STANDARD TREATMENT GUIDELINES

Major Trauma

Ministry of Health & Family Welfare
Government of India

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I. Introduction

Between 1990 and 2013, non-communicable diseases like injuries have become the main causes of mortality and morbidity across the world [1]. Every year 5 million people die due to injuries accounting for 1/10th of world's deaths, larger than fatalities due to HIV/AIDS, TB and malaria combined [2]. Over 90% of these deaths occur in low-and-middle-income-countries (LMICs) and if the injury death rates in these countries could be reduced, to that of high-income-countries, nearly 2 million lives could be saved every year [3][4]. Consequently, there has been increased attention in the international sphere of the need to reduce mortality due to injuries. The Sustainable Development Goals (SDGs) have set the target of halving the current rates of mortality due injuries by 2030 [5]. This requires a continuum of interventions ranging from improving pre-hospital services, streamlined in-hospital care protocols and trained personnel [6]. Out of all trauma deaths, 30-50% has been estimated to occur in hospital, highlighting the need for strengthened hospital trauma care [7]. However, most LMICs do not have in place such capacities to deal with trauma care [8].

Trauma Scenario in India

India, the second-most populous country in the world, is in rapid epidemiological transition, with an increasing burden of noncommunicable diseases like injury [1]. With its large population and inadequate health care system, it shares a major chunk of the trauma burden. It accounts for nearly 20% of the global injury mortality making it a key health priority with substantial scope of improvement [9]. Injuries and trauma are rapidly increasing becoming the top causes mortality and morbidity in the country necessitating critical attention in policy and practice [1] [10] [11]. More than half of these deaths can be prevented by improving trauma services, developing guidelines and investing resources [12] [13].

Why this STG is needed

While there is some acknowledgment among policy makers in India of the significant health challenge posed by trauma, the current trauma care system is largely deficient in terms of guidelines and resources to meet the growing burden of injury and trauma in the country [14][15][16]. The increasing burden of injuries would consequently result in more pressure on the healthcare system to provide adequate and quality trauma care services. Therefore, it is imperative that the healthcare system develops guidelines and protocols to better equip it to respond to this challenge. A key step is developing standard treatment guidelines for trauma which are suitable for the Indian setting by adapting and contextualizing existing guidelines already being used in other settings.

This Standard Treatment Guideline on Major Trauma aims to begin this process by developing guidelines on major trauma in the Indian health setting. This document does not seek to exhaustively cover every aspect of major trauma and would need to be periodically updated. It

would be focusing primarily on major trauma among the adult population covering broad issues such as management of airway, breathing, hemorrhage, pain and other broad areas of trauma without going into definitive care. Recognizing the role played by patient carers in the healthcare system in India, it will include key information to support and guide patients and their carers.

Moreover, the resource availability both equipments and personnel is different in different settings. This document acknowledges that it cannot solve all the challenges of providing trauma care in every health facility given the differences in resources available in different facilities. But it is a tool for medical professionals to enhance the effectiveness and the quality of the services that they can provide and thereby make improvements in the management of major trauma in their own facilities with the resources that they have. Thus, the STG aims to contribute in better planning and provisioning of trauma care services to be made available in the Indian context.

II. Scope of STG Major Trauma Management

A) Population

Adult Population more than 18 years of age

B) Health settings

Primary, secondary and tertiary health care settings

C) Key issues that will be covered

1. Prehospital care

Briefly describing the management of airway, breathing, circulation, spine and fractures in pre-hospital settings.

2. In-Hospital care

1) Airway management with cervical spine protection
   - ŏ Definitive airway control

2) Breathing and ventilation
   - ŏ Recognition of chest trauma(clinical assessment) and management of life saving chest trauma and pneumothorax.
   - ŏ Imaging assessment of chest trauma (including choice and timing of imaging modality and imaging parameters) such as, X-ray, FAST, CT

3) Circulation with haemorrhage control
   - ŏ Assessment and management of haemorrhage and shock
   - ŏ Control of external haemorrhage, non compressible haemorrhage
   - ŏ Control of haemorrhage
     - o use of major haemorrhage protocols
     - o damage-control surgery
   - ŏ Management of shock
     - o i.v. access
     - o hypotensive versus normotensive resuscitation
     - o type of fluid replacement
     - o Intravenous fluid therapy
     - o haemostatic agents
   - ŏ Monitoring
     - o blood tests
     - o frequency of monitoring
   - ŏ Management of specific complications in hospital relating to anticoagulation reversal.

