6300.01 General Major Trauma Management

INTRODUCTION

Trauma is the leading cause of death in patients between the ages of 1 and 44[1]. Trauma is a preventable disease, and therefore the first step towards decreasing mortality is actually injury prevention. Beyond this, reducing mortality involves quickly prioritizing assessment findings and interventions, and rapidly transporting the patient to the most appropriate destination for definitive care.

Trauma patients should be assessed and managed in a systematic manner. With a structured primary and secondary survey, the clinician assesses and treats life-threatening conditions quickly, initiates rapid transport, and continues to provide care while en route to hospital. In order to minimize delay to definitive care, treatment prior to transport should be limited to critical interventions only.

SAFETY

In situations where trauma has occurred, the clinician should ensure the scene is safe to protect the clinicians, patients and bystanders. Through the Communications Centre, activate appropriate resources such as the fire department, HazMat, law enforcement and/or Nova Scotia Power if required.

Clinicians should keep themselves safe by donning personal protective equipment (PPE), including a helmet, high-visibility outerwear, eye protection and hand protection when indicated. Protective gowns should also be considered when there is significant blood loss.

Clinician safety also involves being aware of the risk of occupational stress injury when attending calls involving major trauma (or any other call). Studies have shown that paramedics and other health care workers who have experienced or witnessed trauma are more prone to Post Traumatic Stress Disorder (PTSD). Occupational stress injuries can be acute (witnessing or experiencing one traumatic event) or cumulative (response to multiple traumatic events). Much like physical injury, preventative measures *prior to* the precipitating event and early interventions post-event will help to reduce the risk of PTSD. Resources are available to assist clinicians who are involved with difficult calls (trauma and others). These include the Peer Support Team (which can be activated through the Communications Centre), a confidential employee and family assistance program and a Health and Wellness coordinator who can provide assistance.

ASSESSMENT

Scene Assessment and Mechanism of Injury

Before assessing an individual patient, a scene survey must be done quickly to ascertain how many patients may be involved, what additional resources may be required, and to update the Communications Centre with this information. If there are a large number of patients or the number of patients overwhelms the local resources, a multiple casualty incident (MCI) may be declared in which case the clinician should follow the relevant policies and guidelines for assessing patients in this type of situation.

A scene assessment will provide a great deal of information as to what forces were involved, the mechanism of injury, and therefore the extent of injury that may have resulted. The mechanism of injury and amount of energy involved in the trauma must be thoughtfully considered, even in the absence of obvious injury. The mechanism represents the amount of energy transferred through the individual, and is a significant indicator of the potential for life-threatening injuries, even when they are not immediately apparent (e.g. patient ambulating at the scene after highway speed rollover). This information can be gathered from pre-arrival information, the appearance of the scene, and information from bystanders or other agencies. It is essential that prehospital clinicians obtain a clear understanding of the extent of the mechanism involved, as this may apply to decisions regarding LifeFlight, or activation of the Trauma Team. Information gathered by the prehospital clinician regarding the mechanism of injury is typically the only information available to the in-hospital clinicians, so it is important to gather as much information as possible.

Forces in Trauma

Forces in trauma can be categorized as deceleration acceleration, or compression forces. Deceleration occurs with a sudden stop of motion (e.g. a collision) while acceleration forces occur with a sudden and

[1] Centers for Disease Control and Prevention

6300.01 General Major Trauma Management

rapid increase in motion (e.g. fall). Compressive forces may occur during a collision with an object (blunt trauma), or with penetrating trauma (e.g. gunshot wounds (GSW), stabs, or assault).

While being cognizant of scene time, the clinician should attempt to gather as much information as possible about the event, such as:

- The time of injury – ascertaining the time of injury as soon as possible is critical.
- MVCs – determine the speed of vehicle(s), if the vehicle rolled over, the extent of vehicular damage, if seatbelts were worn, if airbags deployed, if there were fatalities at the scene, and if pedestrians were involved.
- Falls - how high was the fall? Did the patient hit anything before the ground? What was the ground surface like?
- GSW or stabbing - what was size of bullet or blade? How far away was the assailant? How many shots or stabs?

