraser Health

- Trauma Registry at Abbotsford Regional and Royal Columbian concurrent to 2.5 months post discharge
- Expansion of trauma research leadership and appointment of trauma research coordinator (.25 full-time employees)
- Increased focus on interdisciplinary trauma education
- Reviewed adult and pediatric field triage guidelines in collaboration with BCEHS

Island Health

- Regional delivery of Advanced Trauma Life Support training for physicians
- Integration of unintentional and injury prevention strategy within the trauma system
- Trauma simulation education in partnership with emergency department staff to assure optimal delivery of major trauma care

Interior Health

- Commissioned system wide external review to advise on optimal future state for regional Trauma Services
- Strategic system plan with defined priorities to be developed and integrated with provincial trauma system and Trauma Services BC
- High acuity response team (HART) for critical care patient transport

Northern Health

- Amalgamation of emergency, trauma and transfer under one clinical quality program to enhance support for rural emergency departments
- Concurrent BC Trauma Registry data submission at UHNBC within a three-month time frame
- Creation of a regional trauma dashboard
- Standardized mortality review for all trauma-related deaths across three designated trauma sites

Vancouver Coastal Hospital

- Provided updated simulated trauma resuscitation course, Emergency Practice, Interventions and Care (EPICC) foundations and trauma courses
- Finalized and launched adult and pediatric field triage guidelines in collaboration with BCEHS
- Collaborated with transfusion medicine to develop and implement rural massive hemorrhage flowchart
- Launch of electronic health record (CST) at Lions Gate and Squamish General Hospital

BC Children's Hospital

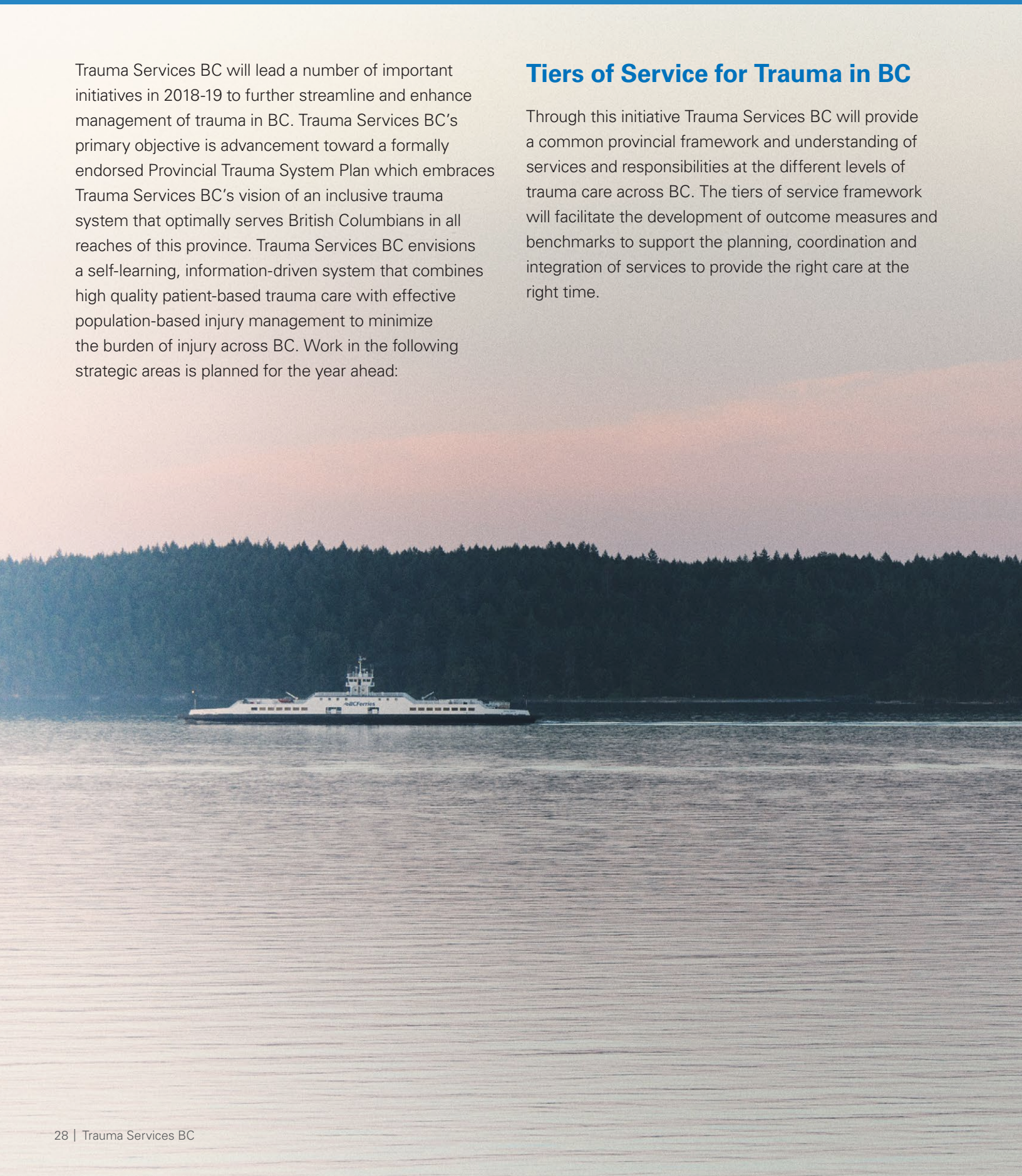
- Trauma simulation multi-disciplinary program for trauma team members
- Leadership of pediatric Specialist Trauma Advisory Network initiative under Trauma Services BC
- Provide pediatric advanced trauma simulation course as well as clinical support tools provincially through ePOPS (Electronic Policies, Order sets, Procedures and Standards) website on a range of pediatric trauma topics
- Semi-annual provincial pediatric trauma rounds via video conference and webinar