4) Head Injury management
   - ŏ Early management

5) Spine trauma management

6) Major Fracture management
   - ŏ Stabilization of Major fractures (Pelvic, long bone)
   - ŏ Assessment of Vascular complications related to fractures

7) Assessment and management of pain relief

8) Skills to be present within the multidisciplinary team

9) Documentation of clinical assessments and management for people with major trauma

10) Information and support needs of patients and their families and carers when appropriate.

D) Clinical issues that will not be covered

a) Prevention of major trauma.
b) Any management after definitive life saving or limb saving intervention.
c) Major trauma resulting from burns.
d) Head injury (for disability relating to neurological assessment)
e) Details of Pre-hospital management of trauma (extrication, whom to transfer, where to transfer)
f) Trauma Rehabilitation

E) Main outcomes

a) Mortality.
b) Morbidity
c) Health related quality outcomes.
d) Time to operating theatre, time to CT scan, time to definitive control of haemorrhage (surrogate outcome of quality of care).

III Recommendations

“Since the management of Trauma is situation based and treatment may undergo change accordingly, the guidelines are therefore recommendatory only"

1. Pre-Hospital

1.1. Airway management

1.1.1 Consider using a supraglottic device* if the patient's airway reflexes are absent. Use basic airway manoeuvres like inserting a Guedelôs airway** and bag and mask ventilation if required or if supraglottic device placement is not possible.

*supraglottic device - Laryngeal mask airway, proseal, i-gel etc.

**Guedels airway = Oropharyngeal airway/oral airway

1.2 Chest Trauma

1.2.1 Use clinical assessment to diagnose pneumothorax for the purpose of triage or intervention

1.2.2 In patients with an open pneumothorax: Cover the open pneumothorax with a three sided occlusive dressing and Observe for the development of a tension pneumothorax

1.3 Haemorrhage

1.3.1 Use simple dressings (sterile gauze pads) with direct pressure to control external haemorrhage.

1.3.2 In patients with major limb trauma use a tourniquet* if direct pressure has failed to control life threatening haemorrhage.

(*Tourniquet can be a bandage roll, rubber tubing , crepe bandage etc.)

1.3.3 If active bleeding is suspected from a pelvic fracture after blunt high-energy trauma: Apply a pelvic binder

1.3.4 Use intravenous tranexamic acid as soon as possible in patients with major trauma and active or suspected active bleeding.

(*Dose of Tranexamic acid - 1 gm i.v. over 10 min followed by 1 gm I.v. over 8 hrs)

1.3.5 Do not use intravenous tranexamic acid more than 3 hours after injury in patients with major trauma

1.3.6 For circulatory access in patients with major trauma in pre-hospital settings: Use peripheral intravenous access.

1.3.7 In pre-hospital settings, titrate volume resuscitation to maintain a palpable central pulse(carotid or femoral).

1.3.8 In pre-hospital settings only use crystalloids (Ringerôs lactate or Normal saline) to replace fluid volume in patients with active bleeding

1.3.9 Minimise ongoing heat loss in patients with major trauma.

*Blankets can be used for reducing heat loss

1.4 Pain Management

1.4.1 Assess pain regularly in patients with major trauma using a pain assessment scale
1.4.2 For patients with major trauma, use intravenous morphine/strong opioids as the first line analgesic and adjust the dose as needed to achieve adequate pain relief
*To be administered after medical consult

1.5 Spine Trauma

1.5.1 Carry out full in-line* spinal immobilisation
*By placing two blocks on either side of the head. Intravenous fluid bottles can also be used to prevent movement.