Primary Survey

Once an overall view of the scene has been obtained, the clinician can proceed with the primary survey which in trauma consists of the ABCDE approach. **During the primary survey, immediate life threats are addressed and treated before proceeding to the next step of the assessment**. If multiple care providers are available, simultaneous tasks are often taking place, but the ABCDE approach may be used as a priority list.

The assessment begins with a “general impression” of the patient:

- How does the patient look?
- Are there any obvious injuries?
- Do they appear in distress?
- Are they walking? Sitting? Lying still?
- What is their level of consciousness?
- Are they able to speak?

In major trauma, c-spine immobilization may be required. This is determined by following the Canadian C-Spine Rule (**PEP 2 supportive**, Figure 1). Until the rule can be applied, c-spine motion should be restricted. If the rule cannot be applied prior to moving the patient from the scene, the patient should be immobilized.

Airway

Assess for airway obstruction, facial trauma, blood or fluid in the airway, presence of foreign bodies, swelling, indication of burns, or sounds such as gurgling, stridor, or snoring. Correct any concerns immediately by positioning, foreign body removal, suction, using a jaw thrust, inserting an airway adjunct, or providing advanced airway management if required (refer to the Airway Management guideline). Remove any equipment (e.g. helmets) that interferes with airway assessment or management.

Breathing

Expose the chest, and assess for respiratory rate, depth, pattern, effort, and symmetry by looking for chest rise and fall. Look for any obvious chest trauma, flail segments, or sucking chest wounds. Initiate pulse oximetry monitoring, look for signs of cyanosis, and apply oxygen if required. Listen for breath sounds bilaterally; unilaterally decreased breath sounds may suggest pneumothorax. Look for any tracheal deviation (late sign of tension pneumothorax) and/or jugular venous distension (JVD) (obstructive shock) at this time.

A tension pneumothorax should be needle decompressed, sucking chest wounds should have an occlusive dressing applied, and any flail segment can be stabilized with a hand in the initial phase of assessment/management (refer to the Torso & Pelvic Trauma guideline). Consider assisted ventilations with a BVM if oxygenation or ventilation is inadequate (respiratory rate less than 10 or greater than 30; SpO_2 less than 92% on high-flow O_2).

Circulation

Assess blood pressure, as well as peripheral and central pulses, paying attention to rate and strength. Assess skin temperature and colour. Patients may develop any of obstructive, distributive, cardiogenic, and/or hypovolemic shock secondary to trauma. Refer to the Shock guideline for further details.

Look for and control any external hemorrhage. Signs of shock, hypotension, or absent peripheral pulses are indications for the initiation of IVs and the administration of a fluid bolus.

If the patient is deemed to be unstable as per your circulatory assessment, rapidly prioritize your assessment to include the chest, abdomen, pelvis

and femurs as these are the internal cavities where life-threatening hemorrhage may occur.

There are 7 life-threatening findings on primary assessment that require immediate prehospital intervention:

1. Airway obstruction
2. Tension pneumothorax
3. Open pneumothorax
4. Flail chest
5. Hypotension or signs of shock
6. Suspected pelvic fracture in hemodynamically unstable patient
7. Suspected long bone fracture in hemodynamically unstable patient

Disability

At this point, the level of consciousness has already been assessed (e.g. using the AVPU scale) however a GCS should now be calculated if not already done (Figure 2). C-spine protection should also be maintained until assessment for immobilization criteria can be completed, and a c-spine collar applied as appropriate (Figure 1).

Pupil size, equality and responsiveness should be recorded, and a BGL checked if the patient has an altered level of consciousness.

Note any neurologic deficits (e.g. weakness or altered sensation) as per the Neurological Trauma guideline.

Exposure (and Secondary Survey)

Further assessment should be done to look for other potential injuries. This includes exposing the patient for a more detailed assessment if time permits. In the case of penetrating trauma, the clinician must take care during the secondary survey to identify all stab wounds, and bullet entry/exit wounds as these may not be readily apparent without thorough examination. Measures should be taken to ensure the patient remains warm.