TSBC Priorities for 2018–19

Trauma Services BC will lead a number of important initiatives in 2018-19 to further streamline and enhance management of trauma in BC. Trauma Services BC's primary objective is advancement toward a formally endorsed Provincial Trauma System Plan which embraces Trauma Services BC's vision of an inclusive trauma system that optimally serves British Columbians in all reaches of this province. Trauma Services BC envisions a self-learning, information-driven system that combines high quality patient-based trauma care with effective population-based injury management to minimize the burden of injury across BC. Work in the following strategic areas is planned for the year ahead:

Tiers of Service for Trauma in BC

Through this initiative Trauma Services BC will provide a common provincial framework and understanding of services and responsibilities at the different levels of trauma care across BC. The tiers of service framework will facilitate the development of outcome measures and benchmarks to support the planning, coordination and integration of services to provide the right care at the right time.



Specialist Trauma Advisory Network

Funded by the Specialist Services Committee under Doctors of BC, work will continue on this project to design and develop provincial clinical practice guidelines, imaging guidelines and destination guidelines, as well as a measurement, monitoring and reporting system to support the effective and appropriate care of trauma patients (with specific key injuries) across the province. The project concludes in March 2019.

Trauma destination framework for BC

In collaboration with BCEHS, Trauma Services BC will develop a provincial template defining key principles, processes and an associated evaluation framework to support effective decision making for trauma transport in BC.

Future regional program initiatives

Fraser Health

- Develop a robust regional trauma dashboard across all 12 sites
- Implement pre-hospital destination guideline for adult and pediatric injured population
- Expand regional trauma research program
- Achieve 2020 Trauma Distinction Accreditation

Interior Health

- Develop inpatient clinical trauma service at the tertiary sites to support five regional (level 3) and 26 (level 4/5) rural sites in a hub and spokes model
- Analyze trends identified in death audits for contributing factors to develop prevention strategies
- Roll out World Health Organization trauma team checklist across all sites

Island Health

- Collaborate with BCEHS to ensure timely access to trauma care
- Develop inpatient trauma service at Victoria General and Royal Jubilee Hospital
- Develop trauma quality score card
- Expand mortality case review process to include morbidity reviews
- Strengthen forensic nurse examiner program
- Collaborate with HEMBC on provincial disaster preparedness

Northern Health

- Implement standardized mortality review for all in-hospital trauma deaths across health authority
- Launch trauma dashboard with geo coding in partnership with injury prevention
- Establish a trauma inpatient model of care at UHNBC
- Expand telehealth capabilities in rural and remote emergency departments
- Establish patient movement indicators to ensure comprehensive and timely access to care

BC Children's Hospital

- Contribute to pediatric prevention and research initiatives
- Support pediatric care protocols, education and performance thresholds across BC

Vancouver Coastal Hospital

- Provide rural trauma team development course at Squamish General Hospital
- Launch regional trauma program intranet site
- Implement trauma nursing assessment record across the region and pilot trauma transfer document
- Launch electronic health record (CST) across remaining sites

References

[1] TSBC council 2017-18 membership listed in Appendix

[2] Trauma Services BC key system indicators are listed in Appendix iv

[3] Using Accreditation Canada's Trauma Distinction Trauma Team Activation (TTA) indicator as a provincial key performance indicator, TSBC has worked with each health authority to provide data on TTA compliance. Several health authorities changed their TTA criteria to improve clarity of TTA criteria following a review of TTA data.