1.6 Fractures

1.6.1 Do not irrigate open fractures of the long bones, hindfoot or midfoot in pre-hospital settings
1.6.2 Consider a saline soaked dressing covered with an occlusive layer for open fractures in pre-hospital settings.
1.6.3 In the pre-hospital setting, consider the following for people with suspected long bone fractures of the legs: A rigid or malleable splint or adjacent leg as a splint if the suspected fracture is above the knee

2. In-Hospital Care

2.0 Airway and Chest trauma Management

2.1 Airway Assessment

2.1.1 A clinical examination of the thorax and respiratory function must be carried out.
2.1.2 The examination should include as a minimum the measurement of the respiratory rate and auscultation of the lungs. The examination should be repeated.
2.1.3 The following can be helpful: inspection (bilaterally unequal in respiratory excursion, unilateral bulging, paradoxical respiration), palpation (pain, crepitations, subcutaneous emphysema, instability) and percussion (hyperresonant percussion) of the thorax together with pulse oxymetry and, in ventilated patients, monitoring ventilation pressure(if available).

2.2 Securing Airway

2.2.1 Manual in-line stabilization should be carried out for endotracheal intubation with the cervical spine immobilization device temporarily removed.
2.2.2 A difficult airway must be anticipated when endotracheally intubating a trauma patient.
2.2.3 The multiply injured patient must be preoxygenated before anesthesia.
2.2.4 Use drug-assisted rapid sequence induction (RSI) of anaesthesia and intubation as the definitive method of securing the airway in patients with major trauma who cannot maintain their airway and/or ventilation.
2.2.5 If RSI fails, use basic airway manoeuvres and adjuncts and/or a supraglottic device until a surgical airway or assisted tracheal placement is performed.

2.2.6 If difficult anesthetization and/or endotracheal intubation are expected, an anesthesiologist must carry out or supervise this procedure in-hospital provided this does not cause delay in an emergency life-saving measure.
Suitable measures must be in place to ensure that an anesthesiologist is normally on site in time
2.2.7 After more than 3 intubation attempts, alternative methods must be considered for ventilation and securing an airway.
2.2.8 Alternative methods for securing an airway must be provided when anesthetizing and endotracheally intubating a multiply injured patient.
*Alternatives like emergency cricothyroidotomy or surgical airway
2.2.9 Etomidate should be avoided as an induction agent due to the associated side effects on adrenal function .
*Ketamine can be used as a safe alternative as an induction agent. Dose- 1-2 mg/kg, time to effect of 45-60 seconds.
2.2.10 ECG, blood pressure measurement, pulse oxymetry and capnography(if available) must be used to monitor the patient for anesthesia induction, endotracheal intubation and emergency anesthesia.
2.2.11 Normoventilation must be carried out in endotracheally intubated and anesthetized trauma patients.
2.2.12 Ventilation must be monitored and controlled by frequent arterial blood gas analyses(if available) in the hospital.
If ABG analysis not available, then keep a check clinically by observing the chest rise & four point auscultation of the chest.
2.2.13 In mandible and maxillofacial injuries, primary securing of the airways and hemostasis in the oral and maxillofacial region must be carried out.

2.3 Chest Trauma Diagnosis and Management
2.3.1 A suspected diagnosis of pneumothorax and/or hemothorax must be made if breath sounds are weaker or absent on one side (after checking correct placement of the tube). Absence of such auscultation findings largely rules out a larger pneumothorax, especially if the patient is normopneic and has no chest pain.
2.3.2 A suspected diagnosis of tension pneumothorax should be made if auscultation of the lung reveals no breath sounds unilaterally (after checking correct placement of the tube) and, in addition, typical symptoms are present, particularly severe respiratory disorder or upper inflow congestion combined with arterial hypotension.
2.3.3 Clinically suspected tension pneumothorax must be decompressed* immediately.
*Chest decompression mainly refers to tube thoracostomy/ Chest drain placement.

2.3.4 Use open thoracostomy instead of needle decompression if the expertise is available, followed by a chest drain via the thoracostomy in patients who are breathing spontaneously.
*Open method of chest drain insertion to be preferred over trocar method. Needle decompression should not be attempted unless absolutely indicated.
2.3.5 Observe patients after chest decompression for signs of recurrence of the tension pneumothorax.