- Head: Reassess the airway and assess for any fluid loss (blood, CSF, etc.), signs of fractures, bruising, swelling, tenderness or other wounds.
- Neck: Reassess for JVD and consider looking for tracheal deviation (may be subtle). Look for any wounds, hematomas, or subcutaneous emphysema and assess for tenderness.
- Chest: Assess for any bruising (such as seat belt marks), subcutaneous emphysema, rib fractures or instability. Auscultate lung sounds and listen for signs of pneumo- or hemothorax (e.g. decreased or absent lung sounds).
- Abdomen and flanks: Look for any open wounds, bleeding or contusions and assess for tenderness, rigidity or guarding.
- Pelvis: Assess for any signs of fracture (presence of pelvic pain, bruising on inspection, or pain on gentle palpation), or open wounds, as well as swelling or tenderness. Look for any blood coming from the urethra, vagina, or anus.
- Extremities (check legs first than arms): Look for any bruising/wounds/punctures. Assess for any shortening, rotation, or signs of bony injury of the extremities. Palpate for localized discomfort. Check circulation, sensation and movement distal to any injuries.
- Back: If possible, assess the back for any signs of fractures, wounds or tenderness. The trauma assessment is not complete unless the back is examined.

For a more detailed description of the trauma assessment performed for the specific system involved, refer to the pertinent Clinical Practice Guideline.

Activating LifeFlight and/or Trauma Team

If the patient meets any of the following criteria, the Trauma Team should be activated at the district or tertiary trauma centre. If time to the trauma centre is greater than 30 minutes (including extrication time), LifeFlight should be consulted for a possible launch.

Criteria for activating the Trauma Team at the regional facility, or launching LifeFlight, are as follows:

Physiologic criteria

- Systolic BP less than 90 with hypoperfusion
- Ventilatory compromise (RR <10 or >30

6300.01 General Major Trauma Management

- Glasgow Coma Scale <12 with evidence of torso or extremity trauma
- Pediatric Trauma Score ≤ 8
- Pregnant patient (>20 weeks)

Anatomical criteria

- Amputation proximal to elbows or knees
- 2 or more proximal long bone fractures
- Suspected spinal cord injury
- Severe maxillofacial injury with possible airway compromise
- Burns >15% body surface area
- Pregnant patient (>20 weeks) with penetrating injury or significant blunt injury

Mechanism criteria

- Gunshot wound proximal to knee/elbow
- Significant penetrating wound to head, neck, chest, abdomen, or groin
- Ejection from vehicle
- Pedestrian thrown (hit by car) or run over
- Fall from a height greater than 6 meters (20 feet)

Other

- Clinician feels patient needs district or tertiary trauma centre
- Local resources are overwhelmed with patients

If in doubt about trauma team activation and/or LifeFlight, contact OLMC.

PRINCIPLES OF MANAGEMENT

When assessing the trauma patient using the ABCDE approach, any necessary interventions are performed in that order, and occur in real time as indicated. Interventions often occur simultaneously when multiple care providers are present, but it is critical that a "team leader" maintains the priority order and an overall care plan for the patient. The team lead must determine which interventions should be done immediately at the scene, what may be done on route to hospital, and what can wait for ED management if necessary. Minimizing scene time is a priority, in order to avoid delay to subsequent definitive care.

Specific management strategies by body system involved can be found in the pertinent guideline (Airway Management, Facial and Neck Trauma, Neurological Trauma, Torso and Pelvic Trauma, Extremity Trauma, Burns, or Shock).

Transport of the Major Trauma Patient

The patient should be transported to the appropriate facility in a timely fashion (**PEP 2 supportive**). Rapid transport of the patient to the appropriate destination is just as important as any other life-saving intervention.

Communication

Ongoing communication with the various agencies on scene, the Communications Centre, the receiving facility, and online clinical support (if required) is essential. It is critical for the receiving facility to be notified as early as possible of an incoming trauma patient.

