

*Development of
Provincial Trauma System*

*Department of Health, Province of
New Brunswick*

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HayGroup

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1.0 Introduction/Executive Summary

Hay Group Health Care Consulting was asked to determine the clinical resources and infrastructure necessary to establish a high-quality provincial trauma system accessible to all residents of the province.

In January 2006 Hay Group Health Care Consulting completed a review of the care received by a 67 year patient who had suffered an episode of severe multiple trauma. Because of concerns which arose regarding the management of this individual, Hay Group was asked to review his care and provide advice to the Minister of Health of New Brunswick regarding opportunities to avoid future such episodes.

As a consequence of this review, a number of recommendations were made. These included, most importantly, the need to establish a provincial trauma system. In support of this system, it was further recommended that the province evaluate the patient transport system, with specific review of the current air transport capacity. Other recommendations included:

- Establishing a one number to call system to facilitate transfers between institutions, and the designation of specific centres of excellence in trauma care.
- Articulating provincial expectations for
 - training of emergency personnel in trauma,
 - standards for the use of sophisticated investigative techniques such as CT scans,
- Exploring opportunities to further standardize the care of trauma patients,
- Creating and funding the infrastructure to support a comprehensive, high-quality trauma system.

The review further suggested the establishment of two trauma centres; a suggestion that was based on the data available at the time that the review was conducted. However, it was noted at that time that a lack of appropriately collected and collated data rendered it difficult to project the actual number of patients who would benefit from the existence of a comprehensive trauma service.

After receipt of the report, and consideration of it by the Department of Health and Wellness, Hay Group Health Care Consulting was asked to elaborate on its initial findings and recommendations to more accurately determine the resources currently available for the treatment of seriously injured trauma patients, and the additional infrastructure, fiscal support, and clinical resources which would be necessary to

establish a high-quality provincial trauma system which would be accessible to all residents of the province.

The specific deliverables were to include:

- Protocols to ensure the appropriate disposition of injured patients. These protocols were to include incident characteristics, physiologic parameters, and other indicators which would delineate which patients would be appropriate for transfer to trauma centres.
- Triage guidelines, including incident and physiologic indications for both primary and secondary referral, for dissemination across the province to ensure that all appropriate patients are referred to a trauma centre.
- The design of a "one number to call" system that would ensure 24-hour availability of online medical advice from trauma specialist physicians to all Emergency Departments.
- The required characteristics of Trauma Teams, including composition, the qualifications of medical staff making up the membership of the teams, the frequency of on-call, and the designation of Trauma Team Leaders.
- Job descriptions and accountabilities for medical staff in a trauma centre, as well as Trauma Coordinators, Research Coordinators, Trauma Team Leaders and Medical Directors of trauma services
- Suggested templates for performance appraisal of the individuals who assume roles within a Trauma Team.
- Definition of minimal educational requirements for individuals who participate both in prehospital care and emergency care, as well as the necessary frequency and intensity of education programs to ensure skill acquisition and skill maintenance is appropriate.
- Identification of data elements which should be collected in relation to trauma to measure the viability of a provincial registry, including, for instance, injury patterns, treatments administered, the number of calls made to a central phone line, and the numbers of transfers and outcomes.
- Identification and development of basic protocols to ensure that data were appropriately collected and analyzed to support comparisons with other centres both inside and outside Canada as a means of quality assurance and stimulating critical thought about the delivery of services.

The trauma system should be accessible to all seriously injured patients and capable of providing comprehensive services in both official languages.

The analysis and report reflect the patient experience commencing with the trauma incident to the completion of each element of the entire episode of care.

- Recommendations regarding charting that would facilitate the acquisition and analysis of data.

It was defined as essential to this undertaking that the trauma system should be accessible to all seriously injured patients and capable of providing comprehensive services in both official languages.

A further mandate was to identify and quantify the resources required to support a trauma centre, including the availability of sophisticated diagnostic imaging, specialized nursing staff, and appropriately trained allied health professionals. The costs associated with the acquisition, maintenance, and ongoing operation of these resources were also to be identified, including appropriate levels of remuneration for medical staff and others who took on administrative or leadership positions.

The consultants were also asked to support department working groups and the provincial Patient Safety and Clinical Collaboration Committee in their efforts to ensure the successful implementation and integration of the contents of the report once it had been completed.

As proposed by the consulting team, the conceptual model for the assignment and for the report that follows are designed to reflect the patient experience commencing with the trauma incident to the completion of each element of the entire episode of care. For that reason, we have, as part of this undertaking we have:

- Estimated the potential for prevention as the primary means of diminishing the demand for trauma services.
- Conducted an analysis of the continuum of emergency and trauma services, starting with the incident, and reflecting on the notification and mobilization of the prehospital care system, decision making regarding the ideal location to which patients should be transported based on incident characteristics, the time required to transfer, and the level of training of prehospital care personnel as well as the resources available for transfer, including the use of air transport.

In an effort to assist the province in the development of a high quality, readily accessed, seamless system we have commented on:

- The minimum skill sets and equipment needs for all hospitals in the province that have the potential to receive

trauma patients. As part of the undertaking, the availability of Laboratory personnel, Diagnostic Imaging personnel, and the training requirements for physicians and nursing staff have all been examined.

- The development of a one number to call system as the next "link" in the chain of trauma care. Our evaluation reflects not only the frequency of phone calls, but also opportunities to integrate the system with other similar systems in the province.
- The transport capacity of the province, both for air and land transport.
- The skills of the transport providers, and the relative availability and anticipated impediments to transport.
- The capacity of hospitals which have expressed an interest in the provision of trauma care, and the gaps between the current resources and anticipated resource needs. This analysis included the number and skills of available personnel in areas as diverse as the Emergency Departments, operating rooms, consultant staff to support a trauma system such as surgeons, and anaesthetists, and intensivists, as well as special care units and rehabilitation facilities.
- A brief review of the Stan Cassidy Centre for Rehabilitation has also been conducted to determine its capacity to serve as the primary rehabilitation facility for all patients suffering polytrauma.

Based on input from providers, we have provided recommendations on the capacity needed for the system to support education and continuing development of professional staff.

Finally, we have identified and quantified the levels of funding which will be necessary to support trauma care, and we have provided readers with suggestions as to where incremental resources may be required.

Recommendations made in this report which we wish to particularly bring to the attention of the minister relate to:

- Criteria for designation of a provincial trauma center and delineation of the infrastructure [capital, human, diagnostic and physical plant] necessary for the hospital to assume this role.

- Annotation of the essential and desirable resources for a provincial trauma centre and an evaluation of the capacity of hospitals to meet those criteria
- Designating several other centres to serve as secondary centres for the provision of trauma care. Again, we have made specific recommendations regarding the infrastructure and organization, as well as the cognitive skills which will need to be in place to support this designation.
- Engaging neighbouring provinces to identify opportunities to develop regional programs [e.g. for paediatric trauma] and to ensure collaboration at times when the system is overwhelmed or to assist with transportation logistics.
- Urgent consideration of the acquisition (lease) of a helicopter to facilitate transportation not only of trauma patients, but potentially other residents of the province of New Brunswick with critical care needs [e.g. neonatal intensive care, critical care].
- Development of a systematic approach to the treatment/transportation of trauma victims in the field, including the skills and training necessary for pre-hospital and emergency department care providers
- Development of a one number to call system to ensure the rapid availability of consultant support and direction regarding the treatment and disposition of trauma victims
- Collecting analyzing and subsequently publishing data regarding the provision of trauma care, incident characteristics, and outcomes on a regular basis.
- Identification of opportunities for enhanced prevention of trauma episodes.

We are confident that if our recommendations are acted upon, significant opportunities to reduce major accidents will be realized, and that the care which is provided to victims of such episodes will improve.

2.0 *Process*

The first phase of the undertaking was a teleconference with the Patient Safety and Clinical Collaboration Committee which has been given responsibility for overseeing the project. Once the committee reviewed the proposed work plan, the actual consulting process began. The consulting process was conducted in two sequential phases prior to the preparation of this draft report.

2.1 *Data Collection and Analysis*

In the next phase, the data collection and analysis process was commenced. This included, among other undertakings; a review of the geography of the province, a review of the number of hospitals and their currently available resources (both human and capital) as well as support services, a review of the credentialing process for emergency physicians and specialist staff as it pertains to the management of trauma, existing policies and procedures for trauma management, reviewing charts specifically designed for the annotation of the injuries and treatments of patients suffering polytrauma, reviewing the skills of specialist appointees with particular reference to their skills in the management of trauma, reviewing budgets to determine the level of fiscal support for trauma care, reviewing the skills and training of prehospital care providers as well as dispatch protocols used in the ambulance system, job descriptions for Trauma Coordinators, Research Coordinators, Program Leaders and Medical Directors of trauma, and a review of the province's critical care transfer capacity as well as existing transfer arrangements.

2.2 *Interviewing*

A comprehensive array of interviews were conducted across the province. In addition to visiting a large number of sites, individuals in key positions in each site were interviewed. (For a complete listing of the interviews conducted, please see Appendix A). Interviewees included, but were not limited to, senior medical leaders, members of senior management teams, director level appointees for allied health professional groups, clinical department heads, and those appointed as trauma coordinators, Research Coordinators and others responsible for the collation and distribution of data pertaining to traumatized patients.

In addition, interviews were conducted with members of the prehospital care system, representatives of the Stan Cassidy rehabilitation facility, and those involved in the management of the air transport system.

2.3 *Hay Group Consulting Team*

The consulting team consisted of four individuals. Dr. Isser Dubinsky, an Associate Director of Hay Group Health Care Consulting, served as the lead consultant for this undertaking. In addition to his long-standing record as an emergency physician and a sustained career as an academic, he has served as a consultant to a variety of health care organizations, provincial governments, and regional health authorities across Canada.

Dr. Barry McLellan, who is currently the Chief Coroner for the Province of Ontario, was the former Chief of Emergency Medicine at Sunnybrook Health Sciences Centre, Medical Director of the air ambulance program operated by Sunnybrook Health Sciences Centre, and former Director of the Trauma Program at Sunnybrook Health Sciences Centre. In addition, he has been the Medical Director for the trauma and critical care access program, and was a vice president of medical, trauma and clinical services at Sunnybrook Health Sciences Centre. He also served as the president of the Trauma Association of Canada and Chair of the Ontario and National Trauma Registry Advisory Committees.

Dr. Brian Schwartz is the current director of the Sunnybrook - Osler Centre for prehospital care. An emergency physician with many years of clinical experience, he is a nationally and internationally acknowledged expert in the area of prehospital care. He currently serves as a Scientific Advisor to the Emergency Management Unit of the Ontario Ministry of Health and Long-Term Care, and provides medical control and oversight for two Emergency Medical Services comprising over 1200 paramedics serving a population of over 3 million.

Mr. Adam Topp is a Senior Consultant with Hay Group Health Care Consulting. He was formerly Vice President of Clinical Operations at Sunnybrook and Women's College Health Sciences Centre, and had operational responsibilities including the Trauma Program, Critical Care and Emergency. Previously he was Vice President of Corporate Performance and Chief Financial Officer at Sunnybrook and Women's College Health Science Centre, and in that capacity was responsible for defining the resources necessary to support a

comprehensive trauma system including both operating and capital costs.

The consultants wish to take this opportunity to thank all those who participated in this process. Without the energies and efforts of those working in the Department of Health, professional staff working in the regions, and the health care providers working both in the prehospital and hospital sectors the conduct of this review would have been impossible. We are particularly grateful for the candour and openness of interviewees which has allowed us, we believe, to prepare a plan for the development of a trauma system which will serve the needs of the residents of New Brunswick for many years in the future and provide them with what will, assuredly, be a high quality system designed to optimize clinical outcomes.

3.0 Trauma Care Systems

Unintentional injury is the leading cause of death between the ages of one and 44 years.

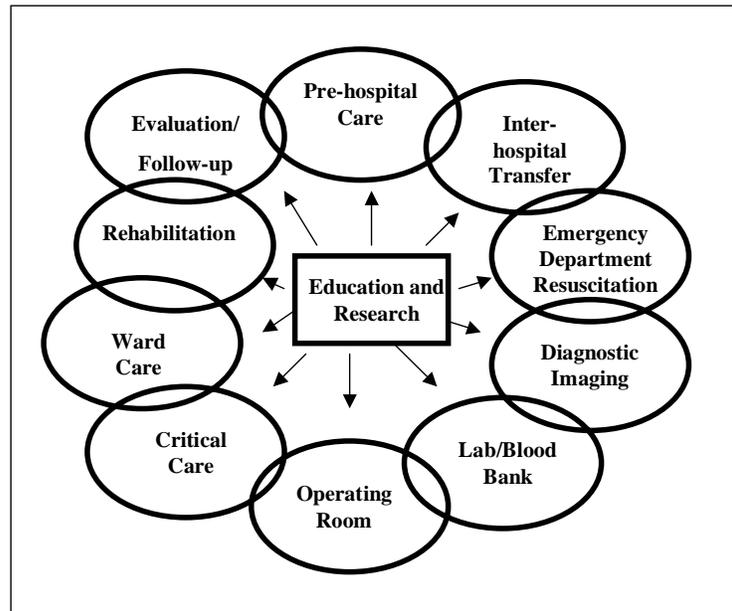
In the last quarter century traumatic injury has gained recognition as a major public health problem. In North America, unintentional injury is the leading cause of death between the ages of one and 44 years. A trauma care system results in an organized and coordinated effort that ensures the delivery of high quality care to injured patients within a geographic area of interest (such as a region or province), from the point of injury through to rehabilitation and re-integration back into society. Studies (including those conducted in Canadian trauma systems) have conclusively established that well designed, comprehensive trauma systems decrease mortality and improve functional outcome following serious traumatic injury. Although the primary focus of a trauma system is on high quality care, the system must also include primary and secondary prevention programs (targeting high risk populations and the most common causes of injury), education, and research activities.

3.1 Trauma Care Chain

Well designed, comprehensive trauma systems decrease mortality and improve functional outcome following serious traumatic injury.

Although injured patients cared for in a well functioning trauma system move seamlessly through the continuum of care, the system is built on components of care that can be conceptualized in the “Trauma Care Chain” outlined below (Figure 1). All components of the chain of care are designed to serve the population at risk of injury and are integrated with the next phase(s) of care. A well-designed trauma system has no “weak links”. High quality care is delivered to all patients who sustain serious injuries, (i) through the spectrum of ages; (ii) whether suffering from blunt, penetrating or thermal injury; and (iii) whether injured in urban or rural environments. The diagram emphasizes the components of care once the traumatic event has occurred, but readers are reminded that all efforts at prevention must be explored to minimize the need for the treatment system.

Exhibit Figure 1 – The Trauma Care Chain



The following sections provide brief descriptions of each element of the Trauma Care Chain as it would function within a well designed Trauma Care system.

3.1.1 *Pre-hospital Care*

There must be a formal liaison between tertiary care trauma centre(s) and the pre-hospital system.

Pre-hospital care is provided by appropriately trained paramedics who function under medical control. The level of care provided to trauma patients, and hence training requirements, are determined by population density and transport times. There must be a formal liaison between tertiary care trauma centre(s) and the pre-hospital system. Protocols include field trauma triage (getting the “right patient” to the “right hospital”), hospital bypass and assessment/resuscitation (taking into account the pre-hospital transport times). Depending on the system, pre-hospital care may be provided by both land systems and helicopter transport from scene to tertiary care trauma centres.

3.1.2 *Inter-hospital Transfer*

Inter-hospital transfers may involve land ambulance and/or aircraft.

Inter-hospital transfers may involve land ambulance and rotary and/or fixed wing aircraft (determined by geography and demography). There is a formal liaison between the tertiary care trauma centre(s) and the transport system. Sending physicians (in primary and secondary hospitals) are provided with “one stop shopping” – a single number to call that provides timely communication between sending MDs and Trauma Team Leaders (or other accepting

physicians/surgeons) and facilitates the physical transfer (whether by land or air ambulance).

3.1.3 *Emergency Department Resuscitation*

Tertiary care trauma centre(s) have a trauma team available 24 hours per day with surgical and medical specialists and supporting diagnostic technologies available (24/7) to support the trauma team

Medical, nursing and other professional staff working in primary and secondary hospitals are trained in trauma resuscitation, including the early recognition of patients requiring transfer to a higher level of care. The most common training for physicians is provided through the American College of Surgeons' Advanced Trauma Life Support Course. Tertiary care trauma unit(s) provide outreach resuscitation education, including case specific feedback, to primary and secondary hospitals within the system.

Tertiary care trauma centre(s) have a trauma team available 24 hours per day led by dedicated Trauma Team Leaders (who should be available on-site at the hospital with a 20 minute response time). Communication between the pre-hospital and inter-hospital transfer systems ensures trauma team notification in advance of patient arrival. Surgical and medical specialists (including Diagnostic Imaging) are available 24/7 to support the trauma team and ensure that patients are transferred seamlessly to the next level of care (usually the operating room or Critical Care Unit).

3.1.4 *Diagnostic Imaging*

Primary and secondary hospitals have protocols to ensure rapid access to plain film radiography (at a minimum). Tertiary care trauma centres require 24/7 access to plain film radiography, ultrasound imaging (FAST), CT imaging and angiographic/interventional imaging.

3.1.5 *Laboratory Services/Blood Bank*

Tertiary care trauma centres require 24/7 access including protocols for the provision of unmatched blood and for the massive transfusion of blood components. The relative importance of laboratory services for primary and secondary hospitals is determined by inter-hospital transfer times to the next level of care.

3.1.6 *Operating Room*

The trauma centre provides OR access 24/7 for emergent surgery.

The tertiary care trauma centre provides OR access 24/7 for emergent surgery and dedicated operating room time during the week for non-emergent or staged procedures. Protocols are in place to ensure back-up teams are available for additional operating rooms in the event that more than one

patient requires emergent surgery. The relative importance of operating room resources for primary and secondary hospitals is determined by inter-hospital transfer times to the next level of care.

3.1.7 *Critical Care*

Trauma centres have sufficient critical care capacity to handle unpredictable volumes of trauma patients

Tertiary care trauma centre(s) have sufficient critical care capacity to handle unpredictable volumes of trauma patients within the system. This may necessitate cancelling elective surgery (to ensure bed availability). There is 24 hour in hospital medical coverage for the provision of care. The relative importance of critical care resources for secondary hospitals is determined by the role definition of these hospitals in the system (i.e. some secondary hospitals may care for torso and/or orthopaedic injuries that necessitate admission to Critical Care Units).

3.1.8 *Ward Care*

In the tertiary care trauma unit ward care may be provided on a dedicated multi-disciplinary trauma ward or on individual surgical units (with admission to the most responsible surgical service). Multi-professional teams ensure comprehensive care and an early focus on rehabilitation.

3.1.9 *Rehabilitation*

Rehabilitation may be provided within the tertiary care trauma centre(s) or in dedicated rehabilitation centres (which may be separate musculoskeletal and neurosurgical centres or facilities that provide comprehensive rehabilitation). Timely access is provided to ensure early rehabilitation in an effort to achieve best functional outcomes.

3.1.10 *Evaluation/Follow-up*

Trauma system evaluation activities include care audits and quality improvement initiatives, trauma rounds and supporting data analysis.

Evaluation activities within the trauma care system include care audits and quality improvement initiatives, trauma rounds (including morbidity and mortality rounds) and analysis of data collected for both minimal and comprehensive data sets. Tertiary care trauma centre(s) collect data to, at a minimum, the level of the National Trauma Registry Comprehensive Data Set. Analyses of outcomes include linkages with coroner's system data so pre-hospital deaths are included. Functional assessments include FIM (Functional Independence Measure) scores at a minimum. Tertiary care trauma centre(s) provide feedback to sending physicians and hospitals through discharge summaries and trauma resuscitation notes. Tertiary care trauma centre(s) also

provide outreach education to pre-hospital personnel, inter-hospital transfer personnel and referring physicians/surgeons. Follow-up care is provided through the tertiary care trauma centre(s) and the rehabilitation centre(s).

3.1.11 Education and Research

All components of the chain of care provide research opportunities to enhance future care. Tertiary care trauma centre(s) provide education for multi-professional staff (medical and non-medical) within the centre and outreach education to all providers within the system.

3.1.12 Prevention

A comprehensive trauma system also includes prevention programs with monitoring of injury trends and assessment of prevention strategies.

3.2 Role of Tertiary Care Trauma Centres

Tertiary trauma care is extremely resource intensive

Tertiary care trauma centre(s) provide leadership within the trauma system and are integral to the overall function of the system. The Trauma Association of Canada has developed accreditation guidelines for tertiary care trauma centre(s) and has accredited centres across the country, including the Saint John Regional Hospital in New Brunswick. Some jurisdictions, including several provinces in Canada, have systems based on regional models of care, with more than one tertiary care trauma centre in the province. In these provinces, the units have either defined catchment areas or receive patients based on predetermined rotations. In other systems, one tertiary care trauma centre provides care for all seriously injured persons in the province. The number and location of tertiary care trauma centres within a province are determined by population, demography, inter-hospital transport times (including land, rotary and fixed wing transports) and the resources available within the centre(s). The provision of tertiary trauma care is extremely resource intensive. Required resources include trained multi-professional (medical and non-medical) staff, fixed infrastructure (Trauma Director, Trauma Coordinator, Trauma Data Assistant(s)), physical plant considerations (most notably for trauma resuscitation, operative care, critical care and ward care) and significant direct and indirect operating costs (ranging from instrumentation and implants to 24/7 diagnostic imaging).

Trauma care systems should be designed with capacity to handle unpredictable patient volumes

Trauma care systems should be designed to be flexible to handle unpredictable patient volumes, including, in the extreme, natural and man made disasters. If a province is relying on a single tertiary care trauma unit it is essential that there be sufficient capacity to handle an unpredictable patient load and protocols to deal with multiple injury incidents, whether within the province (including diverting some injured patients to other centres) or through arrangements with neighbouring provinces (or states).

The province of New Brunswick should develop a provincial trauma system.