[4] 2 of 11 BC facilities have statistically significant standardized mortality ratios below the national average. No BC facility has a statistically significant standardized mortality ratio above the national average.

[5] The BCTR CDS coders are trained in trauma coding and use more documents than the MDS coders to identify injury diagnoses. Linked BCTR MDS and CDS data highlighted select cases where the MDS missed coding of an injury. This data is identified as a trauma case in the MDS based on the presence of injury diagnoses in the CDS.

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BCEHS, pages 13, 18, 20, 32, 38, 39

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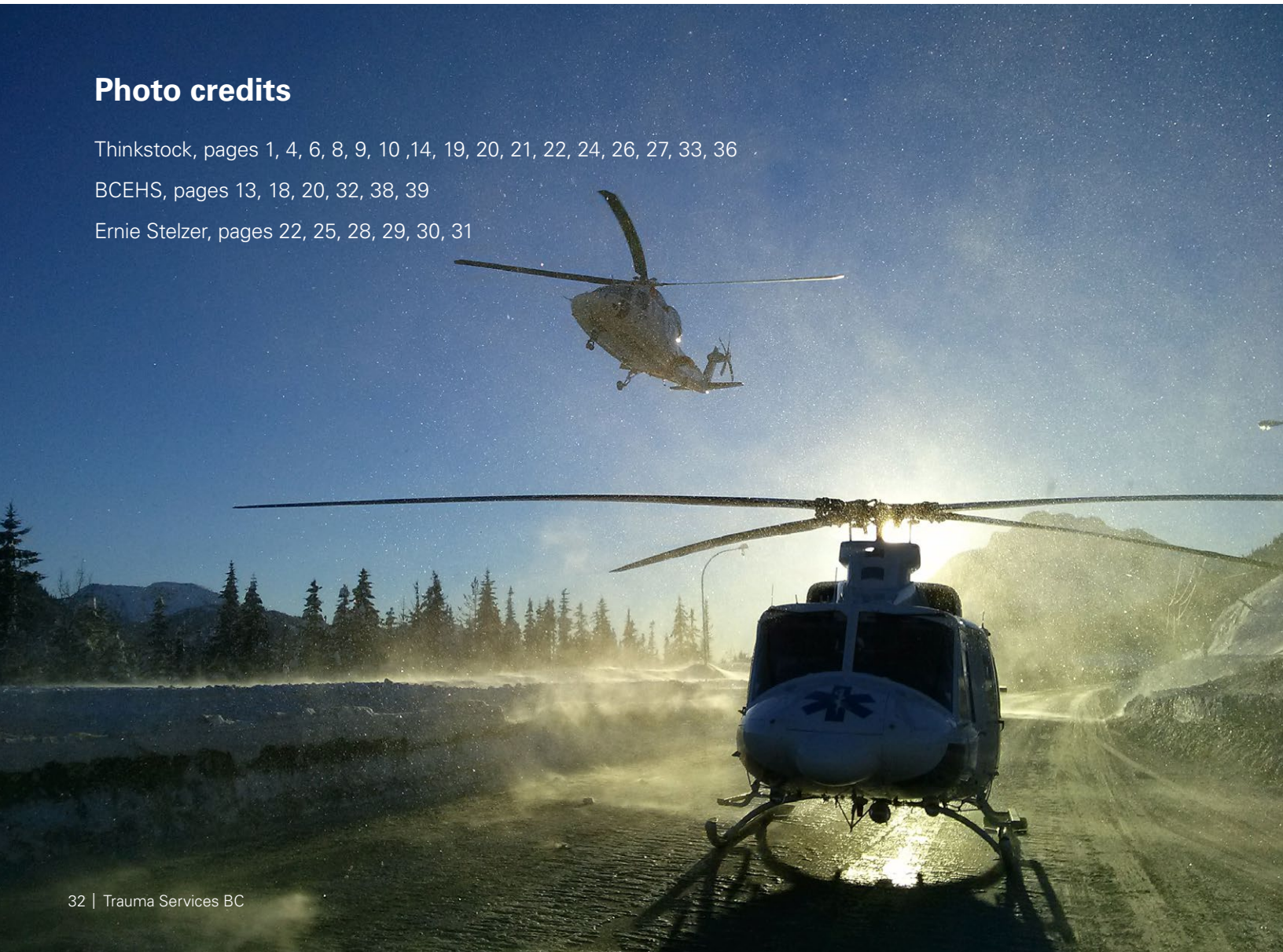