Fluid Resuscitation, Hemodynamics, and Hemorrhage Control in Major Trauma

Fluid resuscitation in the major trauma patient must be thoughtfully managed. Two large bore IVs should be obtained if time permits. If transport time is relatively short, scene time should not be delayed for IV insertion. Fluid boluses (20 mL/kg) should be administered for patients who are hypotensive or showing signs of shock. In the polytraumatized head injured patient, care must be taken to avoid even a single episode of hypotension, and the target blood pressure for resuscitation is therefore a SBP of 120mmHg. For trauma patients with hemorrhagic hypovolemic shock, the target blood pressure for fluid resuscitation is a SBP of 100mmHg. This is permissively lower than one may expect. This recommendation is based on literature that suggests achieving a higher blood pressure via fluid resuscitation in trauma actually worsens outcomes by causing coagulopathy as well as clot disruption at the site of hemorrhage (**PEP 1 supportive**). There is a very limited role for inotropes (e.g. dopamine) in shock due to trauma.

Hemorrhagic shock trauma patients who remain hemodynamically unstable despite 2 L of fluid administration typically require transfusion of packed red blood cells, plasma, and platelets, which require substantial preparation before administration (e.g. thawing, transport, processing, etc.) For example,

packed RBCs and platelets require 15 minutes to be available for patients, however plasma requires 30 minutes. To this end some Regional Hospitals have established **'Massive Transfusion Protocols'** where the hospital may activate this protocol after receiving the prehospital radio patch indicating the patient is in hemorrhagic shock refractory to initial fluid boluses. For this reason, it is important to provide a radio patch early during transport.

Further details regarding fluid management for shock in the setting of head injury and trauma are outlined in the Neurological Trauma, and Shock guidelines.

Another agent utilized in major trauma management is tranexamic acid (TXA) (**PEP White**). TXA is an antifibrinolytic medication that works by inhibiting the degradation of fibrin, the protein that forms the framework of blood clots. If given within 3 hours from the time of injury, tranexamic acid has been shown to decrease mortality in trauma patients with significant hemorrhage. It may actually increase the risk of death if administration is delayed beyond 3 hours. Refer to the Tranexamic Acid medication profile for specific indications and contraindications.

Special Populations

Pediatric Trauma (General)

Pediatric patients should be assessed using the ABCDE approach as well. Throughout the assessment, it is important to keep in mind that vital signs in pediatric patients differ from adults, and some measurements, such as the GCS score must be modified for young children or infants. See Figures 3 and 4 for normal pediatric vital signs and adapted GCS. As with the adult assessment, if there are abnormal findings during the ABCDE assessment, the clinician should stop and initiate treatment before continuing on with assessment.

It is important to remember the anatomical and physiological differences found in children. Understanding these key differences will allow the clinician to reliably predict what injuries may be present and how management may be affected:

- Young children lack neck muscles and have proportionally larger heads, which makes them more susceptible to head and neck trauma. Do not clear the c-spine of a pediatric patient in the prehospital setting when multi-system trauma or any possibility of head trauma is present.
- Infants under the age of 6 months are primarily nose breathers. Anything blocking the nasopharynx can cause severe respiratory distress.
- Children have a higher metabolism and therefore increased oxygen demand compared to adults; it is important to apply oxygen as soon as possible to prevent hypoxia.
- Hypotension in a pediatric patient is a late sign and should be considered ominous.
- Blood volume in the pediatric patient is 80 mL/kg. Smaller volumes of blood loss represent proportionally more circulating volume compared to adults.
- Pediatric patients have compliant chest walls therefore serious underlying injury can occur to the chest organs without obvious external signs.
- Pediatric patients are prone to abdominal injuries as they have less fat and soft tissue as a protective layer.
- Pediatric patients are prone to hypothermia. During the exposure phase of assessment, it is crucial to keep them warm. Hypothermia will also cause a catecholamine release, increasing oxygen demand even further.

When managing a pediatric trauma patient, use available resources such as the Broselow tape, online clinical support, and collateral information from family members or care givers. Figure 5 demonstrates the components of the Pediatric Trauma Score, which can be calculated by the prehospital clinician.