With specific reference to New Brunswick, there are currently a variety of arrangements in which extra-provincial centres serve as the primary referral centre for trauma care. Children with complex injuries may be referred to the IWK Health Centre in Halifax or the Hôpital de l'Enfant-Jésus paediatric centre in Quebec City (if originating in the northwest). In addition, Edmundston has an established relationship with a centre in Quebec City for the management of adult trauma patients, and patients are occasionally transferred to the Queen Elizabeth II in Halifax from other areas of the province. Ideally, a provincial system should be designed to ensure that the province has both the capacity and the necessary infrastructure to deliver all services intra-provincially.

Inter provincial support agreements can provide seamless access to trauma care should the New Brunswick system be overtaxed or unavailable.

On a go-forward basis, it will be essential to maintain these relationships, if only to guarantee seamless access to care should the New Brunswick system either be overwhelmed (e.g. by a mass casualty incident) or out of service (because, for instance, of a SARS like episode). In addition, the province will need to establish repatriation agreements that ensure that residents of New Brunswick return to the province as soon as the necessary resources are available.

Recommendations:

It is recommended that:

- (1) The province of New Brunswick should develop a provincial trauma system.**
- (2) The province should seek opportunities to ensure support for the system from neighbouring provinces in case of mass casualties, sudden hospital closures, or other disasters which overwhelm the provincial system.**
- (3) The province should develop a formal agreement with the provinces of Nova Scotia and Quebec for the care of seriously injured Paediatric patients.**

- (4) The province should develop formal agreements with the provinces of Nova Scotia and Quebec for the provision of care when certain sub-specialists are away or unavailable (e.g., for patients with complicated pelvic/acetabular fractures, or unstable spinal injuries requiring instrumentation).**

4.0 *Prevention of Trauma in New Brunswick*

Injury is a major cause of death, disability and hospitalization in New Brunswick. It is, in fact, the leading cause of death for those between the ages of one and 44.

Data available from the chief coroner's office for the year 2003 revealed that a total of 326 individuals died due to either intentional or unintentional injuries. Most of the deaths occurred in young people, making injury the largest single contributor to potential years of life lost in the province.

New Brunswick has one of the highest rates of accidental injury in Atlantic Canada.

New Brunswick has one of the highest rates of accidental injury in Atlantic Canada. The injury hospitalization rate in Canada, released by the Canadian Institute for Health Information, confirmed that New Brunswick has the fourth highest injury hospitalization rate in Canada.

In addition to hospitalizations, injury accounts for countless visits to Emergency Departments and outpatient treatment centres. It has been estimated that the corrected indirect cost of unintentional injury in New Brunswick is approximately \$500 million per year, clearly demonstrating the need for an integrated and comprehensive strategy designed to maximize opportunities for prevention.

While it may be convenient to think of injuries as the product of "accidents", this conceptual model infers that injury is often the result of a chance episode, and entirely beyond the control of either the victim, or society broadly.

Accidental injury may be as susceptible to preventative strategies as disease entities such as cancer or heart disease

Accidental injury is, however, in reality an under researched epidemic that may be as susceptible to preventative strategies as disease entities such as cancer or heart disease. Injury is the fourth leading cause of death in Canada, but only 1% of research dollars have been channelled in that direction. It has been well demonstrated, however, the dollars invested in injury surveillance, prevention and control will ultimately result in sufficient savings to provide a high rate of return on the initial investment. For instance, one dollar spent on smoke alarms will save, on average, \$69 of health care costs. Similarly, a dollar invested on bicycle helmets will ultimately result in the saving of approximately \$30, and a dollar spent on child safety seats will result in the saving of in excess of \$30. (Centre for Disease Control and Prevention 2000).

Strategies such as seatbelt legislation, bicycle helmet legislation, child care safety seats, and smoke detectors have demonstrated reductions in either the incidence or severity of injury.

The Federal, Provincial and Territorial Deputy Ministers of Health, recognizing the importance of prevention in the management of unintentional injury endorsed the recommendations in the "National Injury Prevention and Control Strategy", a paper prepared by the public health working group.

In developing an injury prevention system, it will be essential to ask and answer the following four questions:

- Who is vulnerable to injury?
- When, how and why are people getting injured?
- What is being done to prevent injuries?
- What additional measures could be employed?

Unfortunately, given the lack of data currently available in the province of New Brunswick, it is exceptionally difficult to answer the questions above. As noted elsewhere in this report, to maximize opportunities for prevention, and subsequently minimize costs (both capital and human), it will be necessary for the province to create a provincial database to better focus prevention strategies.

Those strategies that are developed will have to be multidimensional in nature, and incorporate a combination of educational strategies, enforcement, and environmental changes.

In broad terms, this will require attention to each of the following principles:

- Recruiting and fostering the development of leaders in injury prevention
- Improving the availability of injury surveillance systems in New Brunswick
- Creating a provincial database which may be used to collate provincial injury data
- Fostering injury research initiatives
- Creating public policies which support injury prevention initiatives

- Enhancing existing injury prevention programs, and developing additional injury prevention programs where benefit has been demonstrated
- Fostering community awareness and action plans to minimize the frequency and severity of injury

In reviewing the limited data available, it is impossible to determine the residual potential for injury prevention in the province. A review of existing legislation and statutes reveals that a great deal of attention and energy has been directed to some areas of injury prevention.

These include, for instance, regulations regarding the use of seat belts, the consumption of alcohol when driving a car, and the wearing of bicycle helmets.

There are opportunities to enhance and expand the current accident prevention programs

However, in conversation with provider groups across the province, it became evident that a number of other opportunities exist to further enhance the currently existing prevention programs. These include:

- Consideration of legislation to prohibit the use of cell phones while driving (as currently legislated in the province of Newfoundland and Labrador)
- Creating a minimum age at which individuals may be allowed to drive all-terrain vehicles or snowmobiles
- The creation of legislation to limit the use of alcoholic beverages by drivers of all-terrain vehicles or snowmobiles
- The passing of mandatory legislation to enforce the wearing of helmets or other protective clothing when riding all-terrain vehicles or snowmobiles

Teenage driver education program that is in use in the city of Edmundston can serve as a model of education for young drivers

Particularly interesting to the consultants was the teenage driver education program that is in use in the city of Edmundston (PARTY). This program appears to have heightened young drivers' awareness of the high risks involved in drinking and driving. It is suggested that this program be reviewed, if necessary revised, and then exported to other constituencies in the province. It may serve other provincial constituencies as a model of education for young drivers. The impact of the program should also be evaluated, to provide research-based confirmation of its effectiveness and cost-effectiveness.

Moose - motor vehicle accidents in New Brunswick is exceptionally high

The number of major accidents, and fatalities, related to moose - motor vehicle accidents in the province of New Brunswick is exceptionally high and may be amongst the

highest of all Canadian provinces. In one region of the province, an electrified fence has been installed in close proximity to the highway as a means of discouraging moose from wandering onto the road. It has been anecdotally reported that this intervention has resulted in a significant diminution in the number of moose/car collisions. Similar initiatives have been undertaken in other constituencies, specifically in the Banff region. In that area, in addition to fences, overpasses have been created to direct the flow of animals across the highway, thus preventing collisions with motor vehicles.

While expensive, the benefits realized from the installation of electric fences in areas of high population of moose or other animals are considerable. Not only are lives saved, but considerable morbidity is also avoided, much of which will be not only short, but long-term morbidity. It is suggested that a careful accounting of the cost of installing the current fence be conducted, along with an audit of the number of moose/motor vehicle collisions along the length of the fence since its installation. If, in fact, there is evidence of a significant diminution in such accidents, the province may wish to consider extending this program to all highways where a high risk of collisions with animals is felt to exist.

It is suggested that this undertaking should account for not only mortality reduction, but also direct and indirect health care cost reduction as evidenced by decreased hospitalization, treatment costs, and the cost of rehabilitation.

Recommendations:

It is recommended that:

- (5) The Province should draft legislation to prohibit the use of cell phones when driving.**
- (6) The Province should draft legislation to require the use of helmets and other protective equipment when driving all-terrain vehicles and snowmobiles.**
- (7) The Province should draft legislation creating an age cut off for driving all-terrain vehicles and snowmobiles, as well as laws governing the consumption of alcohol by drivers of such vehicles.**
- (8) The Province should implement the young driver education program offered in Edmundston province wide.**

- (9) The Province should conduct a cost-benefit analysis of the recently installed moose fence. If evidence of the cost-effectiveness of this intervention is forthcoming, consideration should be given to a province wide program to install such fences.**
- (10) The Province should designate an individual to be responsible for the evaluation and implementation of injury prevention programs as part of the development of a provincial trauma program.**

5.0 *Prehospital Care of Trauma Patients: Emergency Medical Services*

5.1 *Present State*

Emergency Medical Services (EMS) in New Brunswick are provided by 54 land ambulance services, operated by 39 organizations

Emergency Medical Services (EMS) in New Brunswick are provided by 54 land ambulance services, operated by 39 organizations and employing 900 full and part-time Emergency Medical Technicians (EMTs) of varying skill and certification levels. Although there is one provincially funded air ambulance, it is a fixed wing aircraft and does not perform 911 first response.

Approximately 90-100 ambulances are staffed and dedicated to either first response or interfacility transfers and are posted throughout the province. Most 911 medical calls are dispatched by one provincial dispatch centre (the Medical Transportation Communication Centre – MTCC) located in Moncton. A second dispatch centre is located in Saint John, which services Saint John, Quispansis and Rothesay areas. Grand Manan Hospital dispatches the ambulances responsible for the Island areas.

The MTCC and Saint John dispatch centres use a proprietary call-taking algorithm (Advanced Medical Priority Dispatch System) to gather information and assess patient acuity and urgency of response. This is an effective and state of the art tool that reliably identifies high priority 911 trauma calls.

There are currently no consistent provincial standards for paramedic practice

In 2004, EMS responded to about 48,000 911 calls. It is not known how many of these fulfill the definition of significant or multi-system trauma. While a comprehensive EMS ALS database exists, participation of EMS services is mandatory but the ALS is not and the list of indicators includes neither identification nor standards for treatment for traumatized patients. Indeed there are currently no consistent provincial standards for paramedic practice.

EMS operators originate from the private, municipal, Regional Health Authority and First Nations sectors. Standards for paramedic skill sets and performance above EMT Level 1 are lacking, resulting in different levels of service geographically and even within the same area depending on paramedic availability. Therefore, the prehospital treatment of trauma patients varies from EMT 1 (immobilization, oxygen, and transport to nearest Emergency Department) to more sophisticated care (advanced airway management such as intubation, and intravenous fluid replacement) A project to

train emergency medical technicians to a level roughly equivalent to the Canadian Medical Association (CMA) Primary Care Paramedic (PCP) designation has been initiated; however, not all services have contracted with the training provider to do this.

Every EMT in New Brunswick is registered with the Paramedic Association of New Brunswick (PANB). This Association has recently been designated by the Provincial Government as the regulatory authority for paramedics. Most paramedics are trained to the EMT 1 level (basic level of service). There are approximately 835 registered EMTs in the province, in ascending skill level based on their educational programs, there are 120 PCPs, 80 EMT Level 2's and 635 EMT 1's. Most of these have also completed training in some advanced level skills. The few CMA level advanced care paramedics (ACPs) work for the Air Ambulance Program.

Few paramedics have real time (“on-line” or “direct”) access to a physician

Each EMS system that provides medical acts has a Medical Director responsible for medical supervision and oversight of paramedic practice. Paramedics in most services follow medical directives for the care of patients (“indirect medical control”), but few if any, have access in real time (“on-line” or “direct”) to a physician. There is no provincial EMS medical leader or authority. This position was advertised in 2005 but was not filled.

Quality control and audits on services are performed by Department of Health personnel. They conduct audits on vehicles and equipment and review processes of care, as well as obtain information from the Mobile Health Services Quality Assurance (MHSQA) program to assist services in remediation and improvement initiatives.

Prehospital trauma care is at best fragmented, and not part of an integrated, systematic model of care for traumatized patients.

Many of the medical directives reviewed contain protocols and guidelines for management of trauma patients, including in some cases (for example, Atlantic Health Sciences Corporation), protocols to bypass local hospitals for trauma patients that fulfill specified criteria. No information was provided to indicate the level of compliance of the paramedics with these policies. Outcome data on these patients are not available.

The combination of a lack of data, inconsistent standards, and fragmentation of services precludes an accurate assessment of the current state of prehospital trauma care. It is at best fragmented, and not part of an integrated, systematic model of care for traumatized patients.

***All ambulance and dispatch services are to be consolidated under a new public-sector company
Emergency Medical Care Inc***

Recent developments portend change in the provision of EMS in New Brunswick. All ambulance and dispatch services are to be consolidated under a new public-sector company: Medavie Blue Cross, through its subsidiary, Emergency Medical Care Inc. This company has been providing ambulance service to the province of Nova Scotia for about 10 years after inheriting a similar fragmented model for EMS there. It has recently contracted to provide EMS service in the province of Prince Edward Island as well. The consolidation of EMS in Nova Scotia has resulted in a superior provincial EMS system, and while there are geographic, political and logistic issues unique to New Brunswick, the Nova Scotia experience could serve as a template for change in New Brunswick for the prehospital care of trauma patients. The presence of a common provider in two adjacent provinces may also provide opportunities for consistencies and enhanced efficiency of care.

The stated vision for a future ambulance services system in New Brunswick includes:

- An integrated provincial system with greater efficiency, responsiveness and patient safety
- Better and more consistent pre-hospital care
- Common standards province-wide for response times, clinical protocols, equipment and skills
- A clinical workforce trained to national standards

With respect to trauma, these components form an essential infrastructure for prehospital patient care.

5.2 Prehospital Trauma System Requirements

Optimal management of trauma patients begins with the 911 call.

Optimal management of trauma patients begins with the 911 call. The call taker must have the ability to quickly identify a trauma patient(s), determine the level of acuity, assess patient access barriers (e.g. weather, entrapment, safety) and address these with allied emergency responders. The dispatcher should expeditiously send the most appropriate ambulance resource, and, if appropriate, notify the receiving facility of the incoming patient(s). The MTCC appears to have the infrastructure to provide this level of ambulance dispatch service.

Land ambulance paramedics must be deployed in a manner that optimizes their ability to reach trauma patients within a standardized time interval from receipt of the call. They must assess the patient, provide immediate basic life support care,

and rapidly transport the patient to the closest appropriate hospital within a specific time standard, under medically approved protocols which are consistent throughout the province.

If urgent life saving intervention that is outside a paramedic's scope of practice is required the most appropriate facility is always the closest Emergency Department.

The term “appropriate” hospital must be clearly defined, disseminated and utilized consistently by hospitals, paramedics and dispatchers. There are a number of clinical conditions which may qualify for transport to the closest hospital, even if that hospital does not have sophisticated surgical capabilities, for example isolated extremity trauma without neurovascular compromise. Some hospitals may be capable of advanced Orthopaedic or General Surgical interventions but be unable to treat neurosurgical conditions, and appropriately assessed patients may be triaged to those facilities. In all cases, if urgent life saving intervention that is outside a paramedic's scope of practice is required the most appropriate facility is always the closest Emergency Department.

Paramedics must be able to discern which patients should be transported directly to a trauma centre; providing paramedics with this discretion has proven to decrease mortality from trauma.

Paramedics should be equipped with specific skills to appropriately treat patients en route to the hospital. While opinions vary as to the most effective skill sets for trauma care, whatever skills are delegated should be consistent and must be subject to medical review and authorization if above the level of basic life support. Therefore, strong and uniform medical control and oversight are essential. More importantly, paramedics must be able to discern which patients should be transported directly to a trauma centre (based on anatomic and physiologic findings, nature of the incident, and transport time to the trauma centre compared to the closest hospital). This practice has been proven to decrease mortality and morbidity from trauma.

A prehospital system must be designed to ensure optimal transport times and to maximize the opportunities for identified patients to reach a trauma centre. This system may include the addition of a helicopter ambulance to respond to selected 911 calls. While this is a desirable and enticing long-term goal, it is expensive (both in terms of service provision and the construction and maintenance of landing areas), has safety risks and is a limited resource, which may not always be available due to weather, geography or mechanical factors. Further, to be effective and efficient in responding to so-called “scene” calls, an air ambulance system must be utilized primarily in an inter-facility transport mode, and for more than just trauma patients. This will be addressed later in the report.

The EMS systems as currently configured in New Brunswick do not fulfill these system requirements in a consistent or measurable fashion. However, should the provincial consolidated system evolve along the lines of that of Nova Scotia it has the potential to fulfill these attributes.

It is outside the mandate of this project to make recommendations on the prehospital system as a whole. We do, however, make the following recommendations specific to the care of trauma patients:

Recommendations:

It is recommended that:

- (11) Trauma triage guidelines and destination policies should be established provincially which result in patients identified as fulfilling anatomic, physiologic or incident characteristics being transported to a designated trauma centre if travel time is less than 30 minutes AND no immediate life threatening condition exists that is not manageable by the paramedic's scope of practice.**
- (12) Trauma triage guidelines should be developed in consultation with and be approved by both the provincial trauma and prehospital medical authorities.**
- (13) Dispatch algorithms currently utilized at MTCC should be utilized throughout the province. Quality assurance processes which ensure optimal protocol compliance and performance of the dispatchers should be established. Dispatchers should learn and participate in medically approved trauma triage and bypass protocols.**
- (14) All paramedics should complete a standardized training program in basic trauma care, to include effective basic (bag-valve-mask) airway management, assessment of the traumatized patient, immobilization, splinting, external haemorrhage control, principles of trauma triage and destination policies, and multiple casualty incident management.**
- (15) Selected paramedics who have achieved PCP level competency should be trained to perform advanced procedures including advanced airway management, intravenous fluid therapy, needle thoracostomy and cricothyrotomy to CMA designated Advanced Care**

Paramedic level. These paramedics should be deployed if feasible (i.e. without delaying response times) to defined major trauma patients that may have longer transport times to a trauma centre. They should also be utilized for inter-facility transport of trauma patients.

- (16) Time standards should be developed for: access to trauma patients (e.g. within 9 minutes 90% of the time for urban areas, within 25 minutes 90% of the time for rural areas, or those consistent with provincial standards for the service provider), “on-scene” time (10 minutes 90% of the time excluding extrication or patient access delays) and transport time.**
- (17) There should be one independent funded prehospital medical authority (ideally an individual but a committee or agency are acceptable alternatives) that oversees the development, implementation, maintenance and quality improvement of the skills, protocols and agreements outlined herein. This medical authority should be a member of the provincial trauma medical advisory group and participate in all relevant trauma system initiatives.**
- (18) Prehospital data from the Dispatch Centre and ambulance patient care reports should be integrated into provincial trauma datasets.**
- (19) Opportunities should be afforded to paramedics and dispatchers to allow them to participate in trauma-related educational and quality improvement activities, primary prevention medical research, and other integrated trauma system initiatives.**

6.0 Receiving Hospitals

The province of New Brunswick has a population of 752,000, based on Statistics Canada reports from the year 2005. Health services are delivered under the aegis of the Department of Health and Wellness, and a master plan for the New Brunswick Hospital system was developed in 1997. The hospital system was divided, for planning purposes, into three general categories of hospitals reflecting the complexity and array of services which each hospital would be able to provide.

While primary care hospitals deliver basic curative (including simple diagnostic procedures and treatment) care, primary care in the hospital system is delivered in all facilities, no matter which level of designation. Services included as primary care services include emergency, interim assessment, and some diagnostic services. In a primary care centre, nurses may act as the initial contact and health professionals other than physicians may assess and intervene for certain presenting conditions, subject to agreed protocols.

Secondary hospitals consist of specialized care centres requiring more sophisticated and complicated diagnostic procedures and treatment than those provided at a primary care level. In general, hospitals designated as providing this level of care are larger facilities and provide services which will include General Internal Medicine, General Surgery, and Anaesthesia as well as a variety of diagnostic interventions.

Tertiary care centres are those capable of delivering highly specialized care or unusually expensive treatment or diagnostic modalities. Services which are offered include not only General Medicine, Surgery, Anaesthesia and Intensive Care (ICU), Paediatrics and Obstetrics, but also more complex or sophisticated services such as Neurosurgery and Oncology.

The hospitals master plan also includes a concept of a “centre of expertise”. The characteristics of a centre of expertise, as defined by the department's document, include:

- A collection of clinical skills in a field that is closely related to an existing or planned tertiary service
- A space and equipment base for program operations recognized as such by the host Region Hospital Corporation.
- A coherent, well-defined and consistently articulated vision of the purpose and aims of the Centre, including an

inventory of resources and expertise and a catalogue of the conditions in which the centre itself is to be expert

- A “track record” of above average success in maintaining successful outcomes of these conditions and
- A commitment and ability to develop and sustain or increase referrals from physicians in other areas of the province.

As indicated in the department's model, “the trust of referring physicians and other professionals is the key ingredient in the creation and maintenance of the centre of expertise”. Clearly, the designation of a centre or centres as a provincial resource for traumatized patients is in keeping with the province’s system of designation of hospitals as “centres of expertise.” The province has already created such centres, for instance the Stan Cassidy Centre for Rehabilitation Services in Fredericton and the New Brunswick Heart Centre in Saint John.

6.1 *Health Regions*

Each region is to have a network of facilities such that primary hospital services can be obtained at a facility reasonably close to the patient's residence, but secondary services are available at a larger facilities, perhaps a some distance from the patient's home.

The province is divided into seven health regions. As designed, each Regional Health Authority should, ideally, contain a network within its boundaries that will allow the referral of patients to the level of care required if available within that region. At times, it will be necessary for the network to extend beyond the region to elsewhere in the province, particularly at times when the services required are not available within the region. The province’s health care plan further acknowledges that at times the network will have to extend beyond the boundaries of the province of New Brunswick, particularly when specialized services are required which are not available or reasonably accessible within the province. This will be of some import with reference to the treatment of severely injured children, or in forming contingency plans should the province’s resources for the treatment of trauma be overwhelmed or out of service in the case of an epidemic or a disaster which closes the tertiary care/provincial trauma centre.

As designed, each region must have a network of facilities, including at least one large facility and one or more smaller facilities, the number and ratio of such facilities being dependent on the geographic size and population distribution within the region. The system was also designed to ensure the primary services would be obtained at a facility reasonably close to the patient's residence, but that secondary services

would be available at the larger facilities, perhaps a further distance.