Appendices

i. Trauma Services BC Council

Trauma Services BC

	Kathy Steegstra	Senior Provincial Executive Director
	David Evans	Medical Director
	Beide Bekele	Project Manager
	Jaimini Thakore	Provincial Lead, Data, Evaluation & Analytics
	Jennifer McMillan	Provincial Coordinator, BC Trauma Registry
	Recep Gezer	Biostatistician, Trauma Information Management Services
	Scott Robinson	Senior Database Analyst, BC Trauma Registry

BC Emergency Health Services

	John Tallon	Vice President Clinical and Medical Programs
	Paul Vallely	Senior Provincial Executive Director, Patient Care Delivery

Regional Trauma Programs

Fraser Health	Ian MacPhail	Regional Medical Director, FH, RCH Trauma
	Chris Windle	Director Clinical Operations, RCH Emergency, Medicine and FH Trauma
Interior Health	Heather Wilson	Regional Medical Director, Trauma Services Network
	AJ Breke	Director, Emergency and Trauma Services Networks
	Micheline Wiebe	Clinical Nurse Specialist, Emergency and Trauma Services Networks
Island Health	Anna Hill	Director of Renal and Trauma Services at Island Health
	Hans Cunningham	Medical Director, Trauma Services, Island Health
	John Marc Priest	Regional Manager, Trauma Services, Island Health
Northern Health	Jordan Oliver	Executive Lead, Emergency and Trauma Program
	Patrick Rowe	Medical Trauma Director
Vancouver Coastal Health	Michelle de Moor	Operations Director, Vancouver Acute & Regional Director, Emergency Programs, VCH
	Ruby Syropiatko	Regional Program Planning Lead – Emergency and Trauma Services
	Hazel Park	Medical Director, Regional Trauma Program

Provincial Tertiary Trauma Centres

Vancouver General Hospital	Nasira Lakha	Trauma Program Manager
	Naisan Garraway	Medical Trauma Director
BC Children's Hospital	Lisa Romein	Trauma Program Manager
	Ash Singhal	Medical Trauma Director
Royal Columbian Hospital	Joe Haegert	Medical Lead, RCH Trauma
	Lisa Constable	Clinical Nurse Specialist, Fraser Health, Trauma Network

ii. Interdisciplinary Trauma Network of BC membership

Trauma Services BC	Viktoria Lichtenwald	Executive Assistant
	Jaimini Thakore	Provincial Lead, Data, Evaluation & Analytics
BC Children's Hospital	Lisa Romein	Trauma Manager
BC Trauma Registry	Jennifer McMillan	Provincial Coordinator, BC Trauma Registry
Fraser Health	Cynthia Thurston	Trauma Coordinator
	Jaquelynne Demmy	Clinical Nurse Educator
	Martha (Lolita) Elmore	Clinical Nurse Educator
	Nelia Steshin	Clinical Nurse Educator
Interior Health	Rita Clarke	Trauma Coordinator
	Jo-Ann Hnatiuk	Clinical Nurse Educator
	Janice LaRoy	Clinical Nurse Educator
	Lisa Whitman	Trauma Coordinator
	Heather Wong	Clinical Nurse Specialist
Island Health	Ann Doll	Trauma Coordinator
	Erik Esleyer	Trauma Coordinator
	Shelly Gauvreau	Clinical Nurse Educator
	Kitty Murray	Acting Manager
	Barb Paulson	Clinical Nurse Leader
	Carol Tinga	Clinical Nurse Educator
	Shari MacFarlane	Clinical Nurse Educator
	Joanne K Paul	Clinical Educator
Northern Health	Nikki Huth	Trauma Coordinator
	Kristy Zurowski	Trauma Coordinator
	Emily LeBlond	Registered Nurse
	Jordan C. Oliver	Executive Lead, Emergency, Trauma Program
Vancouver Coastal Health	Angie Brisson	Trauma Coordinator
	Michelle Connell	Trauma Coordinator
	Nasira Lakha	Manager, Trauma Program
	Monique May	Trauma Coordinator