Geriatric Trauma (General)

Falls are a leading cause of trauma in the geriatric population, and a large contributor to morbidity and mortality. Most falls lead to minor injuries such as abrasions and lacerations, however hip fractures and head injuries represent patterns of trauma that also commonly occur. Despite an obvious scalp laceration, or externally rotated hip, it is important to maintain the ABCDE approach so other associated

injuries are not missed. It is also important to not only assess for injuries caused by the fall, but consider the underlying cause of the fall as well.

It is essential to gather as much medical history as possible from the geriatric trauma patient. Medical conditions often play a causal role in geriatric trauma, such as a stroke while driving leading to an MVC. Medications (prescribed, over-the-counter or herbal) may cause changes in mental status or weakness, culminating in a traumatic event. Information regarding medications is important, for example vital sign interpretation may need to be adjusted if the patient is taking beta-blockers.

Geriatric patients generally have a number of co-morbidities such as heart disease, hypertension or COPD, which can affect the way the body responds to trauma.

Head injuries may be difficult to assess because of pre-existing cognitive disorders (e.g. dementia). The clinician should always attempt to establish the patient's baseline mental status (e.g. What was the patient like yesterday?). Never just assume that an abnormal level of consciousness or altered mental state is normal for an older patient.

Asking about the patient's baseline mobility and range of motion will help to determine if there has been a change from their post-injury state. If a patient has arthritis or other chronic extremity problems it is reasonable to limit testing excessive ranges of motion on exam. The physical exam is often modified to take into account the patients baseline mobility.

It is also important to consider elder abuse when encountering geriatric trauma. When gathering information from the scene, patient, and bystanders note any items that may indicate abuse and ensure this is relayed to the receiving facility staff.

Trauma in Pregnancy

If a major trauma patient is pregnant, consider early LifeFlight activation as per 'Activating LifeFlight and/or Trauma Team' (above), and transport to an appropriate facility. In major trauma, the priority is care of the mother as the best protection of the fetus is a resuscitated mother.

Physiologic changes in pregnancy include increased minute ventilation, heart rate, cardiac output, and gastric emptying time, as well as decreased blood pressure, pCO2 and hematocrit. In the first trimester of pregnancy (weeks 0-13), the uterus is intrapelvic, thick walled and the fetus is protected from direct injury. Major risks in this trimester relate to abortion and isoimmunization. Isoimmunization is the formation of maternal antibodies against fetal antigens, which can occur when fetal blood is exposed to maternal blood (when mother is Rh-). This can possibly lead to fetal mortality, and can occur even in minor trauma. Later in pregnancy, the uterus is thin walled and extrapelvic with maternal abdominal viscera displaced and inferior vena cava compression. Major risks in later pregnancy include pelvic fractures with maternal hemorrhage and direct fetal injury, abruption placentae, amniotic fluid embolism and isoimmunization.

The clinician should avoid placing visibly pregnant patients flat on their back if at all possible. Raise the right hip if appropriate (to shift the uterus to the left and reduce vena cava compression). If the patient is on a back board and the hip cannot be elevated, pad under the right side of the board so the patient is slightly tilted to the left.

In most cases, general principles of major trauma in the pregnant patient are similar to the non-pregnant patient, with a few extra points to keep in mind:

- Airway – increased risk of aspiration
- Breathing – clinician should recognize that the pregnant patient has decreased lung volumes and more difficulty with ventilation
- Circulation – there is a risk that blood loss will not be recognized early; with maternal blood loss, fetal distress precedes changes in maternal vital signs
- Disability – the clinician should consider eclampsia vs brain injury

TRANSFER OF CARE

Early notification to the receiving facility is essential in major trauma, so they can be prepared with appropriate resources and clinicians. It is acceptable to give an early radio patch with limited information and follow up with another radio patch when en route with further findings.

It has been found that not all information delivered by prehospital clinicians to in-hospital staff is captured. It is essential for the prehospital clinician to deliver their report in a loud clear voice and in a structured, articulate manner. The information gathered on scene may be very difficult for in-hospital staff to obtain from other sources, so the transfer of care is very important.

The verbal report to in-hospital staff should include details on scene findings, mechanism of injury, time of injury, initial assessment of the patient, changes in assessment and treatments provided.