The regions which are operational in the province at the current time, and their capacity for the treatment of patients suffering major injuries are indicated as follows:

6.1.1 Regional Health Authority 1 (Southeast)

This region includes The Moncton Hospital, the largest facility in the region, which subserves a secondary and tertiary role, as well as Sackville. The Moncton Hospital, with particular reference to the management of traumatized patients, provides care in General Medicine, General Surgery and Critical Care and is a provincial resource for Neurosurgery, Vascular Surgery, Thoracic Surgery, Plastic Surgery and Urology. Many of these services, particularly Vascular, Orthopaedic, and Plastic Surgery are shared with the Dr. Georges L. Dr. Georges L. Dumont Hospital which, importantly, is included, for planning purposes, in Regional Health Authority 1 (Beausejour).

The Moncton Hospital is undergoing a major expansion and renovation, which, with particular reference to this undertaking, will include the development of a new Emergency Department and Critical Care facilities. The Moncton Hospital has expressed interest in becoming a trauma centre, as noted by the documentation which it has compiled in an effort to receive this designation.

The hospital possesses many of the resources which would support this application. There is a committed group of Emergency Department care providers, seamless access to an array of surgical specialties and sub specialties, and an on-site Neurosurgical capacity. The hospital has 24 hour a day access to diagnostic services, included sophisticated radiologic procedures such as MRI and CT scan. There is strong administrative support for establishing a trauma centre at this site.

However, there are a number of factors which mitigate against this centre being designated as a provincial trauma resource.

These factors include the lack of consistent hospital-based coverage in Thoracic and Vascular surgery, as well as a shared call system for Orthopaedics. In addition, there is a limited capacity to deal with the acutely ill and injured children, particularly those who would need a Paediatric Intensive Care Unit for postoperative management. Furthermore, the

hospital's formerly operational burn unit has been closed, and although the hospital continues to offer burn services, the scope available is limited. In addition, there is only a finite number of surgeons with a strong philosophic commitment to supporting a trauma program, and the Department of Anaesthesia, at the current time, is barely able to cope with the existing workload. The institution is not fully bilingual.

6.1.2 Regional Health Authority 1 (Beausejour)

This region is comprised of three facilities, including the Dr. Georges L. Dumont Hospital in Moncton, and a hospital in St. Anne. de Kent. The Dr. Georges L. Dumont Hospital is a secondary/ tertiary facility, and has recently been announced as the site of the satellite medical school to be operated in cooperation with Sherbrooke University. Dr. Georges L. Dumont Hospital has a large Emergency Department, and a staff of Anaesthetists, General Surgeons, and Intensivists of sufficient size to support a Trauma program. As mentioned above, the Orthopaedic Surgery service, along with Thoracic, Vascular, and Plastic Surgery are shared with The Moncton Hospital. Diagnostic laboratory and imaging services are available on a 24 x 7 basis, and there is facilitated access to sophisticated imaging procedures including MRI, CAT, angiography and interventional radiology.

The hospital offers all services in a fully bilingual mode, and is capable of meeting linguistic needs of all patients of the province. There is strong philosophic commitment to the establishment of a trauma centre at senior administrative and clinical levels.

There are, however, significant limitations in the capacity of this centre to be a provincial resource. There is, currently, no Neurosurgical facility. Any consideration of relocating the Neurosurgery service from The Moncton Hospital would be extremely disruptive and expensive, particularly in light of major pieces of capital equipment which have only recently been acquired for use at the Moncton City site. Additionally, the volume of trauma with an Injury Severity Score (ISS) of 12 or higher which has historically been treated at this site is low, and there is a limited skill and experience set amongst providers.

6.1.3 Regional Health Authority 2

This region has multiple health facilities. They include primary care facilities such as those in Grand Manan, ambulatory facilities, and hospitals including Sussex Health Centre and Charlotte County Hospital and a facility (the Saint John Regional Hospital) with tertiary services. This region has invested considerable time and energy in the development of a comprehensive approach to trauma.

The Saint John Regional Hospital is the only tertiary care trauma centre in New Brunswick that has been accredited by the Trauma Association of Canada, with full accreditation received in both 1996 and 2002. The Saint John Regional Hospital has been recognized by the Trauma Association of Canada as the provincial leader in trauma care.

The trauma program collects data on all trauma admissions using Collector software and submits data to the National Trauma Registry. Over the past two years the hospital has cared for approximately 100 patients/year with an ISS > 12 and 80 patients with an ISS > 15.

The hospital offers a comprehensive array of Medical and Surgical services to support trauma care, including General Surgery, Orthopaedic Surgery, Neurosurgery, Cardiac Surgery, Plastic Surgery, Urology and Vascular Surgery. In addition, the hospital offers care in a variety of subspecialty areas in Paediatrics, although it does not have a level 3 Paediatric ICU. Critically injured Paediatric patients in need of intensive care are treated initially at the hospital, and subsequently transferred to the IWK in Halifax. The hospital has capacity to deal with burns. Diagnostic resources, including both Laboratory and Diagnostic Imaging, are on site and available 24 hours a day seven days a week, and there is a comprehensive array of Diagnostic Imaging resources available.

The centre is rarely unable to accept a referred trauma patient from outside the Region as a result of inadequate resources (usually as a result of insufficient Critical Care Unit beds). If the volume of trauma patients was to increase significantly there will be resource issues in the Emergency Department (including staffing for more instances where multiple trauma patients would require simultaneous resuscitation) and the Critical Care Unit (where there would be insufficient flexibility because of a limited physical plant). There is currently a plan to consolidate Critical Care Unit beds, including Cardiac Surgery beds, in a newly designed unit. If

the Saint John Regional Hospital was to significantly expand its role in trauma care there will be a need for additional critical care beds for trauma patients and this current plan will require re-evaluation.

If SJRH were to be designated as the sole tertiary trauma resource for the province, an incremental capacity of at least 5 critical care beds, designated for the care of trauma patients with an ISS >12, would be necessary to accommodate the demand. It is not possible to predict exactly how many additional critical care beds would be required as a result of the incomplete picture of the number of seriously injured persons in the province. Options might include incorporating the Trauma ICU activity into the planned ICU by expanding its planned footprint to accommodate 5 more beds or decanting the Cardiac Surgery beds to another location.

There is a full time Trauma Coordinator and a Lead, Trauma Advisory Committee (an Orthopaedic Surgeon with subspecialty trauma training). There is currently no position of Medical Director of the Trauma Program. There are no dedicated trauma data assistants/analysts.

There are a number of prevention initiatives in place and staff at the hospital participate in in-house educational activities and a small number of outreach activities. There are currently minimal trauma research activities.

The hospital has invested significant resources in developing a regional approach to trauma, which has been, as of this writing, successful. There is a helicopter landing pad on site. There is a strong administrative commitment to the development and support of a provincial trauma resource.

Of note, not all providers that this site are functionally bilingual, although the provincial Cardiac Services program which operates at this site has a commitment to the provision of services in both official languages. There is a parallel commitment from those who would be involved in trauma care to meet the objective of becoming fully bilingual pending designation as a trauma resource.

6.1.4 Regional Health Authority 3

This region contains facilities designated as primary, secondary (the Oromocto Public, Tobique Valley, Northern Carleton, Hotel Dieu and Carleton Memorial Hospitals) and tertiary (Dr. Everett Chalmers Regional Hospital)

The Dr. Everett Chalmers Regional Hospital in Fredericton currently fulfills an important local and regional role caring for the moderately injured trauma patient. The Dr. Everett Chalmers Hospital in Fredericton has no capacity to perform Neurosurgical procedures. It has expressed no specific interest in becoming a designated provincial resource for the treatment of traumatized patients. The hospital does have seamless coverage in General Surgery, Orthopaedic Surgery, and Anaesthesia. It also has 24 hour a day access to Laboratory and Diagnostic Imaging services, including CT and MR scanning.

Injured patients who have been cared for in Fredericton have not been included in a comprehensive data set and it is therefore unclear as to the exact number of patients cared for or the severity of their injuries. Surgical and Emergency Medical staff estimate that of those patients requiring operative care (excluding single limb trauma including hip fractures) or admission to a Critical Care Unit, approximately 50% are brought directly to hospital from the city of Fredericton and 50 % are referred from surrounding hospitals. There are protocols in place to mobilize a team of clinicians to care for the trauma patients in the Emergency Department (Code Yellow). It is very unusual for a patient who has been referred to Fredericton from an outside hospital for definitive care to subsequently require transfer to another facility to receive a higher level of care. There is no Neurosurgical service and significant brain and all spinal cord injured patients are all referred to other centres, following resuscitation and assessment in the Emergency Department.

The role that the Dr. Everett Chalmers Regional Hospital is playing, in caring for the moderately injured patient, is similar to that of other secondary hospitals throughout Canada.

The Stan Cassidy Centre for Rehabilitation is located in Fredericton and is the sole tertiary rehabilitation facility in the province.

In the last calendar year there were approximately 120 admissions (including 25% for brain injury and 25% for spinal cord injury). The median length of stay is approximately 40 days. The Centre also has an active outpatient program.

The recently opened physical plant has approximately twice as much space and will include five transitional living units, as well as 4 incremental beds.

Although the Centre fulfills a provincial role for the rehabilitation of trauma patients there is currently no comprehensive trauma data at a provincial level and it is therefore not possible to know exactly what percentage of the severely injured patients who could benefit from this high quality rehabilitative care are actually cared for at the centre. There is very good communication and referral practice between the Saint John Regional Hospital and the Stan Cassidy Centre, but less than optimal communication and fewer referrals between the Moncton hospitals and the Centre. The Centre currently has capacity to care for additional patients and as a result of physical plant changes there will be greater capacity in future.

Recommendation:

It is recommended that:

- (20) All TBI (traumatic brain injury), spinal cord injured patients and multiply injured patients in the province requiring in-patient rehabilitation should receive their care at the Stan Cassidy Centre**

6.1.5 Regional Health Authority 4

This region provides service to a population of approximately 51000 people. There are three health-care facilities in the region, with primary care facilities located in Grand Falls and St. Quentin, and a secondary facility in Edmundston. The region has developed a regional approach to trauma, with patients receiving rapid evaluation and resuscitation at the Grand Falls and St. Quentin sites, before expedited transfer to Edmundston. On rare occasions, particularly if it is evident that the injured patient will require Neurosurgical care, patients may be transferred directly from Grand Falls or St. Quentin to Moncton or Saint John, rather than to Edmundston.

The Edmundston hospital, and the region, have demonstrated leadership in developing a comprehensive approach to trauma in a region with a low population with limited facilities. They have developed prehospital indicators which denote patients in need of complex or sophisticated care, a notification system which ensures appropriate resources are available on-site when traumatized patients arrive, and a highly functional transfer and referral arrangement with hospitals in Québec City for those patients for whom transfer is deemed to be necessary.

The hospital has engaged in an active education program to ensure that its medical and nursing staff, to the maximum extent possible, receive training and continuing professional development as it pertains to the management of traumatized patients.

Each episode of care is followed by a debriefing, during which the performance of all services, ranging from prehospital care providers to Surgeons, are reviewed in a transdisciplinary model.

The hospital has a cohort of active Emergency Physicians, supported by on-call Anaesthetists, General Surgeons, and Orthopaedic Surgeons. Unfortunately, there are gaps in the Orthopaedic Surgery schedule, and there is not guaranteed access to an Orthopaedic Surgeon on call 365 days a year. The General Surgeons have excellent training in trauma, and are capable, if necessary, of performing thoracotomies.

6.1.6 Regional Health Authority 5

This region provides service to approximately 30,000 people. Its major health facility is located in Campbellton, and is a secondary level facility. The Campbellton Regional Hospital has an Emergency Department, staffed by Family Physicians who work in the Emergency Department on a rotational basis. Specialists in Anaesthesia and General Surgery are generally on call, and Orthopaedic Surgery services are shared on a rotational basis with those in Bathurst and Miramichi.

There are no consultant services available at the other centres in the region, and the Campbellton Hospital is insufficiently resourced for consideration or designation as a provincial trauma resource.

6.1.7 Regional Health Authority 6

Region 6 has a primary care hospital in Tracadie, and a secondary level facility in Bathurst, (the Chaleur Regional Hospital) The facility in Bathurst has a 24 hour a day Emergency Department and seamless coverage in Anaesthesia. General Surgery services are generally available, but are frequently augmented with the use of locum Surgeons from other communities. The Orthopaedic Surgery service is shared, as noted above, with other centres. While the number of Orthopaedic Surgeons present in the community varies, in general there is on site availability of Orthopaedic Surgery three to four out of every seven days.

The hospital does have 24-hour day access to Laboratory and Diagnostic Imaging facilities, but does not have 24/7 coverage by Radiology. CT scans will frequently need to be read by radiologists in Saint John utilizing a PACS system.

While this hospital has the capacity to treat some patients who have suffered single or multi system trauma, it does not have the capacity to be designated as a provincial resource for trauma.

6.1.8 Regional Health Authority 7

This region has a population of approximately 40,000 people. A secondary facility is located in the community of Miramichi. The Miramichi Regional Hospital has a 24 hour a day Emergency Department, with Anaesthesiology services available 24/7. General Surgery does not offer seamless coverage, and Orthopaedic Surgery is shared with facilities in Bathurst and Campbellton.

The hospital does have Laboratory services available, as well as access to CT scan on a 24 hour basis.

This facility is not currently possessed of a sufficient depth or breadth of resources and skills to be considered for designation as a secondary trauma centre. Unless the system for the provision of on-call services in Miramichi is changed, the lack of guaranteed and coordinated coverage in Orthopaedic Surgery and General Surgery mitigate against the centre being designated as an Intermediate Centre for trauma care.

6.2 Hospital Clinical Staffing

It is essential to insure the highest quality of care is received in the "golden hour" after a trauma episode, much of this care will be delivered in a local hospital, outside of a trauma centre.

In assessing the skills and resources of all hospitals in the province, a number of issues are evident. These include:

- A lack of Emergency Physicians with postgraduate training in Emergency Medicine
- A lack of separate and distinct provincial and regional manpower plans for Emergency Medicine and Family Medicine.
- A lack of a requirement for ATLS certification and/or recertification
- A number of hospitals which require call backs in order to perform Laboratory or Diagnostic Imaging investigations

- A number of hospitals with no second call physician to provide support should a traumatized patient or multiple trauma victims arrive
- Hospitals which operate CT scanners without guaranteed access to a technologist capable of performing the appropriate investigations, especially out of hours
- A lack of standardized protocols for CT scan in traumatized patients
- Difficulty mobilizing a nurse to accompany patients on transfers
- A number of secondary centres which do not have seamless coverage in the “core” services necessary to serve as a secondary centre for trauma care (Anaesthesia, General Surgery and Orthopaedics)
- A lack of a system which ensures that regions which have a regional approach to service delivery in Orthopaedics also have General Surgery available in the same centre on the same day
- While, to our knowledge, no other province has a province wide standardized trauma resuscitation chart, the consultants believe that the development of such a record keeping system will greatly facilitate data collection and research. The Steering Committee may wish to modify the trauma chart currently in use in Saint John contained in the Appendices, or modify the chart(s) in use in a number of other trauma centres (such as Sunnybrook Health Sciences Centre) and distribute the newly designed chart to all centres in the province that will receive and treat seriously injured trauma patients.
- The lack of a formalized system of review of the care received by trauma patients.

In designing a trauma system for the province it will be necessary to address each of these issues. Simply guaranteeing timely access to a high-quality trauma service located in a tertiary care centre will be insufficient to meet the health care needs of the residents of the province. It is equally essential to insure the quality of care received in the "golden hour" after the trauma episode, much of which will be delivered outside a trauma centre, is of the highest possible standard and quality.

Guaranteeing this quality of care incorporates a number of variables. These include the skills and training of prehospital

care providers, as has been presented in other sections in this report.

Once patients arrive in the Emergency Department, however, it is crucial that the infrastructure be in place to optimize outcomes. The important components are described briefly in the paragraphs following.

Nursing and Emergency Medical staff who are trained to recognize the degree of severity of injury, and mobilize the necessary supports to optimize outcome must be onsite. Additional on-call nursing staff will need to be available for those departments which may operate with minimal nursing staff. At least one Emergency Physician will need to be available on site; in some cases it may be appropriate to automatically notify a second call or backup physician; Laboratory and Diagnostic Imaging staff must be on-call and readily available if not present on-site.

In addition, the nursing staff must be empowered, by protocol or medical directive, to initiate those treatments and or investigations which will be necessary. This may include, but not be limited to, initiating large bore intravenous lines, providing supplemental oxygenation (if not already initiated), completing requisitions for laboratory investigations (such as baseline haematology and biochemistry as well as a blood grouping and screening), and ordering x-rays or specialized other radiologic investigations.

***Medical staff must be on site
when the patient arrives in
the ED***

Medical staff must be on site, if possible, when the patient arrives. This will require either an obligation on the part of emergency physicians to remain on site in all Emergency Departments 24 hours a day, or, alternatively, a mechanism which allows for the early notification of Emergency Departments of the impending arrival of a trauma victim, and a system which ensures that physicians live in close enough proximity to the hospital to arrive prior to, or concomitant with, the patient.

***Newly credentialed
Emergency Physicians
minimally should receive
"exposure" to Advanced
Trauma Life Support
training***

In addition, medical staff appointed as emergency physicians must have a baseline level of training specific to the management of trauma patients. Currently, certification in Advanced Trauma Life Support is not mandatory for appointment. The consultants recognize the difficulty in gaining access to this training, particularly for Francophone Physicians. We also recognize the expressed policy of the American College of Surgeons that ATLS certification be an educational, rather than a credentialing tool. It is, however, essential that the basic approach to the resuscitation and

stabilization of trauma victims be explicitly understood by Emergency Physicians for two reasons. The first is to ensure an organized systematic approach to the search for and remediation of immediate life-threatening injuries in the polytraumatized patient. The second imperative is to create a common language to allow Emergency Physicians to engage in discussions with consultant colleagues, so that in effecting transfers to more sophisticated centres, there is an explicit understanding of the part of both parties as to the approach which has been used to search for life or limb threatening injuries.

Therefore, it is recommended, on a go forward basis, that any newly credentialed Emergency Physicians receive "exposure" to ATLS training. This will ensure, at a minimum, that all Emergency Physicians have, on at least one occasion, been exposed to both the curriculum and the procedural skills necessary for the treatment of trauma victims. We suggest that all physicians currently credentialed be "encouraged" to attend an ATLS course if they have not done so.

There are a variety of methodologies to achieve this recommendation. Many residents in surgical training programs, as well as Family Medicine, have the opportunity to undergo such training either in the academic centre in which they are engaged, or in other centres. In addition, many academic centres (such as Sunnybrook Health Sciences Centre in Toronto) offer ATLS training on a frequent basis, up to 20 times per year. It can, and should, be possible for regions to contract with providers of these courses to reserve spaces for physician appointees of the region. An alternative would be for the Department of Health and Wellness to contract with one, or a series of, Academic Health Science Centres to provide an educational opportunity for New Brunswick Emergency Physicians.

In addition, at least one centre, Sunnybrook Health Sciences Centre, facilitates opportunities for emergency nurses to serve as observers during ATLS programs. Offering this opportunity to nurses will only further enhance the quality of care available. It is suggested that the province should negotiate with providers of ATLS Programs to reserve slots for New Brunswick's nursing staff.

With specific reference to the difficulties in obtaining certification in ATLS for French speaking physicians, Laval University, University of Montréal, and Sherbrooke University all offer ATLS training in French, admittedly with fewer opportunities for access.

In addition to core training in ATLS, it is also imperative for practicing Emergency Physicians to regularly update themselves regarding new advances in trauma care. These updates may occur through journal reading, in-house educational opportunities such as rounds, or attendance at continuing professional development. It is recommended elsewhere in this report that the designated tertiary care trauma centre undertake responsibility for planning and implementing professional development opportunities on a province-wide basis. While this will serve many of the needs of both physicians and nurses for continuing professional development, it is further suggested that a core number of hours of professional development focused on the management of trauma be included as part of the re-appointment process for Emergency Physicians.

Emergency physicians in all hospitals treating trauma patients should have a defined set of competencies for the management of trauma victim

It is recommended that emergency physicians in all hospitals treating trauma patients have a defined set of competencies for the management of trauma victims. These would include:

- The ability to recognize the compromised and/or unprotected airway and manage airways by the use of oropharyngeal devices, endotracheal intubation, and at least one type of surgical airway.
- The ability to recognize compromised oxygenation and ventilation and take steps to treat life threatening and serious injuries through advanced airway management, immediate needle chest decompression and/or the insertion a chest tube (as appropriate to the specific injury or injuries).
- The ability to recognize life threatening and serious chest injuries, including a disrupted bronchus and traumatic aortic dissection.
- The ability to recognize the patient in shock and arrange appropriate fluid, blood and blood component therapy including the insertion of a high calibre intravenous lines.
- The ability to recognize and treat visible external exsanguinating haemorrhage.
- The ability to recognize the potential for major intra-abdominal or pelvic haemorrhage and provide blood replacement therapy, while awaiting urgent surgical consultation.
- The ability to conduct a neurologic evaluation to detect impaired or altered level of consciousness, and significant

spinal or intracranial injury and initiate appropriate therapy.

- The ability to conduct a comprehensive secondary survey, and annotate injuries, including the interpretation of x-rays of the chest, cervical spine, extremities, and pelvis.
- The ability to insert, both an oro- gastric tube and a Foley catheter.
- The ability to splint fractures of the extremities in an effective manner.

Recommendation:

It is recommended that:

(21) Emergency physicians in all hospitals treating trauma patients have a defined set of competencies for the management of trauma victims

Developing a provincial plan for the recruitment and retention of Emergency Physicians (whether credentialed by the College of Family Physicians or the Royal College) will greatly assist in the development of a trauma system and ensuring the quality of care received. Trainees emerging from such programs have significant knowledge of trauma care and systems. They are equipped to transition to roles such as Trauma Team Leader (TTL) or pre-hospital care Medical Directors. They may serve as an educational resource to colleagues.