2.3.6 In patients with an open pneumothorax: cover the open pneumothorax with a simple occlusive dressing and observe for the development of a tension pneumothorax.
2.3.7 Pneumothorax diagnosed on the basis of an auscultation finding in a patient on positive pressure ventilation should be decompressed.
2.3.8 Pneumothorax diagnosed on the basis of an auscultation finding in patients not on ventilation should usually be managed by close clinical observation.
2.3.9 Pneumothorax should be treated with a chest drain provided the indication exists.
2.3.10 If there are perforating chest injuries, embedded foreign bodies should only be removed during surgery under controlled conditions after opening up the chest.
2.3.11 A penetrating chest injury, which is the cause of hemodynamic instability in the patient, must undergo an immediate exploratory thoracotomy.
2.3.12 A thoracotomy can be performed if there is an initial blood loss of > 1,500 ml from the chest drain or if there is persistent blood loss of > 250 ml/h over more than 4 hours.

2.4 Imaging in Chest Trauma

2.4.1 Imaging for chest trauma in patients with suspected chest trauma should be performed urgently, and the images should be interpreted immediately by a healthcare professional with training and skills in this area.
2.4.2 Consider immediate chest X-ray and/or eFAST (extended focused assessment with sonography for trauma) as part of the primary survey to assess chest trauma with severe respiratory compromise.
2.4.3 Consider immediate CT for those with suspected chest trauma without severe respiratory compromise who are responding to resuscitation or whose haemodynamic status is normal.

3.0 Haemorrhage and Shock

3.1 Dressings and tourniquets in hospital settings

3.1.1 Use simple dressings* with direct pressure to control external haemorrhage.
*sterile gauze pads
3.1.2 In patients with major limb trauma use a tourniquet* if direct pressure has failed to control life-threatening haemorrhage.
*a bandage,a strip of cloth,a band of rubber,etc.,that checks bleeding or blood flow by compressing the blood vessels

3.2 Haemostatic agents in hospital settings

3.2.1 Use intravenous tranexamic acid as soon as possible in patients with major trauma and active or suspected active bleeding.
Dosage as German guidelines Tranexamic acid initially 1 g i.v. as saturation over 10 minutes + 1 g over 8 hours (CRASH 2 Trials) * Or 2 g (15ï 30 mg/kg)
3.2.2. Do not use intravenous tranexamic acid more than 3 hours after injury in patients with major trauma.

3.3 Anticoagulant reversal in hospital settings

3.3.1 Rapidly reverse anticoagulation in patients who have major trauma with haemorrhage.

3.3.2 FFP (10-15ml/kg body weight)is recommended when there is bleeding associated with clotting factors deficiency and if no alternative processed products or specific factor concentrates are available.

If immediate reversal of warfarin effect is required. Intravenous vitamin K 5mg should be concurrently given for sustained reversal of warfarin effect

*Management of bleeding following major trauma: an updated European guideline Rolf Rossaint et al.

3.3.3 Consult a physician immediately for advice on adults (18 or over) who have active bleeding and need reversal of any anticoagulant agent other than a vitamin K antagonist.

3.3.4 Do not reverse anticoagulation in patients who do not have active or suspected bleeding.

3.4 Trauma induced coagulopathy

3.4.1 Trauma-induced coagulopathy is an autonomous clinical picture with clear influences on survival. For this reason, coagulation diagnostic tests* and therapy must be started immediately in the emergency room.

*Coagulation diagnostic tests - Platelets, PT/INR, APTT and Fibrinogen (if available)

3.5 Activating major haemorrhage protocols in hospital settings

3.5.1 Use physiological criteria that include the patient's haemodynamic status and their response to immediate volume resuscitation to activate the major haemorrhage protocol.

3.5.2 Do not rely on a haemorrhagic risk tool* applied at a single time point to determine the need for major haemorrhage protocol activation.

*For example: ABC score, TASH score, PWH score, McLaughlin score, Emergency transfusion score, Shock Index etc These measure variables at a single point in time.

3.6 Circulatory access in hospital settings

3.6.1 For circulatory access in patients with major trauma in hospital settings: use peripheral intravenous access (14 or 16 gauge intravenous cannula) or if peripheral intravenous access fails, a venous cutdown should be done.

3.7 Volume resuscitation in hospital settings

3.7.1 For patients with active bleeding use a restrictive*/balanced approach to volume resuscitation until definitive early control of bleeding has been achieved,

*Restrictive resuscitation - in order to keep the circulation at a low stable level (Systolic BP: 90 mmHg or palpable central pulse) and not exacerbate the bleeding. (from the german guidelines)

3.7.2 In hospital settings, titrate volume resuscitation to maintain a palpable central pulse (carotid or femoral).

3.7.3 For patients who have haemorrhagic shock and a traumatic brain injury: if haemorrhagic shock is the dominant condition, continue restrictive volume resuscitation or if traumatic brain injury is the dominant condition, use a less restrictive volume resuscitation approach to maintain cerebral perfusion.