If TXA was initiated in the prehospital setting, the clinician should ensure the receiving facility staff is aware of the time the initial bolus was administered and that there is a requirement for subsequent infusion.

CHARTING

Not only is it important to clearly document the patient assessment findings and interventions, but details about the scene, mechanism of injury, exact time of injury, forces involved and other pertinent information should be included in the ePCR. If the Massive Transfusion Protocol was activated by the prehospital clinician, document the time this was done.

Key Points – Major Trauma Management

Use scene and mechanism of injury to predict likelihood and severity of injuries

Early notification for additional resources and receiving facility

Attempt to reduce time on scene

Maintain ABCDE priority approach to trauma and manage immediate life threats in real time

Crisis resource management skills are an important aspect of trauma care

KNOWLEDGE GAPS

Further research is needed in prehospital care of trauma, including:

- assessment of pain in the pediatric, elderly and confused patient populations,
- the ideal amount of fluid to administer to major trauma patients,
- system time benchmarks for major trauma management, and
- the use of advanced assessment techniques, such as ultrasound, in the prehospital setting.

EDUCATION

Formal certification in PHTLS or ITLS will enable improved assessment and care for patients with major trauma. Practitioners are encouraged to maintain certification in these courses. Ongoing practice in scenario management can improve the care that you provide in a trauma situation.

Clinicians should also consider preventative measures and training to reduce the risk of developing PTSD.

QUALITY IMPROVEMENT

In the setting of major trauma, scene times should be limited, and if at all possible, procedures should be done en route to definitive care unless required for a life-threatening condition.

Request for LifeFlight, Trauma Team, and/or notification to the receiving facility should be done early in the setting of major trauma.

Time of injury is a critical piece of information to be included in the PCR for quality improvement purposes.

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Figure 1: Canadian C-Spine Rule

For all alert (GCS=15) and stable trauma patients where cervical spine injury is a concern

1. **Any high-risk factors?**

Age ≥ 65 years
OR
Dangerous mechanism*
OR
Paresthesias in extremities

If YES – Immobilize; If NO – Move to #2

*Dangerous mechanism:
- Fall from elevation ≥ 3 feet/5 stairs
- Axial load to head
- High speed MVC, ejection, rollover
- Motorized recreational vehicle
- Bicycle struck or collision

2. **Any low-risk factor which allows safe assessment of range of motion?**

Simple rear end MVC**
OR
Ambulatory at any time
OR
Delayed onset of neck pain
OR
Absence of midline C-spine tenderness

If NO – Immobilize; If YES – Move to #3

** Simple rear end MVC excludes:
- Pushed into oncoming traffic
- Hit by bus/large truck
- Rollover
- Hit by high speed vehicle

3. **Able to actively rotate neck 45° left and right?**

If unable – Immobilize; If able – Clear c-spine

Figure 2: Glasgow Coma Scale (Adult/Child)

Eye Opening (4)	Verbal Response (5)	Motor Response (6)
Spontaneously - 4	Orientated - 5	Obeys commands - 6
To voice - 3	Confused - 4	Localizes pain - 5
To pain - 2	Inappropriate words - 3	Withdraws from pain - 4
None - 1	Incomprehensible sounds - 2	Flexor response to pain - 3
	No verbal response - 1	Extensor response to pain - 2
		No motor response - 1

Figure 3: Pediatric Vital Signs

Normal Heart Rate

Age	Awake Rate	Sleeping Rate
Up to 3 months	85-205	80-160
3 months - 2 years	100-190	75-160
2 years -10 years	60-140	60-90
Over 10 years	60-100	50-90

Normal Respiratory Rate

Age	Breaths/min
Less than 1 year	30-60
1-3 years	24-40
4-5 years	22-34
6-12 years	18-30
13-18 years	12-16

Hypotension in the pediatric patient

Age	SBP (mmHg)
0 to 28 days	Less than 60
1 to 12 months	Less than 70
1 to 10 years	Less than 70 + (age in years x 2)
Over 10 years	Less than 90

Figure 4: Glasgow Coma Scale (Young Child/Infant)