However, in order to ensure the successful recruitment of such individuals, while not concomitantly adversely affecting the manpower needs for family physicians, it is suggested that a separate human resource plan for trained emergency physicians be developed.

Specialists involved in trauma care must commit to the provision of a high quality service in a timely manner, and to appropriate skill acquisition and maintenance.

Much of the focus on this section of the report is on issues relating to the professional resources and skills required for the initial assessment, resuscitation and transfer of the seriously injured patient. Our review uncovered consistent concerns about the provision of pre-hospital and in-hospital emergency care. Issues related to surgical and in-patient care are addressed in other sections of this report. It is, however, important to clarify that specialists involved in trauma care must commit to the provision of a high quality service in a timely manner, and to appropriate skill acquisition and maintenance.

Ensuring the timely availability of diagnostic services to manage trauma patients is essential

Ensuring the timely availability of diagnostic services to manage trauma patients is also an essential. While it is not necessary to have an on-site laboratory technician 24/7, only those hospitals which are capable of performing necessary core haematologic and biochemical investigations should be receiving trauma victims. In addition to the capacity to perform the investigations, the technician responsible must be able to reach the hospital within 15 minutes of being notified of the impending arrival of a trauma victim, and have the skills necessary to perform these investigations. In addition, at a minimum, the hospital must have a blood bank which contains at least four units of O-negative blood, and the capacity to perform a stat cross match, and deliver group and type specific blood within 45 minutes of patient arrival.

Diagnostic Imaging services must also be available within 15 minutes of patient arrival

Diagnostic Imaging services must also be available within 15 minutes of patient arrival. Only those hospitals capable of mounting this response should receive trauma victims. At a minimum, the hospital must have the capacity to perform x-rays of cervical, thoracic and lumbo-sacral spines, chests, pelvis and extremities. The emergency physician must have the capacity to interpret these x-rays, and /or have the ability to transmit the images electronically to another facility in order to receive further assistance from a radiologist.

If a hospital designated to receive seriously injured trauma patients has a CT scanner on site, then it must have protocols for the conduct of CT evaluation of trauma victims provided to them by experts in the area. It is not essential that all trauma patients be investigated with CT imaging at the initial receiving hospital as, in certain cases, this imaging will more appropriately be performed at another centre (such as the tertiary care trauma centre). Decision making around when and where CT imaging will be performed will be guided by early communication between sending physicians and the Trauma Team Leader at the trauma centre. Secondary care hospitals receiving trauma patients must have a technologist on call 24 hours a day capable of performing these examinations, and administering contrast (under the auspices of a medical directive) in order to enhance the CT images. The hospital must also have a protocol in place to ensure that either the local radiologist reads the films in a timely manner, or that the films can be transmitted to another centre for interpretation by a skilled radiologist.

Many Emergency Departments have only one physician on duty. The transfer of patients who have suffered from major injuries must occur in a manner which is both safe and

expeditious. Transferring patients who have been severely injured, who may or may not have had periods of haemodynamic instability, can only occur safely if the patient is transferred in the company of a nurse and another individual who is both skilled and trained in fluid administration, the management of respiratory emergencies such as a pneumothorax, and endotracheal intubation. Owing to the unique circumstance of transporting critically ill patients in a neck immobilizer, with the attendant difficulties of endotracheal tube placement in such scenarios, and the potential need to create a surgical airway, it is suggested that a physician accompany patients in transfer whenever possible. Alternatively, a Provincial inter-facility transfer system staffed by Critical Care or Advanced Care paramedics with the requisite skills may be used. This would allow sending facility staff and resources to remain in their communities.

If Respiratory Therapists or other non-physicians are used as a resource for the transfer of trauma patients, a provincial trauma committee (or other oversight committee) should be vested with responsibility for defining a skill set necessary to ensure that such transfers take place safely. This may require the design of a skills based curriculum specifically oriented to additional skills for RT's such as intubating patients in cervical collars or creating surgical airways.

A physician will need to accompany the trauma patient for at least some transfers, if not all

Access to a physician to accompany the patient will be necessary for at least some transfers. This necessitates that a second call physician be available, either to be the transfer physician, or alternatively, to be available in the community for further emergencies as they arrive. Any hospital which wishes to treat trauma victims must have a second call roster to ensure the availability of a second Emergency Physician. As an alternative, hospitals may wish to designate the responsibility for transfer to General Surgeons, Anaesthetists, or other physicians who have the necessary skills and training.

It became clear in the course of province wide consultations that primary and secondary care organizations often have significant difficulty with the utilization of nurses for transfer. These difficulties are twofold. In the first instance, many organizations do not have sufficient numbers of nursing staff on duty in the Emergency Department (or elsewhere in the hospital) to allow a nurse to accompany a patient on transfer. It is also evident that not infrequently nurses that do accompany the patient experience difficulty returning to their base hospital, as the ambulance which takes the patient on transfer may be redirected to another venue, thus leaving the

nurse stranded a considerable distance from her or his home base.

Hospitals designated to receive trauma patients must have sufficient nursing staff to ensure adequate staffing of both the Emergency Department and a safe patient transfer.

Therefore, those hospitals which wish to be designated to receive trauma patients must have a system of either ensuring the presence of sufficient nursing staff, or, alternatively, mobilizing sufficient nursing staff to ensure an adequate human resource to staff the Emergency Department and effect a safe transfer. In addition, a mechanism to insure the timely return of nursing staff who accompany patients on transfers must be developed. This might include using a taxi service, or, in conjunction with the ambulance service, developing a mechanism to ensure that the nurse returns promptly to his or her home base.

6.3 Documentation and Data Collection

In order to ensure standardization of data collection, and provide sufficient information to ensure the comprehensiveness of patient evaluation, it is recommended that the province consider developing a standardized chart for use in the care of trauma patients. While individual organizations may seek to develop this chart independently, in order to ensure that all patients have the requisite data collected, and that the data may be rapidly reviewed and interpreted in all centres, it is suggested that one standard chart be developed for use in all institutions caring for accident or injury victims.

Canadian Institute for Health Information (CIHI) compiles an annual report entitled “Major Injury in Canada”. This report is generated from data submitted to the National Trauma Registry (NTR), and reflects a national standard for a comprehensive data set. A standardized provincial trauma record will facilitate data collection and thereby the submission of comprehensive data to the NTR. This will facilitate comparison of the province’s profile with that of other provinces. It will also ensure that any data is available for planning and research purposes.

The essential data elements are listed in Section A of the CIHI report for 2006. In addition to these elements, the province may wish to add additional data points for research or other purposes specific to the New Brunswick environment (such as moose related incidents, for example).

The Atlantic Health Sciences Corporation (Appendix B) has developed charting templates for trauma patients that would be suitable for use in any local hospital or regional trauma

centre. As mentioned in other sections of this report, a number of other trauma centres have also developed “trauma charts”. Many of these would be suitable for use in New Brunswick.

We recommend that the centre ultimately designated as the provincial trauma resource review these, and other template charts, make any revisions deemed to be necessary to customize them for use in New Brunswick, and subsequently distribute them province-wide

To facilitate data collection and analysis, the province and/or the provincially designated trauma centre may wish to employ a data assistant to collect and ensure the completeness of data entry on trauma patients. Alternatively, this task could be assigned to a Trauma Coordinator. Sample job descriptions for such positions are to be found later in this report.

As mentioned elsewhere in this report, Edmundston Hospital has developed an impressive program of review of the care of trauma patients. Each case is reviewed in detail and the process is trans-disciplinary and inclusive. It focuses on opportunities for Quality Improvement and is not seen as punitive. It provides high educational value and promotes team building. It is suggested that this model would be an appropriate one for all centres involved in the provision of trauma care to emulate. Ideally, the designated trauma centre would participate by teleconference and provide follow up on the patient being discussed and constructive feedback, when appropriate. These teleconferences could be conducted either with the sending centre, or with all centres as monthly or quarterly rounds.

Only those hospitals willing to commit themselves to the aforementioned covenants should continue to receive trauma victims in primary (“off the street”) transfer.

In addition, Sunnybrook Health Science Centre has service specific charts for use by consulting services in the tertiary care trauma centre. These charts, are used in a modified format by many other trauma centres in Canada by services such as General/Trauma Surgery, Neurosurgery, Anaesthesia, Orthopaedic Surgery, Plastic Surgery, Spine Surgery, and other subspecialty departments to annotate their findings. These charts are most commonly used in triplicate, so that one copy may be appended to the patient chart, one returned to the consulting service for their record-keeping, research and data analysis purposes, and one copy is forwarded to the Data Analyst for use in trauma system data analysis and reporting.

These charts have been published in the Journal of Trauma and are not copyrighted. We suggest that the designated trauma centre consider the use of these records by subspecialty services at some time in future. Discussion as to the use of these charts should occur between the Medical Director of the trauma program and the division or department chiefs affected.

Recommendations:

It is recommended that:

(22) All hospitals treating trauma patients should:

- **Ensure that Emergency Department RNs receive appropriate education in trauma patient assessment and treatment**
- **Ensure that physicians working the Emergency Department either attend or are familiar with the principles of ATLS and have defined competencies to treat trauma victims.**
- **Have sufficient resources to ensure timely, on site Laboratory and Diagnostic Imaging services**
- **Have a second physician on call**
- **Ensure that if RTs are used for the transfer of trauma patients they have the requisite skills and knowledge**
- **Ensure that there is a sufficient pool of nurses to effect safe and timely transfers**
- **Ensure collection and sharing of the data necessary to support a provincial reporting system**
- **Participate in a province wide education and Quality Assurance program for trauma.**

(23) The Province should develop a physician human resource plan specifically focussed on Emergency Medicine.

7.0 *Designation of Secondary and Tertiary Centres*

7.1 *Paradigm Shift in Trauma Care*

There has been an evolution in the provision of trauma care since the original concept of designating trauma centres in the early 1980's. The following Table, adapted from the American College of Emergency Physicians publication "Trauma Care Systems 2003", highlights the move to a system of care with the focus on a cooperative approach to optimize patient outcomes.

Old Thinking	New Thinking
Trauma is a surgical disease	Trauma is a "team" disease
Focus on reducing deaths	Focus on reducing death, disability and costs to society
"Trauma Centres" save lives	"Trauma Care Systems" save lives, optimize functional outcome and reduce costs
Competition among hospitals	Cooperation among hospitals within the system to ensure best outcomes
Focus on resources consumed	Focus on improved health status of the population served

In future, comprehensive information on trauma patients will assist in planning, the development and evaluation of injury prevention programs, permit trend analyses and allow for provincial and international injury and outcome comparisons. At this time it is not possible to know how many persons are seriously injured each year in New Brunswick or exactly where they are injured.

7.2 *Trauma Cases in New Brunswick*

As a result of an incomplete picture of serious injury in New Brunswick it is necessary to estimate the volume of patients who should be receiving care in the setting of a tertiary care trauma centre. Newfoundland has a population of approximately 500,000 and the single tertiary care trauma centre in St. John's cares for approximately 60-65 patients per year with an ISS > 15 (80-100 with ISS > 12). Nova Scotia has a population of approximately 950,000 and the only tertiary care trauma centre (QE II in Halifax) treats approximately 375 patients with an ISS > 15 (approximately 450 with an ISS > 12). Based on this population registry information from neighbouring Atlantic provinces it is

estimated that there are between 200-300 patients per year with an ISS > 15 in New Brunswick.

For standardization, and to assist the consultants in defining both the volume and acuity of injury in order to determine whether one or two trauma centres should be created in the province, we attempted to ascertain the number of patients with Injury Severity Scores higher than 12 or 15. It should be noted that in most constituencies a score of 15 is associated with the need for treatment in a definitive trauma centre, but in order to ensure optimization of care to all patients, and to accurately determine the total volume of "serious" injuries, we have also engaged in a process of identifying patients with scores of 12 to 15.

Unfortunately, other than the Saint John Regional Hospital, no organization in the province collects data attesting to Injury Severity Scores. According to CIHI (2005 report Major Injury in Canada National Trauma Registry) the number of cases with Injury Severity Scores greater than 12 reported in the province of New Brunswick for the year 2003/2004 was 74. This compares to 82 cases in the province of Newfoundland, and 425 cases in the province of Nova Scotia. Of note, the data from New Brunswick pertain to one facility only, assumedly the Saint John Regional Hospital.

It is estimated that there are only 370 trauma cases per year occur in New Brunswick.

If, one were to extrapolate the data, and to assume that only 20% of N.B. trauma cases with an ISS of 12 or higher are treated in Saint John, then it is estimated that there are only 370 cases per year in New Brunswick.

Recommendations:

It is recommended that:

- (24) A provincial trauma care steering committee should be created with representation from all Regions and the various clinical components of the Trauma Care Chain.**
- (25) Comprehensive data should be collected on those patients with an Injury Severity Score > 12 as part of the provincial trauma registry (and National Trauma Registry). A dedicated Data Analyst at the tertiary care centre could assist with this data collection.**
- (26) A provincial trauma registry should be developed to include comprehensive data on all patients in the province with an Injury Severity Score > 12.**

Minimal and comprehensive data should also be sent to the National Trauma Registry.

- (27) Province wide protocols should be established for trauma triage, hospital by-pass and the provision of the pre-hospital care for trauma patients.**

7.3 A Trauma Centre for New Brunswick

Given that Nova Scotia, with its 425 cases, concentrates all trauma activity for the province in one centre, the data confirm that concentrating all referral trauma activity in one centre is a viable provincial model. In addition, the trauma literature is unclear regarding the minimum number of cases with Injury Severity Score of 12 or higher necessary to maintain the competency and skills of providers, and to ensure the cost efficiency and cost effectiveness of a comprehensive trauma program.

There are no accepted Canadian standards as to the threshold volumes for a hospital to be designated as a tertiary care trauma unit. The American College of Surgeons (in their publication “Resources for the Optimal Care of the Injured Patient”) has defined volume performance criteria for Level 1 verification (equivalent to Trauma Association of Canada Tertiary Care Trauma Centres) to be 1200 admissions per year, or 240 admissions with an ISS > 15, or an average of 35 patient admissions per trauma panel surgeon per year.

There should be only one trauma centre in the province.

Hay Group previously submitted a report suggesting that 2 trauma centres, one located in Moncton and one in Saint John, be created to meet the needs of the province. However, since the publication of that report, the opportunity to access and analyze data from the province has led the consultants to the belief that only one trauma centre should be established in the province.

For similar patients, the mortality rate is significantly lower in trauma centres than nontrauma centres

The first issue to address is whether, in fact, trauma centres can reasonably be expected to improve outcomes. Many articles in the literature have attested to this, and an annotation of these articles can be found in Appendix D. Readers of this report are, however, directed specifically to the reference by MacKenzie et al., entitled "A National Evaluation of the Effect of Trauma Centre Care on Mortality", published in the New England Journal of Medicine in January of 2006. This article, specifically, reaffirms that after adjustment for differences in case mix, the mortality rate is significantly lower in trauma centres than nontrauma centres, as is the one-year mortality rate. Importantly, the authors point out that this

effect varies according to the severity of injury, but, importantly, the differences in mortality rates are most evident in patients with more severe injuries.

There are a variety of methodologies to annotate the severity of injury in trauma patients. The Edmundston Hospital for instance, utilizes a Prehospital Index to assist prehospital care providers in that region to determine which patients are at higher risk than others.

Other constituencies, such as the prehospital care system in Ontario, or Region 2 in New Brunswick, have developed a combination of physiologic and incident characteristics to denote which patients are at high risk.

The consultants recommend that province wide criteria be developed annotating both incident and physiologic characteristics which would result in mandatory transfer to a hospital designated as capable of receiving trauma patients. We emphasize that this does not suggest that all patients suffering from any such injuries should be taken primarily to the provincially designated trauma centre, but that all patients who suffer injuries as annotated below be taken to centres which meet the criteria outlined elsewhere in this report (i.e., a physician is, or will be present at the time the patient arrives; a sufficient nursing resource exists, and both laboratory and a diagnostic imaging services are available in a prompt and timely manner). In addition, if the physical location of the accident or injury is reasonably equidistant from a primary or secondary centre, the patient should preferentially be taken to the secondary centre. Furthermore, if the incident is equidistant from a secondary centre or a designated tertiary trauma resource, the patient should be transferred to the trauma centre.

In addition, we recommend that once the initial assessment, resuscitation, and stabilization of patients has occurred, all patients who meet these characteristics must, at a minimum, have their clinical course discussed with a Trauma Team Leader at a provincial resource. Upon review, some patients identified through this process may be deemed to be appropriate for referral to secondary centres. If such referral is to occur, it will be the responsibility of the RN working in the provincial 'one number to call' system, to make contact with the appropriate land or air ambulance transfer service and staff at the suggested receiving centre in order to appraise them of the history, physical examination, treatments completed, and anticipated course of treatment for the patient. Identification of Provincial Trauma Centre.

In the Table which follows we have reproduced the Trauma Association of Canada criteria published for the designation of tertiary care trauma centres in Canada. We have evaluated the capacity of the Saint John Regional Hospital, Dr. Georges Dumont Hospital, The Moncton Hospital and the Dr. Everett Chalmers Regional Hospital to meet these criteria currently and in the future. Where appropriate we have commented on areas of concern, or highlighted the changes in philosophy, physical plant or infrastructure which will be necessary to meet the criteria.

Capacity of New Brunswick Hospitals to Meet Tertiary Centre Criteria

SJRH=St. John Regional Hospital, DGDH=Dr. Georges Dumont Hospital, TMH=The Moncton Hospital, DECRH=Dr. Everett Chalmers Regional Hospital

Existing Criteria	Req't	SJRH	DGDH	TMH	DECRH	Comments
CATEGORIZATION CRITERIA INCLUDE PRE-HOSPITAL CARE WHICH IS ESSENTIAL (E), OPTIONAL (O) AND DESIRED (D) FOR EACH OF THE CENTRES.						
Hospital Governance:						
• demonstrated clinical commitment to priority treatment of severely injured patients	E	++++	++	++	+++	Established program at SJRH. Philosophic commitment at DGDH. ? commitment of general surgery, anaesthesia, at TMH. DECRH has no expressed desire to have provincial role.
• assure adequate resources and staff	E	++++	?	++	+++	
• be committed to the trauma system	E	++++	++	?	+++	See above comments
• demonstrated financial support to trauma program	E	++++				SJRH has longstanding commitment of resources
• funded hospital beds for trauma	E	++++				SJRH has financed with operating dollars
• trauma registry financial support	E	++++				Long standing support from SJRH
• funding for trauma team leader/trauma surgical staff	E	++++				Would need augmented funding
Medical/Surgical Director:						
• a physician or surgeon responsible for the medical and specialty services providing trauma care within the hospital	E	++++				
• financial support for that physician or surgeon responsible	E	++++				Need additional support
Trauma Program Manager/Coordinator:						
• an individual who has the responsibility and authority for coordination and management of trauma care within the institution	E	++++				
• financial support for that position	E	++++				Would need additional support

Existing Criteria	Req't	SJRH	DGDH	TMH	DECRH	Comments
Medical Resuscitative Services:						
(a) a multi-professional trauma system within the hospital providing timely service, i.e., OR, Lab, Diagnostic Imaging, Nursing & Critical Care	E	++++				
(b) 24 hour trauma team* response to include:						
• Trauma team leader (max 20 min response)	E	++++				
• Certified General Surgery emergency department bedside consultation (per defined local protocol, max 20 min response)	E	++++				? commitment of TMH surgeons to provide if designated as trauma centre
• Other surgical consultation as required (max 30 min response)	E	++++				TMH, DGDH have shared on call for vascular, plastics, and orthopedics. Will require devoted single site call if either become provincial resource. ? ability to provide
* Two in-hospital physicians capable of providing advanced airway management and initial resuscitation should be available at all times.						
(c) Protocols in place for recognition of major trauma patient and communication to TTC.	-E	++++	++	++	+++	
(d) 24-hour hospital coverage by the following surgical services involved in resuscitation (response time 30 mins):						
• Neurosurgery	E	++++		++++		Service only located at SJRH, TMH
• Paediatric Surgery*	E					No devoted paed surgeon at any site- service provided by adult surgeons
• Urology	E	++++	++++	++++	++++	
• Vascular Surgery	E	++++	++	++	++	
• Plastic Surgery	E	++++	++	++	+	Shared service in Moncton. Will require devoted service at designated site to meet criteria
• Thoracic Surgery	E	++++	+	+	+	Seamless coverage in SJRH only
• Orthopaedic Surgery	E	++++	++	++	++++	Shared service in Moncton. Will require full time commitment at trauma centre
• Cardiac Surgery	D	++++				SJRH sole provincial resource
• Gynecology & Obstetrics	D	++++	++++	++++	++++	
• Ophthalmology	D	++++	++++	++++	++++	
• Otolaryngology	D	++++	++++	++++	++	
• Oral Surgery	D	?	?	?	?	
* Must be available on call with a 30 min maximum response time. Pediatrics may be provided at a dedicated alternate site.						
Services indicated as desirable (D) and paediatric surgery may be provided at a dedicated alternate site or with consultation site within 30 mins.						