iii. Specialist trauma advisory group physician leads

Physician Lead	Specialist Advisory Group
Dr. Ken Wong	Diagnostic Imaging
Dr. Nick Carr	Plastics
Dr. Tony Papp	Burns
Dr. Ash Singhal	Pediatrics
Dr. Morad Hameed	Thoraco, Abdominal
Dr. John Street	Spine
Dr. Pierre Guy	Orthopedic
Dr. Myp Sekhon	Traumatic Brain Injury

Between 2009 and 2015, 146 children were treated at trauma centres in the province after falling from a window or balcony. 85% of these children were between one and six years old.

iv. Provincial trauma key system performance indicators

Trauma Services BC uses data to understand current performance in care delivery including benchmarking and monitoring national performance indicators (Accreditation Canada standards) and local/regional indicators. These indicators are made available to health authorities' trauma leaders and are reviewed periodically. Trauma Services BC key performance indicators are:

1. **Mortality**: Proportion of trauma patients admitted to the hospital with a primary diagnosis of an injury with an ISS>12 who die within 30 days.
2. **Field Triage**: Proportion of patients with major anatomic injuries admitted to a Level I or II (or equivalent) trauma centre.
3. **Time to Rehab**: Average number of days from the day the trauma patient is ready for inpatient rehabilitation to the day when the patient has received rehabilitation.
4. **Emergency Department (ED) Length of Stay**: Proportion of trauma patients with a primary diagnosis of an injury with an ISS>12 discharged from ED within four hours.
5. **Time to Definitive Care**: Average time taken by emergency medical services to arrive from scene to definitive trauma centre with a trauma patient who has a primary diagnosis of injury with an ISS>12.
6. **Trauma Team Activation (TTA) %**: Proportion of trauma patients with a primary injury diagnosis admitted to the ED who satisfy local TTA protocols and for whom there is a TTA.
7. **Tracheal Intubation %**: Proportion of patients with a primary diagnosis of an injury and with a documented decreased level of consciousness (GCS < 9) in the ED and who had a successful insertion of endotracheal tube in the ED.
8. **Presence of an Ambulance Report**: Proportion of trauma patients transported from the injury scene by emergency medical services to the ED with a primary diagnosis of an injury with an ISS>12 who have an accompanying ambulance report in the medical record.
9. **Seven- and 30-day Re-admission Rates**: Proportion of trauma patients with a primary diagnosis of an injury who are non-electively readmitted with injury, after passing through the ED, to any acute care hospital in the trauma system, within seven or 30 days of a previous discharge.
10. **Timely Craniotomy**: Proportion of trauma patients with an acute epidural or subdural brain hematoma that required a craniotomy and did not receive one within four hours.
11. **Trauma-related complications**: Proportion of trauma patients with a primary diagnosis of injury and at least one or more selected complications (excludes deaths within 30 minutes of arrival to hospital) and an ISS>12.
12. **Acute Care Length of Stay**: Average acute care hospital days for admitted trauma patients with a primary diagnosis of injury and an ISS>12 who were discharged alive.

TIMS also provides detailed reports to support regular reviews of individual cases identified through the following KPIs and processes:

- **Provincial Trauma Mortality Reviews**: all trauma mortalities (reviewed several times a year) and a report of prioritized mortalities (annual audit of unexpected mortalities)
- **Triage and Inter-facility Transport**: field triage and high severity cases that were not transferred to a higher level of care (annual audit of triage and inter-facility transport)
- **Clinical Processes**: all remaining key performance indicators and Accreditation Canada Trauma Distinction indicators (reviewed several times a year)

TIMS provides site, regional and provincial reports to support planning for decision makers across all levels.

- Provincial and Regional Trauma Dashboard: focus on key Accreditation and Provincial trauma performance indicators (reviewed semi-annually)
- Trauma site and regional summary reports: summarizing key volume based statistics (quarterly and annually)
- Provincial Trauma Data Summary Report: summarizing key volumes based statistics, analytical highlights and key findings from the trauma datasets (annually)
- BC Trauma Registry Operations Reports: summarizing data quality, timeliness of data and staff productivity at each site for the BC Trauma Registry Comprehensive Dataset (monthly)


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