Eye Opening (4)	Verbal Response (5)	Motor Response (6)
Spontaneously - 4	Interacts, coos/babbles - 5	Spontan./purposeful movement- 6
To voice - 3	Cries but consolable, odd interactions - 4	Withdraws from touch - 5
To pain - 2	Inconsistently consolable, cries in response to pain - 3	Withdraws from pain - 4
None - 1	Inconsolable, agitated, moans in response to pain - 2	Flexor response to pain - 3
	No verbal response - 1	Extensor response to pain - 2
		No motor response - 1

Figure 5: Pediatric Trauma Score

Component	+2	+1	-1
Weight	>20 kg (44 lbs)	10-20 kg (22-44 lbs)	<10 kg (22 lbs)
Airway	Patent	Maintainable	Unmaintainable
CNS	Awake	Obtunded or loss of consciousness	Unresponsive
Systolic BP	>90 mmHg	55-90 mmHg	<50 mmHg
Wounds	None	Minor	Major, penetrating, or burns
Skeletal	None	Single closed fracture anywhere	Open or multiple fractures

The Pediatric Trauma Score is designed as a triage tool for pediatric trauma patients. The six components are graded then added together to produce a score to assess injury severity and potential for mortality.

PEP 3x3 TABLES for GENERAL TRAUMA MANAGEMENT

Throughout the EHS Guidelines, you will see notations after clinical interventions (e.g.: **PEP 2 neutral**). PEP stands for: the Canadian **P**rehospital **E**vidence-based **P**ractice Project.

The number indicates the Strength of cumulative evidence for the intervention:
1 = strong evidence exists, usually from randomized controlled trials;
2 = fair evidence exists, usually from non-randomized studies with a comparison group; and
3 = weak evidence exists, usually from studies without a comparison group, or from simulation or animal studies.

The coloured word indicates the direction of the evidence for the intervention:
Green = the evidence is supportive for the use of the intervention;
Yellow = the evidence is neutral;
Red = the evidence opposes use of the intervention;
White = there is no evidence available for the intervention, or located evidence is currently under review.

PEP Recommendations for General Trauma Interventions, as of 2014/07/02. PEP is continuously updated. See: https://emspep.cdha.nshealth.ca/TOC.aspx for latest recommendations, and for individual appraised articles.

General Major Trauma Care

Recommendation		RECOMMENDATION FOR INTERVENTION			
		SUPPORTIVE (Green)	NEUTRAL (Yellow)	AGAINST (Red)	NOT YET GRADED (White)
STRENGTH OF RECOMMENDATION FOR INTERVENTION	1 (strong evidence exists)				• Mechanical Intraosseous Insertion
	2 (fair evidence exists)	• Optimal Trip Destination	• Manual Intraosseous Insertion • Thermostasis		
	3 (weak evidence exists)				

Pediatric General Trauma Care

Recommendation		RECOMMENDATION FOR INTERVENTION			
		SUPPORTIVE (Green)	NEUTRAL (Yellow)	AGAINST (Red)	NOT YET GRADED (White)
STRENGTH OF RECOMMENDATION FOR INTERVENTION	1 (strong evidence exists)	• Analgesia (narcotic)			• Crystalloid Infusion • Hypertonic Saline • Intubation with in-line stabilization • Thermostasis
	2 (fair evidence exists)	• Mechanical Intraosseous Insertion	• BVM • C-Spine Clearance • Manual Intraosseous Insertion • Spinal Immobilization		
	3 (weak evidence exists)	• Nitrous Oxide	• Intubation		

6300.01 General Major Trauma Management

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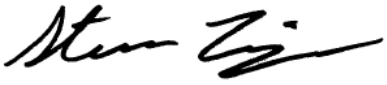
Signature of Program Director 	Signature of Program Document Coordinator 	

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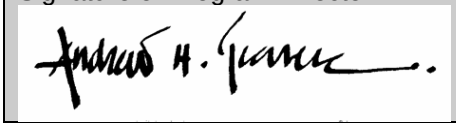
Signature of Program Director 	Signature of program Document Coordinator