Existing Criteria	Req't	SJRH	DGDH	TMH	DECRH	Comments
(e) Non-Surgical Institution Specialties, 24-hour coverage						
• Radiology*	E	++++	++++	++++	++++	Supported by PACS, teleradiology
• Paediatrics*	E	++++	++++	++++	++++	
• Anaesthesia*	E	++++	++++	++	++++	?commitment of TMH to trauma care
• Critical Care*	E	++++	++++	++++	++++	
• Cardiology	E	++++	+++	+++	++	SJRH has provincial cardiac resource
• Respiriology	E	++++	++++	+		
• Gastroenterology	E	++++	++	++	++	Guaranteed single site at SJRH only
• Hematology	E	?	?	?	?	
• Infectious Diseases	E	?	?	?	?	
• Internal Medicine	E	++++	++++	++++	++++	
• Nephrology	E	++++	++++			
• Pathology	E	?	?	?	?	
• Psychiatry	E	?	?	?	?	Service available. Have not determined commitment to support trauma care.
* Must be available on call with a 30 min maximum response time. Pediatrics may be provided at a dedicated alternate site.						
SPECIALTY SERVICES WITHIN THE HOSPITAL:						
Emergency Department:						
(a) Personnel						
• designated chief, certified emergency physician	E [‡]	++++	?	++++	++++	? certification of chief at DGDH
• 24 hr coverage by an emergency physician with appropriate training	E	++++	++++	++++	++++	All departments have 24X7 coverage, but not all ERP's are certified at any site
• medical personnel in hospital	E	++++	++++	++++	++++	
• dedicated nursing personnel in hospital	E	++++	++++	++++	++++	
• surgical residents or equivalent must be in-house 24 hrs/day	E	++++				No guaranteed coverage by residents at any site. SJRH has guaranteed staff surgeon coverage for trauma
• development and use of trauma practice guidelines	E	++++	++	++	+++	Only SJRH has trauma team at this time
(b) Equipment required in the Emergency Department	All necessary equipment available at all sites except FAST at SJRH only					
• advanced airway management equipment (adults & children)	E					
• multi-channel monitoring BP, pulse O2 sat, temp	E					
• electrocardiograph monitor and defibrillator	E					
• dedicated portable or in-place X-ray equipment	E					

Existing Criteria	Req't	SJRH	DGDH	TMH	DECRH	Comments
• dedicated communication equipment to ambulance services	E					
• chest tube & pericardiocentesis equipment	E					
• fracture stabilization & traction equipment	E					
• resuscitation room	E					
• rapid infusion warmer	E					
• surgical equipment, i.e., abdominal lavage, wound closure, cricothyroidotomy, central venous & arterial line insertion, pericardiocentesis	E					
• FAST (bedside ultrasound by emergency physicians)	D	++++				
‡ or CCFPEM						
Intensive Care Unit:						
1) Personnel	Note: Anticipating new ICUs at TMH					
• Medical Director of Intensive Care	E	++++	++++	++++	++++	
• 24 hr in-hospital medical attendance	E	++++	?	?	?	
• dedicated ICU nursing	E	++++	++++	++++	++++	
• treatment conjoint with attending surgeons	E	++++	++	++	++	Established pattern of care for trauma patients at SJRH ICU
• development and use of trauma practice guidelines	E	++++	++	++	++	"ad hoc" in institutions other than SJRH
2) Available Equipment/ Protocols:	All available in all sites except intracranial pressure monitors only in TMH and SJRH, hemodialysis in SJRH, DGDH only					
• EKG monitoring & recording	E					
• cardiac resuscitation cart	E					
• cardiac pacemaker equipment	E					
• cardiac defibrillator	E					
• airway control equipment	E					
• mechanical ventilators & monitors	E					
• O ² supply & saturation monitor	E					
• arterial catheters, peripheral & centre	E					
• priority lab analysis, blood gas, pH	E					
• hemo-analysis, BUN, Electrolytes, etc.	E					
• multi-channel monitoring	E					

Existing Criteria	Req't	SJRH	DGDH	TMH	DECRH	Comments
equipment						
• pulmonary artery catheters	E					
• bronchoscope & gastroscope	E					
• chest tube, cricothyroidotomy, cut-down trays	E					
• intracranial pressure equipment & monitor	E	++++		++++		
• portable light source	E					
• weighing equipment	E					
• special care bed; i.e., isolation	E					
• special ICU beds & stretchers	E					
• hemodialysis program in hospital or	E	++++	++++			
• protocols for transfer of hemodialysis patients	E					
• immediate access to laboratory equipment & reports	E					
• protocols for transfer of trauma patient	E					
Burn Unit: (or transfer agreement with burn unit)						
• with Medical Director	E	+++				SJRH only facility with burn unit , but no medical director
• protocols for transport & transfer of burn patients	E	++++	++++	++++	++++	
Cardiac Surgery:						
• protocols for transport & transfer of cardiac patient	D	++++	++++	++++	++++	SJRH is provincial cardiac centre
Radiology:						
• immediate plain film radiology	E	++++	++++	++++	++++	PACS and/or teleradiology
• 30 minute attending staff call-in	E	++++	++++	++++	++++	
• angiography available 24/7 with timely response	E	++++	++++	?	?	
• ultrasonography (excluding FAST)		++++	++	++	++	Limited out of hours service except at SJRH
• CT scanning available 24/7	E	++++	++++	++++	++++	
• access to magnetic resonance imaging & digital subtraction angiography	D	++++	?	++++	?	New imaging capacity to be installed at TMH
Rehabilitation: Stan Cassidy Centre is provincial resource						
• assigned medical director of rehabilitation program	E					See above
• protocols for referral for rehabilitation	E	++++	++	++	++++	
• timely access to rehabilitation services for trauma patients	E					Dependent on Cassidy Centre resources
Operating Room:						
• 24 hour operating room	E	++++				SJRH has protocol in place

Existing Criteria	Req't	SJRH	DGDH	TMH	DECRH	Comments
availability for immediate surgery with the necessary equipment and personnel						for immediate trauma access. ? support of surgeons, anaesthetists at TMH
• demonstrated formalized prioritization system for trauma cases	E	++++			++	See above
Laboratory System:						
• available 24 hours per day X	E	++++	++++	++++	++++	
• blood bank system capable of providing unmatched blood with 10 minutes	E	++++	++++	++++	++++	
• massive transfusion protocol	E	++++	++++	++++	++++	
Quality Improvement Programs & Trauma Registry:						
• evidence of continuous multi-professional quality improvement process	E	++++				SJRH only
• trauma registry participation with recognized severity indices	E	++++				SJRH only
• review of all deaths, yearly report	E	++++				SJRH only
• review of morbidity, yearly report	E	++++				SJRH only
• regular multidisciplinary trauma rounds	E	++++				SJRH only
• annual trauma conferences	E					
Communication System for External Support:						
• a system for physician to physician communication & transport for referred trauma cases	E	++++	++	++	++	Only SJRH has designated contact person for trauma 24X7
• participation in pre-hospital care as appropriate to local circumstances	E	++++				RHA2 has integrated Ambulance Services into trauma care system
• 24 hour system to give advice/backup to primary and district trauma centres	E	++++				Only from SJRH
Public Education:						
• programs to assist in public education in injury prevention	E	++				Only SJRH, needs enhanced resources
Trauma Research Programs:						
	E	++				Only SJRH, needs enhanced resources
Continuing Education Programs for:						
• doctors in the hospital	E	+++				Only SJRH
• nurses	E	++				Only SJRH
• allied health personnel	E	++				Only SJRH
• medical education within the community/region	E	++				Only SJRH
• residency medical education as appropriate to university affiliation	E					No facility has constant resident coverage/support

Recommendations:

It is recommended that:

- (28) The Province of New Brunswick should designate one hospital as the provincial trauma resource.**
- (29) The designated trauma centre should appoint a Medical Director of the Trauma Program who should be funded for the administrative responsibilities arising from the position.**
- (30) Resuscitation of trauma patients should be enhanced by a more formal trauma team approach with dedicated Trauma Team Leaders who receive funding for this role.**
- (31) The trauma centre should have a greater role with the pre-hospital care system on a provincial basis, including the development of triage and by-pass protocols. There should be better and more formalized communication between pre-hospital care providers and the team responsible for the assessment and resuscitation of the patient (re: pre-notification of patient arrival), facilitated by the ambulance dispatch centre.**
- (32) There should be a clear definition of what constitutes a major trauma case and a formal process to mobilize the trauma team (including Trauma Team Leader) once the decision is made that the patient meets this definition.**
- (33) The Trauma Centre should hire a full time data assistant/analyst. This will allow the centre to assume a provincial role in collecting data on ISS > 12 patients across the province.**
- (34) The designated trauma centre should assume an active role in the province wide inter-hospital transfer of trauma patients, including involvement with the “one number to call system”.**
- (35) Once there is only one designated tertiary trauma centre it is important that all referred patients are accepted and not refused because of an inadequate number of critical care beds.**
- (36) The designated tertiary centre should ensure sufficient nursing resources in the Emergency**

Department to provide care to a higher volume of patients (including times when multiple trauma patients will require simultaneous care).

7.5 *Elements and Operating Characteristics of A Provincial Trauma System*

A provincial trauma system should also include a number of designated secondary trauma centres.

If a patient is to be transferred from the receiving hospital to another centre, the Trauma Team Leader will give specific direction to the Emergency Physician at the initiating hospital indicating which further treatments are to be administered, a plan for transfer, and answer any questions which emergency physician has regarding further management.

The incident characteristics which should lead to preferential transfer to include any of the following:

- High-speed motor vehicle collision
- Fall from a significant height [15 feet or more]
- Patient ejected from vehicle
- Any incident in which there have been fatalities
- Any penetrating trauma to the head, neck or torso
- Explosions and or burns associated with major trauma
- Inhalation injury or high-voltage electrical injury
- Pedestrians or cyclists struck by motor vehicles where speed > 15 km/hr.
- Vehicle rollovers with injured patient(s)
- Vehicle struck by fixed object (e.g. tree, rock or large animal)
- Paramedic judgement, based on mechanism of injury

The physiologic characteristics which would trigger transfer to a centre capable of providing primary and/or secondary trauma care (or SJRH if less than 30 minutes away) include:

- Respiratory rate <10 or >24
- Blood pressure less than 80, heart rate less than 50 or greater than 120 (in adults)
- Evidence of shock in children
- Children <16 with Paediatric Glasgow score ≤ 8

- Airways which require support in order to remain stable
- Glasgow coma scale less than ten, or, any two of altered level of consciousness, changes in vital signs as above
- Burns greater than 25% of the body surface area in adults, or 15% in children
- Pregnant patients greater than 20 weeks of gestation
- Traumatic amputations above wrist or ankle
- Spinal cord injury with para or quadriplegia

The disposition of trauma patients should occur as follows:

- Any patient who meets the physiologic or incident characteristics outlined above be transported immediately to the designated tertiary centre if he or she is within 30 minutes of transit time of that facility
- Any patient who meets the physiologic or incident characteristics outlined above and is not within 30 minutes of the designated provincial trauma centre should be taken to the closest available hospital, assuming that hospital has available on site, or within 15 minutes, an Emergency Physician, Emergency Department nursing staff, a Laboratory and a Diagnostic Imaging technician, as well as a blood bank with a minimum of four units of O-negative blood. All such patients should be discussed with the Trauma Team Leader as soon as possible if treated in a primary care hospital.
- Any patient who meets the above physiologic or incident characteristics and is equidistant from a primary care or secondary care hospital, should be preferentially transferred to the secondary care
- Any patient suffering from an immediate life-threatening injury [e.g., airway compromise, shock, cardiac arrest] must be transferred to the nearest available staffed hospital. Once resuscitated and stabilized, arrangements for transfer to the tertiary trauma hospital should be made.

Recommendations:

It is recommended that:

- (37) The important role that all hospitals in the province play in trauma care should be defined (including trauma resuscitation, admission of moderately injured patients, provision of tertiary trauma care).**
- (38) If not designated as the provincial trauma centre hospitals in the following cities should be considered for designation as secondary trauma centres¹: Edmundston, Bathurst, Miramichi, Campbellton, Fredericton, Saint John and Moncton.**
- (39) Hospitals that accept the designation as secondary trauma centres should ensure the on site availability of an Emergency Physician, sufficient Emergency Department nursing staff and Laboratory and Diagnostic Imaging personnel for the acute management of trauma victims. The blood bank must have a minimum of four units of O-negative blood at all times.**
- (40) The secondary trauma centre hospitals must establish a call schedule which ensures the availability of an on-call Anaesthetist, General Surgeon and Orthopaedic Surgeon on all nights when the hospital is on "trauma receiving call".**
- (41) The secondary trauma centre hospitals may opt not to be "on call" on any given night, but must cooperate to ensure that at least one of the Saint John Regional Hospital, Moncton City or Dr. Georges L. Dumont Hospitals and one of the centres in Campbellton, Miramichi or Bathurst are designated as being on call on any given night.**
- (42) Edmundston should be supported in an effort to recruit a sufficient number of Orthopaedic Surgeons to provide seamless coverage.**
- (43) The hospitals must ensure that the trauma centre and the call centre have accurate, up-to-date information on the hospitals able to receive**

¹ These hospitals should not anticipate an increase in the volume or acuity of patients treated, but rather a decrease. Thus, no incremental funding should be expected or sought as a consequence of volunteering to accept this designation.

secondary level trauma victims and the names and contact details for the on-call general surgeon, should serve as the "team leader" for incoming trauma victims.

8.0 Trauma Teams

Composition of the trauma team will vary between the provincial trauma centre and secondary centres

The composition of the trauma team will vary between the provincial trauma centre and secondary centres. In the provincial trauma centre, the team should be composed of a Trauma Team Leader (who may possess a range of backgrounds as stated elsewhere in this report), General Surgeon, Orthopaedic Surgeon, Neurosurgeon, Anaesthetist, 2 RN's, and a Respiratory Therapist. All team members need **not** be present for all cases – the TTL will determine which members are required on a case by case basis. Other resources, such as Diagnostic Imaging and Laboratory personnel, will be involved in the care, on an as-needed basis.

In secondary centres, the team should be composed of an Emergency Physician, General Surgeon, Orthopaedic Surgeon, and Anaesthetist. Not all team members need be present for all cases but must be readily available (<15 minutes) should the TTL require their assistance. Again, nursing, Respiratory Therapy, Diagnostic Imaging and Laboratory personnel will also be involved on an as needed basis.

In establishing the frequency with which members of the trauma team should be on call, it is suggested that Trauma Team Leaders working in the designated tertiary resource not take call more frequently than one night in three. This responsibility may need to be adjusted depending on the number of trauma patients consulted upon, and the actual number of patients with Injury Severity Scores greater 15 transferred for care to the provincial trauma centre.

The frequency of call experienced by General Surgeons, Anaesthetists and Orthopaedic Surgeons can and should be determined by the on-call template used in the hospital. While it is accepted that not all General Surgeons, Orthopaedic Surgeons, or Anaesthetists credentialled at the designated trauma centre will choose to undertake responsibility for trauma care, a minimum of three such individuals should be designated for participation in trauma care by each of these departments or divisions.

The single designated trauma centre must make a commitment to the provision of care in both official languages

The consultants were cognizant of the specific mandate of ensuring that the trauma system was equally available to, and capable of the provision, of service to all residents of the province, regardless of language of first choice. As evidenced by the data, there is only sufficient volume to merit the designation of one tertiary centre of trauma care for the

province. When asked specifically, all interviewees responded that if only one centre were to be designated, the primary concern MUST be one of the quality of care, and not linguistic preference. Having said that, we believe that the designated centre must make a commitment to the provision of care in both official languages by attempting to recruit bilingual staff, providing language training to unilingual staff, and ensuring the immediate availability of translators.

Recommendations:

It is recommended that:

- (44) Membership in the trauma team at all centres should be defined and publicized.**
- (45) The frequency of on call for trauma team members should approximate one in three.**
- (46) Care givers on the trauma team at the designated provincial trauma centre should either be bilingual or be provided with language training.**

9.0 Transfer to Definitive Care Centre

9.1 Present State

The majority of patient transfers in New Brunswick are effected by the Land Ambulance Services. In 2004, about 30,000 inter-facility transfers were performed to an acute care hospital. There are no data available on numbers of patients with multi-system trauma, types of procedures performed en route, reasons for transfer (e.g. bed availability, level of care, surgical consultation) or outcomes.

The air ambulance system consists of one private provider (New Brunswick Air Care) under contract with the Department of Health. It is a publicly funded service. The Medical Director is under contract with the Department of Health. The airplane, pilot and support facilities are rented by the Department from the private company. Situated in Moncton and dispatched by the MTCC, it consists of one King Air 100 fixed wing aircraft fully staffed 24/7 by a combination of flight paramedics with ACP skills, flight nurses and respiratory therapists (RTs). In 2004-2005 this service performed about 500 calls, only 9 of which were classified as trauma. Air transfers are either requested by the sending facility through MTCC, or suggested by MTCC if: a) land transport time is greater than 3 hours, and b) the aircraft is available (not already in use and not grounded due to weather conditions or mechanical problems).

While the aircraft availability has been optimized (mechanical problems are rare and fixed wing aircraft are grounded less frequently than rotor wing aircraft) transfer times are generally long. The total transfer time includes preparation for take-off after call acceptance (usually 10-15 minutes), flight time to the closest landing airstrip, travel in a land ambulance to the sending facility, patient assessment, transfer to transport stretcher and changeover to air ambulance medical equipment, land ambulance travel back to the airstrip, flight to an airport or airstrip close to the receiving hospital and travel by land ambulance to the receiving hospital itself. For example, it takes about 90 minutes to service a call from Bathurst. Therefore, most calls are completed 2-3 hours after the request is initiated. Patients are transferred to receiving hospitals in the south of the province, but also occasionally transferred to Quebec City (from Edmundston and Campbellton) and Halifax.

The skill sets and levels of intervention in the air ambulance system are very advanced. Paramedics, nurses and RTs have special training in flight medicine and can initiate and/or manage intravenous infusions, ventilators, chest tubes and other critical procedures. While this optimizes patient care in flight, the time it takes to complete a transfer renders the fixed wing aircraft of limited use in the care of acute trauma although it is clearly superior to land transfer over long distances.

Due to the high-level nature of medical care provided, the degree of medical control and oversight is of necessity at a much higher level than that of the land system. A single Medical Director serves this role and provides close monitoring of air ambulance calls and staff. A Medical Director provides policy, procedures and guidelines for the Air Ambulance and the MTCC. Medical control physicians provide real time guidance to both aero medical crews and MTCC in relation to air ambulance calls..

9.2 *Inter-hospital Transfer of Trauma Patient Requirements*

Ideally, the need for an inter-hospital transport system for trauma patients will be minimized by an initial assessment and immediate transport of patients for whom 911 response is initiated to the most appropriate level of care. Secondary transfer of patients from a basic to a higher level of care after initial stabilization, or for the management of unanticipated injuries discovered by the initial treating facility which require definitive care at a higher level trauma facility may be accomplished by a combination of land and air resources configured as follows:

9.2.1 *Land Ambulance*

- Assesses patient(s) according to trauma triage guidelines and provides initial stabilization according to skill set
- Transports patient(s) to closest appropriate facility (defined as follows):
 - Closest Emergency Department if patient does not fulfill criteria for trauma triage and bypass, or tertiary trauma centre is not within 30 minutes or patient requires urgent life saving interventions outside the paramedic's scope of practice
 - Tertiary trauma centre if patient fulfills physiologic or incident criteria (i.e., major trauma) and this facility is within 30 minutes

- Responds to inter-facility transfers of less than approximately one hour driving time and those that cannot be performed by air ambulance (will likely require medical/nurse/RT escort).

9.2.2 *Air Ambulance – Rotor Wing (Helicopter) (see below)*

- Responds to “short haul” (within approximately 200 km flying distance) inter-facility transfers through MTCC
- May respond to 911 calls:
 - If travel time from the helicopter to the scene is greater than time to full extrication of the patient, and a land ambulance is available, the helicopter will be directed to the primary/secondary centre closest to the patient’s location for rendezvous, in order to minimize transfer time to the tertiary trauma centre
 - If the patient meets physiologic or incident characteristics for a secondary or tertiary centre, and
 - Trauma centre is more than 30 minutes and less than 200 km from the scene by land

9.2.3 *Air Ambulance – Fixed Wing*

- Responds to “long haul” (>200 km) inter-facility requests or short haul inter-facility requests when rotor wing aircraft is not available and land driving time is greater than 2 hours
- May participate in the response to 911 calls by initiating travel to airport or landing strip near closest primary or secondary centre by land ambulance to minimize total transfer time if:
 - Land paramedics identify a patient(s) that fulfils trauma triage requirements to a regional or lead trauma facility and land transport time is greater than 30 minutes, and rotor wing aircraft is not available.

This model does not address cost or utilization issues. It assumes unlimited provision of air resources as needed. In any air ambulance system transport of trauma patients by fixed or rotor wing aircraft is only a component of the prehospital inter-facility transport system and the provision of these services for trauma patients must be provided in that context.

9.3 *Helicopter Transport*

Helicopter transport of trauma patients (both inter-facility and scene response) should be considered as a key component of the service.

As described above, in an ideal integrated trauma system, a rotor wing aircraft, staffed by advanced care level paramedics plays a role in the inter-facility transfer of short haul patients (app. 200km) from community to regional or lead trauma facilities, and less commonly in response to 911 calls where trauma triage policies suggest transport directly to a regional or lead trauma centre and land transport time is greater than 30 minutes. If there is no access to the patient at the scene by the aircraft, the patient should be transported by land ambulance to closest Emergency Department or a helicopter landing pad for rendezvous.

A comprehensive rotor wing ambulance service is expensive and, given weather patterns in New Brunswick and the expected mechanical issues that helicopter maintenance demands, may be unavailable up to 25% of the time. Initial training, skills maintenance and continuing educational requirements of Advanced or Critical Care flight paramedics are expensive and resource intensive (for example, clinical training in hospital Operating Rooms, Emergency Departments, Obstetrical suites and Intensive Care Units is standard). In addition, a system of landing areas/helipads must be built and maintained throughout the province. On the other hand, the availability of both fixed and rotor aircraft wing is a substantive component of a comprehensive and integrated regional health system in a province with geographical challenges such as New Brunswick. With limited regional facilities in the north and driving times of 3-6 hours to definitive care, air ambulance transfers are essential for Cardiac, Perinatal, Oncological and Paediatric as well as trauma patients. Further, an intra-provincial air ambulance system which is integrated with the land ambulance service prevents depletion of resources at the sending facility, by maintaining the land ambulance in the community and not requiring sending facility staff (nurses, RTs and physicians), due to high paramedic skill level and strong medical control.

While the cost of acquisition and maintenance of a helicopter is high, in order to mitigate costs consideration of a single shared service provider of land and air ambulance services for New Brunswick, Nova Scotia and Prince Edward Island, is an opportunity to explore. Currently a Sikorsky 76 air ambulance

is deployed in Nova Scotia (there is no dedicated fixed wing aircraft) and no air ambulance service exists in PEI. The sharing of helicopters and fixed wing dedicated resources may prove to be both an effective and cost efficient model to move patients of all types, including Critical Care, Perinatal and Neonatal, Neurosurgical, Cardiac and trauma, to definitive care centres, both intra-and, in selected circumstances, inter-provincially.

The ideal venue to locate the helicopter is dictated by a variety of factors. In order to minimize the interval from notification to pick up, it should be as close as possible to geographic regions which will need to use an air based (as opposed to land based) service. However, a number of other criteria and factors must also be considered. They include:

- Easy access to trained mechanics and storage facilities (i.e., an airport)
- Proximity to a centre of paramedic expertise
- The existing infrastructure for the fixed wing aircraft in Moncton
- The existing dispatch centre in Moncton
- A location which will maximize opportunities to support other provinces, should the province wish to do so
- A location in which flight crews may be reassigned to other prehospital activities when weather prohibits flying
- Ensuring that as many centres as possible are within a radius of app. 200 Km. of the helicopter site

Bearing the above considerations in mind, we recommend that the helicopter base be established in Moncton. Readers are advised that this does not mitigate against physically locating the helicopter in another venue on any or all days, but speaks only to the “home base”. The consultants believe that locating the helicopter in Fredericton would be an appropriate alternative, particularly if an Atlantic Provinces system, with shared coverage provided by Nova Scotia, were developed.

Should the province not acquire a rotor wing aircraft, the inter-facility transport capability of the fixed wing aircraft system should be expanded and integrated with the 911 system. For example, in circumstances where a patient meeting trauma triage requirements is identified in a remote area, air ambulance deployment may be initiated under some conditions identified by land paramedics at the scene before assessment at the closest Emergency Department. This will

allow air ambulance staff to meet the patient earlier at the sending facility, thereby realizing a time savings of up to 60 minutes. We suggest that a dedicated land transfer vehicle, staffed by advanced or critical care paramedics, and deployed in the southern regions where fixed wing transfers are not feasible will further enhance the system.

9.4 One Number to Call

Patient care must be as seamless as possible

In any integrated system, in this case trauma, patient care must be as seamless as possible. If a patient requires transfer to a secondary or tertiary trauma centre for definitive care, the sending physician must be able to effect the transfer in a seamless manner.

Therefore, one access number should be available to allow the sending physician to speak directly to the receiving physician (Trauma Team Leader in the tertiary trauma centre or designated receiving physician in a secondary centre). This results in acceptance of the patient in transfer, advice to the sending physician regarding further resuscitative or diagnostic measures, a link to the dispatch centre for deployment of a land or air ambulance, and a further link to an EMS medical control physician (Medical Director or a delegate on-call physician) if necessary so the transport staff are alerted and prepared to treat the patient quickly upon arrival.

The province has an operational highly functioning one number to call infrastructure currently. The service handles in excess of 300 calls per day or approximately 120,000 calls per year. Incoming calls are routed to a variety of “unique” services, including rabies advice, poison control services and primary care/telehealth. The service operates in both official languages, and operates on a 24/7 basis.

There is a quality assurance mechanism which ensures that clinical practice guidelines are followed and a rigorous complaint audit system.

Initial responders are, in general, RNs with a demonstrated capacity to triage calls to the appropriate services, with the time of response being very short.

We suggest that the one number to call system for the support of the trauma system be “piggy-backed” onto the existing system. A provincial 1-800 number should be publicized across all hospitals in the province. The RN who receives the call should ascertain the requisite information using a protocol developed by the provincial trauma centre. The information

must include the nature of the trauma episode, demographics of the patient(s), a summary of the pertinent history and physical, and details of any treatments or resuscitation thus far conducted. The Trauma Team Leader will then be contacted, and take responsibility for contacting the initiating physician within 10 minutes of the receipt of the initial call. The TTL will review the details with the sending physician, make requests as appropriate for further investigation or treatment and commence arrangements as necessary for transfer. The RN will notify the ambulance transfer system, and the TTL will initiate planning in the trauma centre for the incoming patient. When appropriate, the RN, after receiving direction from the TTL, may arrange transfer to a centre other than the trauma centre, and, after appropriate discussion and information sharing with the receiving centre, notify the sending physician and the transfer system of the plan which has been effected.

Should it be evident that the patient will require services not available in the province (e.g. a critically injured child) and that primary transfer to an extra-provincial resource (e.g. IWK) is the safest and most appropriate option, the TTL will take responsibility for contacting that centre and initiating transfer arrangements, while also providing clinical direction to the physician in the sending centre.

As is the case with the current services, there must be a quality assurance system in place to monitor parameters such as response time, the quality of information gleaned and other measures to ensure optimization of the system.

Recommendations:

It is recommended that:

- (47) The province should develop a cohort of paramedics with ACP and CCP skills be developed to serve in an inter-facility transport service capacity for trauma patients. Skill sets must include: endotracheal intubation and advanced airway management of intubated and ventilated patients, chest tubes, intravenous therapy and drug infusions. These paramedics may also be deployed to selected 911 trauma calls.**
- (48) The province should fund comprehensive medical authority, leadership, and oversight for the trauma response system and the authority should be**

integrated with the 911 system and air ambulance medical authority.

- (49) The province should acquire and staff a helicopter for use in trauma and other critical care transfers.**
- (50) If a rotor wing aircraft is not acquired the province should implement an expanded inter-facility transfer system consisting of early fixed wing notification and response in the north, and a land transfer paramedic system in the south.**
- (51) The province should explore opportunities for a “shared” air ambulance service with Prince Edward Island, Nova Scotia and other regional partners.**
- (52) The province should develop a “one number to call” system to ensure an integrated and seamless inter-facility transfer response for trauma and other critically ill patients.**

10.0 Trauma Centre Job Descriptions

In order for a trauma centre to meet its mandate, it will be necessary to assign individuals to a variety of roles. These include, but are not limited to, Trauma Team Leaders, Medical Director, Trauma Coordinator, Research Coordinator and Data Analyst.

Each of these roles will, by definition, have job descriptions attached to them. Each individual subserving a role should have an explicit understanding of the job description, including, but not limited to, the expectations of the role, the supports which will be provided to the individual in order to assist him or her, and a stipend which will be paid.

The compensation should be discussed with the individual and, in the opinion of the consultants, should consist of a base compensation, with incremental pay available for exceeding performance expectations. The performance appraisals may be conducted either by the Chief of Staff of the hospital, the Vice President of Medical Affairs, or, in the case of Trauma Team Leaders, Research Coordinators, and Program Directors, by the hospital Trauma Program Director.

10.1 Medical Director

The Medical Director, in collaboration with the Trauma Coordinator, should provide leadership to the implementation of the Trauma Centre's strategic plan, the development and implementation of the trauma registry, and provide a guiding philosophy, policies, and standards for the clinical components of the trauma centre. The Medical Director should also provide guidance for activities associated with research and education.

He or she should have a fundamental understanding of how a comprehensive trauma program integrates with the emergency health services system, including the range of activities from prevention to long-term care. He or she should be an advocate provincially, regionally, and locally for enhanced trauma services for the population served.

The Medical Director should be a consultant in trauma care. He or she should also be the individual with whom discussions with other hospital departments (e.g., Surgery, Critical Care, Emergency Medicine) that pertain to the management of trauma are conducted.

Criteria for appointment to the position must include the following:

- A physician in good standing in the province of New Brunswick
- Residency or postgraduate training specific to trauma and trauma care
- Current active involvement in the provision of trauma services
- Previous experience in the development of a comprehensive, patient and community focused trauma program
- A thorough understanding of the medical system in the province of New Brunswick
- A level of administrative skills and training sufficient for the role
- A willingness to undergo further administrative and management training to further enhance the role
- A certified ATLS provider
- Exceptional leadership and interpersonal skills
- Ability to communicate effectively in both official languages
- A thorough understanding of the emergency services system

Expected achievements of this individual will include:

- The development and maintenance of communication with other related programs, hospitals, and clinics on a province wide basis
- Continuous high quality communication amongst all personnel involved in delivery of trauma care in the trauma centre, as well as province wide
- The provision of appropriate leadership to all centres involved in the provision of trauma care
- Advocacy to assure that minimum standards for education, equipment, and communication are available at all centres providing trauma care
- Defining the number of Trauma Team Leaders necessary to support the program, ensuring their recruitment, mentorship, performance appraisal, and ongoing professional development

- The provision of support for the design and implementation of an effective quality assurance program to monitor the performance of the trauma system
- Regularly visiting centres involved in the provision of trauma care to ensure their ongoing capacity to provide high-quality care
- Provide medical direction to the trauma Registry
- Participate in professional development opportunities both for those involved at the trauma centre, as well as those in outlying centres across the province
- Assist in the development of educational seminars for interested parties
- Create and foster linkages with other designated trauma centres, particularly those in Atlantic Canada, but Canada wide
- Serve as a resource to support community organizations involved in the development and/or promotion of injury prevention programs
- Assist in the evaluation of the trauma program
- Pursue and/or recruit, mentor, and foster trauma related research
- Serve on any committees where his or her presence is requested

10.1.1 Term of Appointment

It is recommended that this individual be appointed for initial term of three to five years, with one [for a five-year term] or two [for a three-year term] renewals.

10.1.2 Compensation

This position should be funded in a range from \$50-\$75000 per year, assuming that the individual devotes 1-1.5 days per week to the role.

10.2 Trauma Team Leader (in the designated trauma centre)

10.2.1 Job description

The Trauma Team Leader will be responsible for the evaluation and resuscitation of trauma patients in response to consultation requests either from physicians in outlying centres, or the emergency physician working in the hospital in which the trauma program is located.

10.2.2 Responsibilities:

- To be available for an on-site response within 20 minutes of notification (see Trauma Association of Canada guidelines)
- To be capable of performing and teaching trainees all resuscitative and investigative procedures pertaining to the management of trauma patients
- Notify the operating room staff that a major trauma is present in the Emergency Department
- Ensure referral to the consultant who will assume the most responsible physician role for the patient
- Notification of all surgical specialties and subspecialties of the patient's clinical condition in the Emergency Department
- Dictate a patient report outlining the care received in the Emergency Department of the receiving Hospital and ensure that the referring physician receives a copy
- Liaise with the patient's family
- Ensure completion of the Trauma Team Leader patient record as well as any other patient records
- Ensure appropriate monitoring and supervision of trauma patients at times at which they leave the Emergency Department [e.g. for diagnostic imaging procedures]
- Arrange appropriate return to the initiating centre should it evolve that the patient does not require admission to a trauma centre
- Participate in educational activities that pertain to the travel program
- Be the first responder to calls which are received from outside centres, and provide appropriate direction to emergency physicians in those centres
- Liaise with secondary centres to ensure the safe and timely transfer of patients to those centres of patients who will not require the resources of the provincial trauma centre
- Serve as an educational resource both within the trauma centre and regionally and provincially

10.2.3 Criteria

Those seeking designation as a Trauma Team Leader must meet the following criteria:

- Certification as ATLS provider
- Postgraduate training in Anaesthesia, a Surgical specialty, Critical Care, or Emergency Medicine
- An interest in the provision of trauma care
- Proficiency, or a commitment to become proficient, in both official languages
- A willingness to supervise junior trainees
- A willingness to participate in research studies pertaining to trauma care

10.2.4 Term of appointment

Appointment as a Trauma Team Leader will be on an annual basis, to be reviewed by the Medical Director of the trauma program

10.2.5 Remuneration

Trauma Team Leaders are assumed to work a 24 hour on-call rotation with an on-call stipend to be negotiated between the New Brunswick Medical Society and the Department of Health and Wellness. The Trauma Team Leader will also be eligible to bill unrestricted fee for service for trauma patients.

10.3 Program Administrative Director

10.3.1 Job Description

In conjunction with the Medical Director of the trauma program. The Director will:

- Develop a strategic plan and an annual operating plan
- Assist in the development of program goals and objectives
- Develop and ensure implementation of the quality improvement and effectiveness plans
- Assist in the establishment of processes for the delivery of the quality improvement and effectiveness plans
- Assist in the development of program policies and procedures
- Arrange with support services in the host hospital the necessary support services to ensure a high quality trauma program

- Determine, where appropriate, the specifications for the resources required, including augmented capital equipment and human resources report
- Establish both extra-program and intra-program communication mechanisms.
- Establish and monitor the budget and budget performance for the trauma program
- Promote a milieu in which communication both within the trauma centre and with outlying centres occurs frequently and with high quality
- Assist with the measurement and evaluation of program effectiveness by monitoring patient outcomes and supporting the quality assurance program
- Upon request, report to various administrative committees, either locally, regionally, or provincially on the performance of the trauma program
- Ensure that professional practice standards are maintained
- Liaise with other departments and divisions within the trauma centre as required

10.3.2 Criteria

The Program Administrative Director must have the following skills and educational preparation:

- A master's degree in Health Administration or a health discipline
- A minimum of three years of administrative and management experience
- A demonstrated ability to deliver transdisciplinary health service programs
- Commitment to a patient focused, action oriented, high-quality health care environment
- Skills in visioning, coaching, mentoring, leading, and facilitation
- Skills in team building, negotiation, and conflict resolution
- Demonstrated ability in planning, budgeting, information analysis and reporting
- Well-developed communication and interpersonal skills in both official languages
- A willingness and ability to travel province wide

10.3.3 Term of Appointment

Appointments to the Program Administrative Director position will be made in consultation with the CEO, Medical Director of the Trauma Program and a provincial representative.

The term of appointment is for one year and subject to an annual performance appraisal to be conducted by the CEO of the hospital, and the Vice President responsible for the Trauma Program.

10.3.4 Compensation

We suggest that this role would ideally be served by an individual currently serving as the Program Director of any of Emergency Medicine, Critical Care or Surgery, as the responsibilities fit well with any of these mandates. The individual should be designated based on their skills, interest and training. Compensation should not be incremental, but factored into the remuneration for their primary role.

10.4 Trauma Coordinator

10.4.1 Job Description

- Take responsibility for the design, implementation and maintenance of all computerized databases, screen designs of layouts, computerized checks and calculations and ensure reports are designed to be user-friendly and regularly distributed to appropriate parties.
- Track each patient or case with a detailed chart review after admission and post discharge, and ensure that appropriate data for clinical evaluation are collected.
- Review any postmortems conducted, and compare the results of postmortem evaluation with original physician documentation, and inpatient treatment.
- May also conduct post discharge interviews, either by mailed questionnaires or telephone follow-up.
- Ensure that copies of discharge summaries are mailed to the referring physician, as well as other interested parties.
- May also serve as a resource to secondary hospitals, and assist them with the development of data collection and analysis tools.
- Will be a resource person to the hospital's medical records department to ensure consistency and accuracy of injury scoring and coding.

- Responsible for designing, preparing, and validating various reports used by hospital committees, the provincial government, or interested parties in the trauma centre to monitor trauma-related activity.

10.4.2 Criteria

Ideally, this individual should come from a nursing background. The ideal candidate should have a master's degree in Epidemiology, Hospital Administration, or a related discipline.

- Computer skills including knowledge of relational databases, spreadsheet applications, and word processing.
- Medical knowledge with an understanding of anatomy and trauma protocols will be necessary.
- An understanding of coding systems used by trauma registries and CIHI.

10.4.3 Term of appointment

The individual's term of appointment and performance evaluation should be conducted in a manner parallel to other middle management employees.

10.4.4 Compensation

Compensation should be commensurate with other middle management employees.

10.5 Trauma Data Assistant

This role may be required with further evolution of the trauma system in the province. At the current time, the consultants believe that most of the tasks to be completed by such an individual could be assigned to the trauma/statistics coordinator. Should such an individual be recruited in the future, the job parameters could be defined as follows:

10.5.1 Job Description

- Ensure that all patients with Injury Severity Score of 12 or higher are identified as trauma patients
- Collect information regarding trauma and burn patients and verify diagnosis via concurrent chart review
- Follow up on trauma patient outcome both as an inpatient and post discharge
- Enter all trauma patient information into a trauma database

- Assist in follow-up evaluation of discharged patients
- Respond to requests from physicians and surgeons for the provision of information from the trauma program database
- Assist in the preparation of reports pertaining to the trauma program

10.5.2 Criteria

- Completion of a community college program including computer skills, medical terminology, and knowledge of basic anatomy
- Mathematical and analytic skills
- Knowledge of various software packages
- Knowledge of ICD 9 international classifications

10.5.3 Term of appointment

This individual should be of an employee, and subject to the same performance appraisal process and renewal of employment terms as other employees.

10.5.4 Compensation

Should be commensurate with other college graduates employed by the organization.

Recommendation:

It is recommended that:

- (53) The selected trauma centre should be given sufficient financial support to hire and remunerate the necessary staff to support the trauma program.**

11.0 Continuing Professional Development

Opportunities for continuous learning in the management of trauma victims will be essential for staff in the trauma system.

An essential component of skill maintenance and acquisition, particularly in primary and secondary centres, is ensuring adequate opportunities for continuous learning in the management of trauma victims. Interviewees consistently revealed that there is difficulty gaining access to such education. There is, for instance, a trauma and critical care skills course for nurses but it is expensive, and often taught distant from the nurses' home community. Physician staff report difficulty in gaining access to ATLS courses, owing to issues of distance, and the lack of frequency with which these courses are taught in French.

In order for continuing professional development to be successful, and to maximize opportunities to guarantee the quality of care which patients the province of New Brunswick receive, a variety of conditions must be met.

The designated trauma centre should accept responsibility for being not only a clinical, but also an educational resource to the province. This may entail, amongst other obligations, allowing physicians, nursing staff, and other interested health professionals including paramedics credentialled at other centres to attend the trauma centre as observers or participants in care in order to improve or renew their skills.

It also includes an obligation to provide direct educational opportunities to providers outside the trauma centre. These opportunities may be delivered by teleconference or videoconference (using existing facilities or installing facilities in those centres which do not have the necessary equipment), but must also include opportunities for on-site education at the provider's home base. Doing so will familiarize the trauma specialists with the individuals with whom they will be conversing regarding the transfer of patients, and will also allow them to become personally familiar with the resource limitations which exist at outlying centres, in order to be more aware of the limitations faced by providers trying to effect transfers.

The trauma centre may also choose to have scheduled comprehensive educational events pertaining to the management of trauma (for instance an annual clinic day) to which providers across the province are invited, for a nominal registration fee.

In addition to the continuing professional development needs of primary care providers, educational events should address specialist (e.g. General Surgery, Orthopaedic Surgery, etc.) needs for new information or skills.

It is recognized that this obligation of the trauma centre will require the devotion of time and energy on the part of providers at that centre, and financial modeling, contained elsewhere in this report, has incorporated this obligation

Recommendation:

It is recommended that:

- (54) The designated trauma centre, as part of its role as the Provincial Tertiary Trauma Centre, must take a leadership role in the development of a province wide Continuing Professional Development program in support of the provincial trauma system.**

12.0 Resource Implications

The recommendations of this report will have significant resource implications for the Province and for the province's hospitals.

If accepted, a number of the recommendations made throughout this report will have resource implications. Part of the mandate of the project was to identify and quantify the resources required to support a trauma centre, including the availability of sophisticated diagnostic imaging, specialized nursing staff, and appropriately trained allied health professionals. The costs associated with the acquisition, maintenance, and ongoing operation of these resources were also to be identified, including appropriate levels of remuneration for medical staff and others who take on administrative or leadership positions.

We have approached this mandate by quantifying the incremental resources associated with the recommendations required to support a trauma centre. Exhibit 12-1 provides a summary of these estimated incremental resources associated with the relevant recommendations organized by the corresponding Trauma System component as detailed in section 3 of this report.

It should be noted that not all resources are quantified. For example, Saint John Regional Hospital (SJRH) would not require a full-time Trauma Coordinator; as this position already exists at the facility.

There are also a number of recommendations that may have resource implications that we have not considered, while the chosen response to a given recommendation will impact the resource implications. For example, while it is outside the mandate of this project to make recommendations on the pre-hospital system as a whole, one recommendation would require all paramedics to complete a standardized training program in basic trauma care. We are aware that a project to train emergency medical technicians to a level roughly equivalent to the Canadian Medical Association (CMA) Primary Care Paramedic (PCP) designation has been initiated; however, not all services have contracted with the training provider to do this. If the Department of Health chose to provide the necessary resources to all Emergency Medical Technicians for training to the PCP level, an investment of up to \$8.5 million may be required (assuming 700 EMT positions requiring tuition support of approximately \$12,000). Decisions on how such a recommendation is implemented, however, must consider the level of support that may be expected from the province in relation to such support provided to other allied health professionals, the responsibility

of individuals for their own training, other support available through programs such as the New Brunswick Student Financial Services and Canada Student Loans Programs, the employer responsibilities of the 39 organizations that currently operate the EMS services and the changes currently planned for the pre-hospital system. Therefore, while we recognize that such recommendations will have resource implications, they have not been included in exhibit 12-1 as they are largely beyond the mandate of the current project while the details of implementation are well beyond the policy decisions necessary for the development of a provincial trauma system.

We have attempted to be as explicit as possible regarding our resource calculations and have detailed our assumptions in Appendix C. Exhibit 12-1 provides a summary of these calculations divided into three categories: one-time capital expenses; one-time investments of an operating nature and estimates of annual on-going operating expenses. The one-time operating costs are largely associated with recruitment and orientation of the relevant positions; it is assumed that such costs will be equivalent to 20% of salary. The estimates in exhibit 12-1 are to be considered gross estimates and will vary based on the detailed circumstances. The capital cost will vary based on the details of the physical space available at the chosen facility – we have simply assumed gross square footage requirements at an estimated cost per square foot. These assumptions may vary depending on the extent of construction and re-evaluation required at the selected hospital. Given the confidential nature of this report we have not sought information from any hospital to verify our assumptions in more detail.

Finally, we have not quantified the cost-shifting that will be inherent in the recommended designation of any site as the sole tertiary trauma centre for the province of New Brunswick. While such a designation can be expected to decrease trauma volumes in other centres, we have not quantified this reduction. Rather, we have suggested that the recommended secondary trauma centres should not anticipate an increase in the volume or acuity of patients treated, but rather a decrease. Thus, no incremental funding should be expected or sought as a consequence of volunteering to accept this designation.

Exhibit 12.1: Summary of Estimated Incremental Resource Requirements				
Trauma System Component	Recommendation Summary	Capital Resource Estimate	One-time Operating Resource Estimate	Annual Operating Resource Estimate
Pre-Hospital Care	(17 & 48) Establishment of pre-hospital medical authority	N/A	\$56,000	\$280,000
	(19) Opportunities for paramedics and dispatchers to participate in integrated trauma system initiatives	N/A	N/A	\$404,000
	(49) A helicopter be acquired and staffed for use in trauma and other critical care transfers	N/A	N/A	\$12,000,000
Inter-hospital transfer	(15 & 47) Advanced Care Paramedic and Critical Care Paramedic level training for selected paramedics	N/A	\$1,100,000	N/A
Emergency Department Resuscitation	(22) All hospitals treating trauma patients ensure that RNs and physicians receive appropriate education in trauma patient assessment and treatment	N/A	\$585,000	\$146,000
	(29 & 53) Trauma Program Medical Director	N/A	\$11,000	\$56,000
	(36) Additional ED nursing resources	N/A	\$48,000	\$240,000
	(53) Trauma Program Administrative Director	N/A	\$7,000	\$36,000
	(53) Trauma Program Admin support	N/A	\$9,000	\$46,000
Critical Care	(35) Critical Care Capacity	\$350,000	\$276,000	\$1,500,000
Evaluation / Follow-up	(25 & 33 & 53) Trauma data analyst	N/A	\$9,000	\$44,000
	(26) Provincial Trauma Registry development	\$50,000	\$57,000	N/A
Education & Research	(53) Trauma Research Coordinator	N/A	\$11,000	\$57,000
	(54) Development of a province-wide Continuing Professional Development program	N/A	\$76,000	\$115,000

In summary, we have estimated the need for capital resources of \$400,000, one-time operational expenses of \$2.3 million and on-going annual operational expenses of approximately \$15.0 million. The ongoing operational expenses include the significant item associated with the acquisition of a helicopter for an estimated \$12 million. The actual cost of this acquisition could clearly vary significantly depending on the implementation decisions. As previously suggested, to mitigate these costs, consideration of a single shared service provider of land and air ambulance services for New Brunswick, Nova Scotia and Prince Edward Island, is an opportunity to explore. The sharing of helicopters and fixed

wing dedicated resources may prove to be both an effective and cost efficient model to move patients of all types, including Critical Care, Perinatal and Neonatal, Neurosurgical, Cardiac and trauma, to definitive care centres, both intra and, in selected circumstances, inter-provincially. The on-going operating costs without this investment are estimated to be \$3.3 million.

Appendix A:
List of Interviews

List of Interviews

RHA1 – (Beausejour)	
Dr. Hubert Dupuis	Trauma services
Dr. Rina Lee	Chief of Intensive Care
Dr. Martin Robichaud	Director of ED
Dr. Ye Yturalde	VP Medical Services (Acting)
Dr. Renaud Laplante	Chief of Anaesthesia
Dr. Mario Gosselin	Anaesthesia
Dr. Sylvain Beausoleil	Surgery
Dr. Francis Cormier	Chief of Orthopaedics

RHA 1 – The Moncton Hospital:	
Dr. Janet Fultz	Chief of Plastics
Dr. Serge Landry	Emergency / Trauma
Dr. Jacques Albert	Emergency / Trauma
Dr. David Dodge	Chief of Anaesthesia
Dr. John Crompton	Critical Care
Dr. Steve Massoeur	Dept. of Orthopaedics
Dr. Paul Goobie	General Surgery
Ms. Mary Lee	VP Acute Care
Dr. Ken Mitton	Chief of Staff
Dr. Peter Docherty	Medical Director
Dr. Carolyn Baer	Chief of Internal Medicine
Mr. Daniel Lauziere	Nurse Manager, Emergency
Mrs. Wendy Bransfield	Nurse Manager, MSICU
Mrs. Amanda Cleary	Nurse Manager, Neuro ICU
Mrs. Ellen Smith	Nurse Manager, Rehab Unit
Mr. Kirby Papic	Chief, Respiratory Therapy
Mrs. Bridgette Dutcher	Chief, Occupational Therapy
Mrs. Shirley Jensen	Chief, Physiotherapy
Dr. Roy Tingley	Chief, Medical Imaging
Mrs. Rachelle Gaudet	Technical Director, Medical Imaging
Dr. Ralph Burnett	Thoracic Surgeon
Dr. John Murphy	Vascular Surgery

RHA 2 – Saint John Regional Hospital	
Ms. Eileen MacGibbon	Administrative Director, Health records and Utilization
Dr. Gerry Stiles	Vascular Surgery
Dr. Peter Ross	Head of Emergency (telephone interview)
Dr. Frank Sanderson	Clinical Director of Surgery
Ms. Nancy Savage	VP Patient Programs
Dr. John Whelan	Clinical Head, DI
Dr. Andrew Trenholm	Orthopaedic/Lead, Trauma Advisory Committee
Ms. Laurie Janes	Administrative Director, Emergency Department
Ms. Nancy Gillies	Unit Manager, OR

RHA 2 – Saint John Regional Hospital	
Ms. Sue DeLong	Unit Manager, Emergency Department
Ms. Tracey Scott	Unit Manager, Critical Care)
Ms. Margaret Melanson	Administrative Director, Rehabilitation and Psychosocial Services
Dr. Stephen Connolly	Clinical Head, Orthopaedics
Dr. Todd Chedore	Anaesthetist
Dr. John Mowatt	Medical Director, ICU
Ms. Heather Oakley	Trauma Coordinator
Dr. A.J. O'Brien	VP Medical
Dr. B. Wheelock	Chief of Staff

RHA 3 – Dr. Everett Chalmers Regional Hospital, Cassidy Rehabilitation Centre	
Dr. Scott Bowden	Head of Orthopaedics
Drs. Rob Leckey	Medical Director
Dr. Ron Harris	Administrative Director, Specialized Rehabilitation Services
Dr. Jane Findlater	Head of Emergency
Dr. Richard Chisholm	Chief of Anaesthesiology
Dr. John Franklin	Head of General Surgery
Dr. Zeeshan Aslam	Medical Director of Critical Care

RHA 4 – Edmundston	
Dr. Edouard Hendriks	CEO and VP Medical
Ms. Lise Roy	Vice-president planification et evaluation/PDGA
Ms. Roberte O'Régan	Vice-présidente, services cliniques et communautaires
Ms. Mariette Damboise	directrice des soins infirmiers
Mr. Edward Harquail	chef des services ambulanciers
Ms. Michelle Clavette	infirmière ressource, urgence de l'HRE

RHA 5 – Campbellton	
Mrs. Gwen Cook	Chief nursing Officer, VP Patient Services
Mrs. Ruth Lyons	Senior VP and facility manager
Dr. Hristo Loeski	Dept. Head of Surgery and Service Head Anaesthesia
Dr. Gilles Verret	Service chief of orthopaedics (he is the only orthoped in RHA 5)
Dr. Nadine Lebel	Service Chief of ED

RHA 6 – Bathurst	
Mr. Stéphane Legacy	V.P. des services hospitaliers
Mrs. Deborah Gammon	Chief Nursing Officer
Mr. Arthur Cormier	V.P services corporatifs
Dr. Robert Desjardins	chef du personnel medical
Dr. Neil Branch	chirurgien orthopédique et chef du department de chirurgie
Dre. France Desrosiers	Chef du département de médecine générale d'urgence – Péninsule Acadienne
Dr. Jean-Pierre Arseneau	Chef du department de médecine générale et d'urgence – Chaleur

RHA 7 – Miramichi	
Mr. Gary Foley	CEO
Ms. Annette LeBouthillier	V.P. Patient Care Services/CNO
Ms. Karen Copp	ER Nurse Manager
Dr. Rex Edwards	Surgery
Dr. Michael Hayden	Anaesthesia
Mr. Greg Dunn	Ambulance Services

Ambulance Services	
Mr. Jean-Marc Dugas	Mrs. Penny Coburn
Mr. Stephen Hanley	Mr. Donnie Campbell
Mr. Henry Palmer	Mrs. Ann Secord
Mr. Arnold Rovers	Dr. Vona MacMillan
Mr. Chris Hood	Dr. Ed Cain
Mr. Don Wilson	

Appendix B:

*Atlantic Health Sciences Corporation
Trauma Patient Chart*



Atlantic Health Sciences Corporation
 Corporation des sciences de la santé de l'Atlantique

STRETCHER _____

**EMERGENCY
 DEPARTMENT
 PATIENT RECORD**

FACILITY

- SAINT JOHN REGIONAL HOSPITAL
- ST. JOSEPH'S HOSPITAL
- CHARLOTTE COUNTY HOSPITAL
- FUNDY HEALTH CENTRE
- SUSSEX HEALTH CENTRE
- GRAND MANAN HOSPITAL

PATIENT'S NAME _____

HOSPITAL NO. _____ DATE _____

ALLERGIES _____

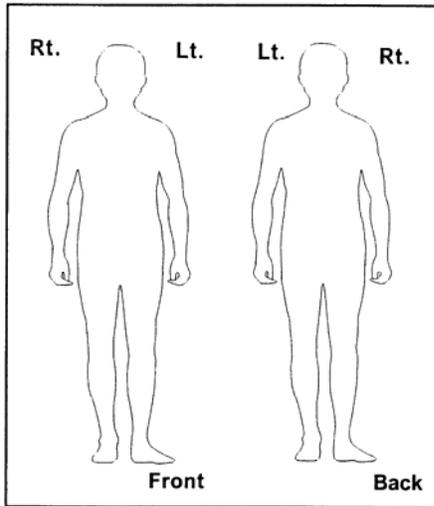
ARMBAND ON FAMILY NOTIFIED _____
 time

FAMILY PRESENT @ _____ hrs.

NURSING ASSESSMENT

SIG. _____

TIME _____



AIRWAY

- PATENT _____
- ET @ lipline _____
- TRACH. _____
- BAG _____

C SPINE

- COLLAR _____
- SANDBAG _____
- SPINE BOARD _____

O2 CONCENTRATION

- 28% _____
- 40% _____
- 100% _____
- OTHER _____

MENTAL STATUS

- ALERT _____
- VERBAL _____
- PAINFUL _____
- UNRESPONSIVE _____

BREATHING

- RATE _____
- DEPTH _____
- REG./IRREG. _____

CIRCULATION

- SKIN COLOR _____

SKIN CONDITION

- DRY _____
- WARM _____
- COOL _____
- DIAPH. _____

HEART RYTHM

- REG./IRREG. _____

EKG PRINTOUT



Atlantic Health Sciences Corporation
 Corporation des sciences de la santé de l'Atlantique

Trauma Notes

- SJRH CCH Sussex
 Grand Manan Fundy Health

Patient Label

34851(02/06)

Date (M/D/YYYY)	Arrival Time	Initial Assessment Time
-----------------	--------------	-------------------------

PRE-HOSPITAL	Arrival by	<input type="checkbox"/> Land Ambulance <input type="checkbox"/> Air Ambulance <input type="checkbox"/> Private Vehicle <input type="checkbox"/> Police <input type="checkbox"/> Other Transfer from _____		
	Pre-hospital data	BP _____ P _____ RR _____ GCS _____ Pupils reactive: <input type="checkbox"/> Y <input type="checkbox"/> N Accucheck _____		
	Interventions	Airway:	<input type="checkbox"/> Oral <input type="checkbox"/> Nasal	
		Oxygen:	<input type="checkbox"/> O2 mask ___% <input type="checkbox"/> BVM <input type="checkbox"/> Other _____	
		Intubated:	<input type="checkbox"/> Oral <input type="checkbox"/> Nasal # ___ E-tube ___ cm @ lip <input type="checkbox"/> Combitube (esophageal/ tracheal)	
IV Access:		<input type="checkbox"/> Y <input type="checkbox"/> N IV Site / Solution / amt infused _____		
	Other:	<input type="checkbox"/> Cervical collar <input type="checkbox"/> Spine board <input type="checkbox"/> Towel rolls/ blocks <input type="checkbox"/> Head taped <input type="checkbox"/> KED <input type="checkbox"/> Splints Extrication <input type="checkbox"/> Y <input type="checkbox"/> N # ___ mins		
EVENT HISTORY	Mechanism of Injury	<input type="checkbox"/> MVC <input type="checkbox"/> Fall <input type="checkbox"/> Assault <input type="checkbox"/> Drowning (fresh water/ pool/ salt water) <input type="checkbox"/> Electricity – exposure ___ mins <input type="checkbox"/> Fire/heat – enclosed area <input type="checkbox"/> Y <input type="checkbox"/> N <input type="checkbox"/> Other: _____		
	Time of Injury	_____		
	Vehicle	<input type="checkbox"/> Car <input type="checkbox"/> Van <input type="checkbox"/> Truck <input type="checkbox"/> Other		
	Place in Vehicle	<input type="checkbox"/> Driver <input type="checkbox"/> Passenger: Front seat— <input type="checkbox"/> right <input type="checkbox"/> middle Rear seat— <input type="checkbox"/> left <input type="checkbox"/> middle <input type="checkbox"/> right <input type="checkbox"/> Pedestrian <input type="checkbox"/> unknown		
	Type of Collision	<input type="checkbox"/> Low Speed <input type="checkbox"/> High Speed ___ km/hr <input type="checkbox"/> Head on <input type="checkbox"/> Rear End <input type="checkbox"/> Rollover <input type="checkbox"/> T-bone – <input type="checkbox"/> driver side <input type="checkbox"/> passenger side) <input type="checkbox"/> Struck (<input type="checkbox"/> pole/ <input type="checkbox"/> tree/ <input type="checkbox"/> other _____) <input type="checkbox"/> Off road <input type="checkbox"/> Other _____		
	Restraints	<input type="checkbox"/> None <input type="checkbox"/> Seatbelt <input type="checkbox"/> Car seat/booster seat <input type="checkbox"/> Airbag deployed <input type="checkbox"/> Ejected ___ m		
	Other	Struck: <input type="checkbox"/> Steering wheel <input type="checkbox"/> Windshield <input type="checkbox"/> Ground/ pavement <input type="checkbox"/> Death of occupant		
	Primary Injury Type	<input type="checkbox"/> Blunt <input type="checkbox"/> Penetrating <input type="checkbox"/> Knife <input type="checkbox"/> Gun (type _____) <input type="checkbox"/> Other _____		
	Recreation:	<input type="checkbox"/> ATV <input type="checkbox"/> Bicycle <input type="checkbox"/> Snowmobile <input type="checkbox"/> Ski <input type="checkbox"/> Snowboard <input type="checkbox"/> Skateboard <input type="checkbox"/> Motorcycle <input type="checkbox"/> Sport <input type="checkbox"/> Other _____		
	Safety equipment	<input type="checkbox"/> Helmet <input type="checkbox"/> Other _____		
Fall	<input type="checkbox"/> Stairs/steps comment: _____ <input type="checkbox"/> Ladder <input type="checkbox"/> Other _____ m Location found _____			
ALLERGIES:			PAST MEDICAL HISTORY:	
TETANUS:	Up to date: <input type="checkbox"/> Y <input type="checkbox"/> N <input type="checkbox"/> Unknown Time administered: _____ lot # _____ Location _____ by _____			

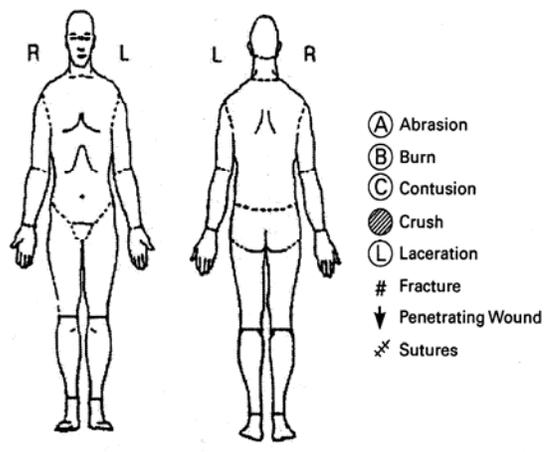
TRAUMA TEAM CALLED: Trauma Alert called at _____ hr									
	Name	Initial	Time Paged	Arrived		Name	Initial	Time Paged	Arrived
Trauma Team Leader					Orthopedic Surgeon				
General Surgery					Thoracic Surgeon				
Anaesthesia					Operating Room				
Neurosurgery					Other				
Time		Date			Signature				

AIRWAY	<input type="checkbox"/> Patent <input type="checkbox"/> Obstructed <input type="checkbox"/> Tongue obstruction <input type="checkbox"/> Loose teeth <input type="checkbox"/> Foreign objects <input type="checkbox"/> Bleeding <input type="checkbox"/> Edema	
	Suction:	<input type="checkbox"/> Oral <input type="checkbox"/> Nasal <input type="checkbox"/> Tracheal
	Airway:	<input type="checkbox"/> Oral <input type="checkbox"/> Nasal Size ____ by _____ @ _____ hr
	Surgical cricothyroidotomy by _____ @ _____ hr Needle cricothyroidotomy by _____ @ _____ hr	
Cervical spine immobilization/stabilization maintained <input type="checkbox"/> Y <input type="checkbox"/> N if No note: _____		
BREATHING	Respirations:	<input type="checkbox"/> Spontaneous <input type="checkbox"/> Absent <input type="checkbox"/> Assisted <input type="checkbox"/> Hyperventilated
	Quality:	<input type="checkbox"/> Normal <input type="checkbox"/> Fast <input type="checkbox"/> Slow Depth: <input type="checkbox"/> Normal <input type="checkbox"/> Deep <input type="checkbox"/> Shallow
	Chest Movement:	<input type="checkbox"/> Symmetrical <input type="checkbox"/> Asymmetrical Use of: <input type="checkbox"/> Abdominal muscles <input type="checkbox"/> Accessory muscles
	Abnormalities noted:	<input type="checkbox"/> None <input type="checkbox"/> Distended neck veins <input type="checkbox"/> Tracheal deviation (left / right) <input type="checkbox"/> Flail segment (left / right) Comment: _____ <input type="checkbox"/> Simple <input type="checkbox"/> Tension (left / right) <input type="checkbox"/> Subcutaneous emphysema (location _____) <input type="checkbox"/> Sucking chest wound (left / right) <input type="checkbox"/> 3 sided occlusive dressing
	Interventions:	Oxygen administered ____ O2 mask ____ % BVM continued _____ L/min Other _____ Needle thoracotomy <input type="checkbox"/> left <input type="checkbox"/> right needle size ____ by _____ @ _____ hr
	Intubation:	<input type="checkbox"/> Oral <input type="checkbox"/> Nasal Size ____ # ____ attempts by _____ Placement confirmed <input type="checkbox"/> Y <input type="checkbox"/> N ____ cm lip End tidal CO2 <input type="checkbox"/> Y <input type="checkbox"/> N Successful intubation @ _____ hr by _____
	Mechanical Ventilation	Time _____ hrs Mode _____ Tidal volume _____ Rate ____ FiO2 ____ PEEP ____ Pressure support ____
	ABG:	Drawn by _____ @ _____ hr Site: <input type="checkbox"/> radial <input type="checkbox"/> femoral <input type="checkbox"/> brachial (left / right)
Chest Tube	Left chest tube: size # ____ inserted by _____ @ _____ hr drainage _____ Connected to Pleurevac with _____ cm H2O suction Right chest tube: size # ____ inserted by _____ @ _____ hr drainage _____ Connected to Pleurevac with _____ cm H2O suction Other: _____	
CIRCULATION	Vital Signs	T ____ P ____ RR ____ BP (Left) ____ (Right) ____ SaO2 ____ % on ____ % O2 / room air Accucheck ____
	Rhythm strip attached	<input type="checkbox"/> Y <input type="checkbox"/> N <input type="checkbox"/> 12 lead EKG @ _____ hrs reviewed by _____ MD @ _____ hr
	Assessment	Skin Color <input type="checkbox"/> Normal <input type="checkbox"/> Pale <input type="checkbox"/> Cyanosis <input type="checkbox"/> Flushed <input type="checkbox"/> Ashen Comment: _____
		Skin Temperature <input type="checkbox"/> Cool <input type="checkbox"/> Cold <input type="checkbox"/> Warm <input type="checkbox"/> Hot
		Skin Moisture <input type="checkbox"/> Dry <input type="checkbox"/> Diaphoretic Comment: _____
		External Bleeding <input type="checkbox"/> Y <input type="checkbox"/> N Site(s): _____ <input type="checkbox"/> Direct Pressure <input type="checkbox"/> Dressing
	Pulses	Left
Radial <input type="checkbox"/> Present <input type="checkbox"/> Absent		<input type="checkbox"/> Present <input type="checkbox"/> Absent
Femoral <input type="checkbox"/> Present <input type="checkbox"/> Absent		<input type="checkbox"/> Present <input type="checkbox"/> Absent
Carotid <input type="checkbox"/> Present <input type="checkbox"/> Absent		<input type="checkbox"/> Present <input type="checkbox"/> Absent
Rewarming Methods	<input type="checkbox"/> Warm Blankets <input type="checkbox"/> Warming Blanket <input type="checkbox"/> Blood/Fluid Warmer <input type="checkbox"/> Overhead warmer <input type="checkbox"/> Warm O2 <input type="checkbox"/> Other: _____	
Bloods	Drawn by _____ @ _____ hr Trauma panel <input type="checkbox"/> Toxic screen <input type="checkbox"/> Lipase <input type="checkbox"/> Amylase <input type="checkbox"/> Crossmatch ____ units	
DISABILITY	Level of consciousness	<input type="checkbox"/> Alert <input type="checkbox"/> Verbal <input type="checkbox"/> Pain <input type="checkbox"/> Unresponsive
	Pupils:	<input type="checkbox"/> Reactive <input type="checkbox"/> Nonreactive Size: ____ R ____ L
	Comment	
		EXPOSE
		Clothes: <input type="checkbox"/> Clothes removed / cut <input type="checkbox"/> Bloody <input type="checkbox"/> Wet <input type="checkbox"/> Urine <input type="checkbox"/> Feces <input type="checkbox"/> Other _____ <input type="checkbox"/> Jewelry removed
		Odours: _____

Implement Care Plan If Any Problems With Primary Assessment. If Normal Complete Risk Assessment (see back page)

Time	Date	Signature
------	------	-----------

HEAD / FACE / NECK	<input type="checkbox"/> No abnormalities found <input type="checkbox"/> Not Assessed		Patient Label
	Skull	<input type="checkbox"/> Laceration <input type="checkbox"/> Contusion <input type="checkbox"/> Hematoma <input type="checkbox"/> Battles Sign <input type="checkbox"/> Otorrhea <input type="checkbox"/> L <input type="checkbox"/> R Comment: _____	
	Face	<input type="checkbox"/> Laceration <input type="checkbox"/> Contusion <input type="checkbox"/> Hematoma <input type="checkbox"/> Abrasion <input type="checkbox"/> Rhinorrhea Comment: _____	
	Mouth:	<input type="checkbox"/> Laceration <input type="checkbox"/> Loose teeth <input type="checkbox"/> False teeth removed Comment: _____	
	Eyes	<input type="checkbox"/> Laceration <input type="checkbox"/> Raccoon Eyes <input type="checkbox"/> Contact Lenses— <input type="checkbox"/> Removed <input type="checkbox"/> Stored in Saline <input type="checkbox"/> Glasses 34851(06/05)	
	Neck	<input type="checkbox"/> Laceration <input type="checkbox"/> Pain - Location _____ <input type="checkbox"/> Contusion <input type="checkbox"/> Other - Comment _____	
CHEST	<input type="checkbox"/> No abnormalities found <input type="checkbox"/> Not Assessed		
	Inspect	<input type="checkbox"/> Abrasions <input type="checkbox"/> Bruising <input type="checkbox"/> Seat Belt Markings <input type="checkbox"/> Penetrating Injury <input type="checkbox"/> Paradoxical Chest Movement <input type="checkbox"/> Hemoptysis Comment: _____	
	Percuss	<input type="checkbox"/> Tympany <input type="checkbox"/> Dullness	
	Palpate	<input type="checkbox"/> Tender <input type="checkbox"/> Crepitus <input type="checkbox"/> Subcutaneous emphysema Location _____	
	Auscultate	Breath Sounds - <input type="checkbox"/> Present <input type="checkbox"/> Absent <input type="checkbox"/> Decreased <input type="checkbox"/> Left <input type="checkbox"/> Right <input type="checkbox"/> Crackles <input type="checkbox"/> Wheezes	
	Other	_____	
ABDOMEN	<input type="checkbox"/> No abnormalities found <input type="checkbox"/> Not Assessed		
	Inspect	<input type="checkbox"/> Abrasions <input type="checkbox"/> Bruising <input type="checkbox"/> Seat Belt Markings <input type="checkbox"/> Penetrating Injury <input type="checkbox"/> Pulsations <input type="checkbox"/> Distention	
	Percuss	<input type="checkbox"/> Normal <input type="checkbox"/> Tympany <input type="checkbox"/> Dullness	
	Palpate	<input type="checkbox"/> Tenderness <input type="checkbox"/> Soft <input type="checkbox"/> Firm <input type="checkbox"/> Rigid <input type="checkbox"/> Guarding <input type="checkbox"/> Rebound Tenderness Comment: _____	
	Auscultate	<input type="checkbox"/> Bowel Sounds <input type="checkbox"/> Present <input type="checkbox"/> Absent <input type="checkbox"/> Hyperactive <input type="checkbox"/> Hypoactive Comment: _____	
	Gastric Tube Inserted	<input type="checkbox"/> Nasal <input type="checkbox"/> Oral Tube Size _____ Drainage _____ Time _____ Inserted by _____	
PELVIS	<input type="checkbox"/> No abnormalities found <input type="checkbox"/> Not Assessed		
	Inspect	<input type="checkbox"/> Abrasions <input type="checkbox"/> Bruising	
	Palpate	<input type="checkbox"/> Tenderness <input type="checkbox"/> Bony crepitus	
	Other	_____	
PERINEUM	<input type="checkbox"/> No abnormalities found <input type="checkbox"/> Not Assessed		
	Inspect	<input type="checkbox"/> Bladder distention <input type="checkbox"/> Blood at urinary meatus <input type="checkbox"/> Priapism <input type="checkbox"/> Scrotal hematoma # ___ Foley Catheter inserted by _____ at ___ hrs ___ ml urine Connected to urometer/ straight drainage Urine Dip _____	
	Possible Pregnancy:	<input type="checkbox"/> Y <input type="checkbox"/> N <input type="checkbox"/> LMP Urine pregnancy test <input type="checkbox"/> negative <input type="checkbox"/> positive Fetal heart rate _____	
	Rectal	by MD <input type="checkbox"/> Y <input type="checkbox"/> N	
	Other	_____	
	Comments:	_____	
SPINE	<input type="checkbox"/> No abnormalities found <input type="checkbox"/> Not Assessed		
	Logged rolled @ _____		
	<input type="checkbox"/> Spinal precautions maintained		
	Comments: _____		
		Upper Extremities: <input type="checkbox"/> assessed and no difficulty	
		Lower extremities: <input type="checkbox"/> assessed and no difficulty	
		Comments: _____	
Time	Date	Signature	



or dep
Progr

NEUROLOGICAL ASSESSMENT

		Time																				
		Initials																				
GLASGOW COMA SCALE	Eyes open = • Eyes closed by swelling = C	Spontaneously	4																			
		To Speech	3																			
		To Pain	2																			
		None	1																			
	Best Verbal Response = • Endotracheal Tube = ET	Oriented	5																			
		Confused	4																			
		Inappropriate Words	3																			
		Incomprehensible Sounds	2																			
		None	1																			
	Best Motor Response = •	Obeys Commands	6																			
Localize to Pain		5																				
Withdrawal		4																				
Flexion to Pain		3																				
Extension to Pain		2																				
None		1																				
		Total																				
LIMB MOVEMENT	ARMS	Normal Power																				
		Mild Weakness																				
		Severe Weakness																				
		Spastic Flexion																				
		Extension																				
		No Response																				
	LEGS	Normal Power																				
		Mild Weakness																				
		Severe Weakness																				
		Extension																				
No Response																						
PUPILS Brisk = B Sluggish = S	RIGHT	Size																				
		Reaction																				
	LEFT	Size																				
		Reaction																				
		Time																				
		Initials																				
VITAL SIGNS	Blood Pressure (left)																					
	Blood Pressure (right)																					
	Pulses																					
	Respirations																					
	Temperature																					
	O2 sat																					
	Pain Scale																					
	Accu Check																					
DIAGNOSTIC IMAGING		Time (hrs)		Time (hrs)																		
	Spine		Thoracic Spine																			
	Chest X-ray		Lumbar Spine																			
	Pelvis																					
	Upper Extremity		Lower Extremity																			
	Left		Left																			
	Right		Right																			
	Fast		Other																			

PUPIL SCALE (mm)
8



CT SCANS / MRI

Accompanied by (i.e. RN RRT MD CNO LPN)

MEDICATIONS	TIME	MEDICATION	DOSE	ROUTE	SIGNATURE	PHYSICIAN ORDER	EFFECT / PAIN SCALE

INTRAVENOUS	Size _____ Site _____					Size _____ Site _____					
	TIME	SOLUTION	RATE	AMOUNT INFUSED	SIGNATURE	TIME	SOLUTION	RATE	AMOUNT INFUSED	SIGNATURE	
	TOTAL					TOTAL					

OUTPUT	TIME	URINE	EMESIS / NG	CHEST TUBE	CHEST TUBE
	TOTAL				

NURSE SIGNATURES	INITIALS		

Patient Label

ra-Mu
ergen

Risk Assessment	Interventions Major Trauma
<p>Primary Survey</p> <ul style="list-style-type: none"> • Glasgow coma scale <13 • Systolic BP <90 • Respiratory rate <10 or >29 breaths/min <p>Motor Vehicle Collision</p> <ul style="list-style-type: none"> • Major deceleration (head on, high speed > 60 km/hr) • Car/pedestrian • Off road vehicles (snowmobiles, ATV, dirtbikes, scooters) • Thrown from vehicle • Trapped: extrication time > 20 minutes • Death of another passenger • Ejection of passenger • Rollover (unbelted occupant) • Restraint marks from seatbelt <p>Falls</p> <ul style="list-style-type: none"> • Height > 2 feet • Head first landing <p>Thermal Injuries</p> <ul style="list-style-type: none"> • Burns > 20% TBSA • Burns/frostbite – full thickness • Prolonged exposure to cold <p>ANY PENETRATING INJURIES/ASSAULTS</p> <p>If Risk Assessment negative– physician assessment according to CTAS</p> <p>If high risk:</p> <ul style="list-style-type: none"> • Notify physician • Proceed to secondary assessment 	<ul style="list-style-type: none"> • Give 100% O2 via non-rebreather mask. • Apply pressure dressing to any uncontrolled bleeding area • Initiate 2 large bore IV's (gauges 14 or 16) connected to 0.9% NaCl 1000ml (one with blood tubing). • Assess patency of all IV lines • Obtain trauma bloods including crossmatch • Accucheck • Cardiac monitor • Continuous pulse oximetry • Foley catheter connected to hourly output (unless contraindicated) • Nasogastric/orogastric (unless contraindicated) • Use fluid warmer if rectal temperature <35°C or the patient requires active fluid resuscitation • Check tetanus status • Ensure documentation of all findings, times and MD notification • If penetrating trauma, inspect for exit and entrance wound <p>Ongoing Evaluation</p> <ul style="list-style-type: none"> • Vital signs every 15 minutes for first hour (initial time BP in both arms) • Vital signs every 30 minutes until stable • Hourly vital signs when stable • Document oxygen saturation q1h *Any patient with actual/potential chest trauma complications should have continuous oxygen saturation monitoring with documentation every 30 minutes. • Pain scale obtained 10-20 minutes post administration of analgesia. <p>If patient has a head injury or any symptoms of decreased level of consciousness:</p> <ul style="list-style-type: none"> • Glasgow Coma Scale (GCS) every 30 minutes for 2 hours • After first 2 hours GCS q1h

Appendix C:

***Detailed Calculations Re: Financial Resource
Implications***

C.1 Assumptions

The cost assumptions used for resource calculations were largely derived from the Annual Report of Hospital Services for the fiscal year ending March 31, 2005.

Summary of Assumptions used in calculations	
Salary Assumptions by Position	Hourly Salary Assumptions
Medical Director / Pre-hospital Authority	128.21
Admin / Professional Development Director	33.00
Critical Care RN	28.08
Emergency RN	26.13
Research Coordinator / IT Consultant	25.91
Paramedic	25.00
Administrative Support	21.00
Data Analyst	20.00
Data Assistant	17.13
Other Assumptions	Value
Benefits as a percentage of salary	12.18%
Recruitment & Orientation one-time costs as a percentage of annual salary	20%
Tuition for PCP training – 1 year course	\$12,000
Tuition for ACP / CCP training – 1 year course	\$14,000
MD attendance at ATLS training – 2 days	\$750
Auditing of ATLS for non-MDs – 2 days	\$150
Critical Care Unit cost per day	\$1,030

C.2 Calculations: Prehospital Care:

- (17) **There should be one independent funded prehospital medical authority (ideally an individual but a committee or agency are acceptable alternatives) that oversees the development, implementation, maintenance and quality improvement of the skills, protocols and agreements outlined herein. This medical authority should be a member of the provincial trauma medical advisory group and participate in all relevant trauma system initiatives.**
- (48) **The province should fund comprehensive medical authority, leadership, and oversight for the trauma response system and the authority should be integrated with the 911 system and air ambulance medical authority.**

Together these recommendations require the necessity for a pre-hospital medical authority. It is assumed that this is

equivalent to a single full-time equivalent with a salary based on an hourly rate of \$128.21 plus benefits, with necessity for recruitment and orientation. While there is no provincial EMS medical leader or authority, the position was advertised in 2005, but was not filled. Therefore the necessary resources may already be budgeted for such a position; we have assumed, however, that this will be an incremental cost.

(19) Opportunities should be afforded to paramedics and dispatchers to allow them to participate in trauma-related educational and quality improvement activities, primary prevention medical research, and other integrated trauma system initiatives.

At an average hourly rate of \$25 plus benefits, it is assumed that each paramedic and dispatcher in the province will be provided 8 hours annually for participation in integrated trauma system initiatives. There will also be a requirement to backfill the normal duties of such individuals during such participation. Therefore, the assumed cost per individual is \$450 annually; equivalent to 16 hours. It has been assumed that this opportunity will be provided to 900 staff annually.

(49) The province should acquire and staff a helicopter for use in trauma and other critical care transfers.

The costs associated with this recommendation will be heavily dependent on implementation decisions as noted. For the purposes of calculation, it is assumed that the helicopter will be leased, and therefore not capitalized. The estimated cost of such a lease, to base a single helicopter in a hanger with pilots and maintenance is \$6 million annually. It is further assumed that flying costs associated with additional paramedic staff and variable costs are \$3000/hour. An assumed 1,500 flights annually results in an operating cost of \$4.5 million. These 1,500 flights are not solely related to Trauma; the estimate includes requirements to move patients of all types, including Critical Care, Perinatal and Neonatal, Neurosurgical, Cardiac and Trauma. There will be further operational costs associated with such items as landing fees, airport fees, back-up aircraft rental when necessary, totalling an additional \$1.5 million annual. Total operating costs are therefore estimated to be \$12 million annually. While there may also be some capital costs associated with the development of landing sites, there are a number of landing sites in the Province, and we have not made any assumptions in this regard.

C.3 Calculations: Inter-hospital Transfer:

- (15) Selected paramedics who have achieved PCP level competency should be trained to perform advanced procedures including advanced airway management, intravenous fluid therapy, needle thoracostomy and cricothyrotomy to CMA designated Advanced Care Paramedic level. These paramedics should be deployed if feasible (i.e. without delaying response times) to defined major trauma patients that may have longer transport times to a trauma centre. They should also be utilized for inter-facility transport of trauma patients.**

- (47) The province should develop a cohort of paramedics with ACP and CCP skills be developed to serve in an inter-facility transport service capacity for trauma patients. Skill sets must include: endotracheal intubation and advanced airway management of intubated and ventilated patients, chest tubes, intravenous therapy and drug infusions. These paramedics may also be deployed to selected 911 trauma calls.**

For the proper functioning of the Trauma system, it will be a priority to have a minimum number of paramedics who have achieved the Advanced Care Paramedic level. These individuals will be required for inter-facility transfer, air ambulance operations and selected 911 calls. While there are a few ACP level trained paramedics in the Province now, we have assumed a requirement for an additional 20 such individuals. This requirement is of sufficient priority that, while the province may choose other means and a longer time-frame to fulfill recommendation 11 that requires that all paramedics complete a standardized training program in basic trauma care, recommendations 12 & 45 require the direct intervention of the Department of Health.

The direct intervention that is assumed is covering the backfill requirements while 20 existing paramedics with PCP level competency are trained to the ACP level. This will require a one-time operational cost of \$1.1 million, equivalent to 20 FTEs for a year at a salary rate of \$25 per hour plus benefits.

C.4 Calculations: ER Resuscitation:

(22) All hospitals treating trauma patients:

- **Ensure that Emergency Department RNs receive appropriate education in trauma patient assessment and treatment**
- **Ensure that physicians working the Emergency Department either attend or are familiar with the principles of ATLS and have defined competencies to treat trauma victims.**
- **Have sufficient resources to ensure timely, on site Laboratory and Diagnostic Imaging services**
- **Have a second physician on call**
- **Ensure that if RTs are used for the transfer of trauma patients they have the requisite skills and knowledge**
- **Ensure that there is a sufficient pool of nurses to effect safe and timely transfers**
- **Ensure collection and sharing of the data necessary to support a provincial reporting system**
- **Participate in a province wide education and Quality Assurance program for trauma.**

There are a number of components of recommendation 18, however, a majority of the resource requirements associated with this recommendation are covered more specifically by other recommendations or will not be associated with incremental resource requirements given the recommendations of a single tertiary level trauma centre, combined with expected decreased trauma activity in secondary centres.

RN and physician training in trauma patient assessment and ATLS, however, will require incremental resources. These resources are largely of a one-time operational nature with an annual requirement to maintain the skills that are developed.

There are an estimated 420 FTE Nurses working in emergency rooms in New Brunswick, if support is commensurate with level of employment (full / part time), it is assumed that 420 individuals will be required to be supported for education in trauma patient assessment and treatment. Assuming that such treatment will require two days (16 hours) at a course fee of \$150, and individuals will be required to be backfilled at a rate

of \$26.13 per hour plus benefits, there will be a one-time operating cost of \$434,000 to bring the existing RN work force up to this recommendation.

For physician and ATLS training, it is assumed that there will be a requirement for 50 physicians to be trained, at a 2 day course fee of \$710 and backfilling costs for 2 days at the rate of 128.21 plus benefits. This equates to a one-time operating cost of \$150,000. While there may be other sources of funding for this recommendation (such as the NBMA) we have not made any assumptions of such alternative sources.

The total one-time resource requirement is therefore, \$585,000 with an on-going annual cost of 25% of this amount to maintain competency (assumes a three year recertification with an additional amount available to train new staff).

(29) The designated trauma centre should appoint a Medical Director of the Trauma Program who should be funded for the administrative responsibilities arising from the position.

(53) The selected trauma centre should be given sufficient financial support to hire and remunerate the necessary staff to support the trauma program.

It is assumed that this position is funded at a rate of \$128.21 per hour plus benefits and further that the individual devotes one day per week to the role.

(30) Resuscitation of trauma patients should be enhanced by a more formal trauma team approach with dedicated Trauma Team Leaders who receive funding for this role.

(53) The selected trauma centre should be given sufficient financial support to hire and remunerate the necessary staff to support the trauma program.

Trauma Team Leaders are assumed to work a 24 hour on-call rotation with an on-call stipend as negotiated between the Department of Health and Wellness and the New Brunswick Medical Society. The Trauma Team Leader will also be eligible to bill unrestricted fee for service for trauma patients.

(36) The designated tertiary centre should ensure sufficient nursing resources in the Emergency Department to provide care to a higher volume of patients (including times when multiple trauma patients will require simultaneous care).

It is assumed that one additional RN will be required on a 24/7 basis for the Emergency Department at the selected provincial site. This equates to 4.5 FTEs. At a rate of 26.13 plus benefits, this equates to an annual operating expense of \$240,000.

(53) The selected trauma centre should be given sufficient financial support to hire and remunerate the necessary staff to support the trauma program.

Specifically, this will require 1 FTE administrative support at a rate of \$21 per hour plus benefits as well as 0.5 FTE Program Director at a rate of \$33 per hour plus benefits. We suggest that the Program Director role would ideally be served by an individual currently serving as the Program Director of any of Emergency Medicine, Critical Care or Surgery, as the responsibilities fit well with any of these mandates. The individual should be designated based on their skills, interest and training. While compensation may not be incremental, as the budget may exist already in relation to the current primary role for this individual, we have assumed incremental resources will be required.

C.5 Calculations: Critical Care Capacity:

(35) Once there is only one designated tertiary trauma centre it is important that all referred patients are accepted and not refused because of an inadequate number of critical care beds.

We have assumed the need for an additional 5 Critical Care Unit beds at the provincial trauma centre to handle incremental volumes. The capital cost of such an expansion will vary based on the details of the physical space available at the facility – we have simply assumed gross square footage requirements of 200 per bed at a construction and equipment cost of \$350 per square foot. These assumptions may vary depending on the extent of renovations / construction and re-evaluation required in relation to the current or proposed plans at the institution which is selected.

The operational costs associated with this expansion assume a 1:1 nurse to patient ratio that equates to 22 FTEs at an hourly rate of \$28.08 plus benefits as well as supplies expenses for a total annual operating cost of \$1.5 million.

C.6 Calculations: Evaluation / Follow-up:

- (33) The Trauma Centre should hire a full time data assistant/analyst. This will allow the centre to assume a provincial role in collecting data on ISS > 12 patients across the province.**
- (25) Comprehensive data should be collected on those patients with an Injury Severity Score > 12 as part of the provincial trauma registry (and National Trauma Registry). A dedicated Data Analyst at the tertiary care centre could assist with this data collection.**
- (53) The selected trauma centre should be given sufficient financial support to hire and remunerate the necessary staff to support the trauma program.**

It is assumed that these recommendations taken together will require a 1 FTE analyst position at a rate of \$20.00 per hour plus benefits.

- (26) A provincial trauma registry should be developed to include comprehensive data on all patients in the province with an Injury Severity Score > 12. Minimal and comprehensive data should also be sent to the National Trauma Registry.**

It is assumed that the development of the trauma registry will build upon the work currently underway at SJRH and will require a \$50,000 IT data architect consulting contract (to be capitalized) to ensure appropriate development of the database to accept information from throughout the province as well as a 1 FTE IT / Data Consultant position for a year at a rate of \$25.91 per hour plus benefits. On-going operational costs are assumed to be covered by the other Trauma Program positions previously identified.

C.7 Calculations: Education & Research:

- (53) The selected trauma centre should be given sufficient financial support to hire and remunerate the necessary staff to support the trauma program.**

It is assumed that 1 FTE Trauma Research Coordinator will be required at a rate of \$25.91 per hour plus benefits.

- (54) The designated trauma centre, as part of its role as the Provincial Tertiary Trauma Centre, must take a leadership role in the development of a province**

**wide Continuing Professional Development program
in support of the provincial trauma system.**

It is assumed that 1 FTE Educational Coordinator will be required at a rate of \$33 per hour plus benefits as well as .5 FTE administrative support at a rate of \$21 per hour plus benefits. Supplies of \$20,000 annually have also been assumed. In addition, one-time operational expenses associated with proper development of an educational outreach program are assumed at a cost of \$57,000 and based on 1 FTE for a year at a rate of 25.91 plus benefits.

It is assumed that those recommendations associated with standards etc. will be put in place through the cost of the positions outlined and therefore not require any additional resource.

Appendix D:
References and Source Documents

Appendix D: References and Source Documents

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