3.7.4 Damage Control resuscitation:

- ŏ In patients who are actively bleeding, the goal can be set at mean arterial pressure ~ 65 mmHg and systolic arterial pressure ~ 90 mmHg until surgical hemostasis.
- ŏ Suitable measures should be taken and treatment given to avoid hypothermia.
- ŏ Acidemia should be avoided and treated by suitable treatment.

3.8 Fluid replacement in hospital settings

3.8.1 In hospital settings, only use crystalloids* to replace fluid volume in patients with active bleeding if blood components are not available.

* preferably Normal saline,Ringers lactate. Glucose containing fluid should be avoided in (a head injury) patients, during initial resuscitation.

3.8.2 Human albumin must not be used in hospital volume replacement.

3.8.3 Colloidal solutions can be used in hypotensive trauma patients, if available and preference should be given to HES 130/0.4.

3.9 Haemorrhage protocols in hospital settings

3.9.1 Hospital should have specific major haemorrhage protocols for adults.

3.9.2. For patients with active bleeding, start with a fixed-ratio protocol (1:1:1 FFP: platelets: RBC) for blood components and change to a protocol guided by laboratory coagulation results at the earliest opportunity.

In patients with Grade 3 and 4 hemorrhagic shock with imminent threat to life and if components are not available then whole blood can be given to stabilize the patient before transferring to a higher centre[MK5] .

3.9.3 In an actively bleeding patient, the indication for transfusion can be made at hemoglobin levels below 10 g/dL, and the hematocrit value maintained at 30%.

3.9.4 In critically ill trauma patients, transfusion strategy to be employed

- ŏ Hb concentration <7 g/dL, RBC transfusion is likely to be appropriate; however, transfusion may not be required in well-compensated patients or where other specific therapy is available.
- ŏ Hb concentration of 7ï 9 g/dL, RBC transfusion is not associated with reduced mortality. The decision to transfuse patients (with a single unit followed by reassessment) should be based on the need to relieve clinical signs and symptoms of anaemia.
- ŏ Hb concentration >9 g/dL, RBC transfusion is generally unnecessary.

3.9.5 Red blood cell (RBC) transfusion should not be dictated by a haemoglobin (Hb) concentration alone, but should also be based on assessment of the patient's clinical status

3.9.6 Replacement of fibrinogen should be carried out, if test provisions are available, at levels < 1.5 g/l (150 mg/dl).

3.10 Haemorrhage imaging in hospital settings

3.10.1 Imaging for haemorrhage in patients with suspected haemorrhage should be performed urgently, using FAST, and a CT if required, and the images should be interpreted immediately by a healthcare professional with training and skills in this area.

3.10.2 Limit diagnostic imaging (such as chest and pelvis X-rays or FAST [focused assessment with sonography for trauma]) to the minimum needed to direct intervention in patients with suspected haemorrhage and haemodynamic instability who are not responding to volume resuscitation.
3.10.3 Be aware that a negative FAST does not exclude intraperitoneal or retroperitoneal haemorrhage.
*To repeat a FAST examination if clinical index of suspicion for intraperitoneal hemorrhage.
3.10.4 Consider immediate CT for patients with suspected haemorrhage only if they are responding to resuscitation or if their haemodynamic status is normal.

3.11 Damage control surgery
3.11.1 Use damage control surgery in patients with haemodynamic instability who are not responding to volume resuscitation.

3.12 Resuscitation (Criteria for Cardiac arrest after trauma)
3.12.1 In the case of definitive cardiac arrest or uncertainties in detecting a pulse or other clinical signs that make cardiac arrest likely, resuscitation must be started immediately
3.12.2 During resuscitation, trauma-specific reversible causes of cardiac arrest ., airway obstruction, esophageal intubation, hypovolemia, tension pneumothorax or pericardial tamponade) should be diagnosed and treated.
3.12.3 If resuscitation is unsuccessful after eliminating possible causes of cardiac arrest, cardiopulmonary resuscitation must be stopped.

3.13 Role of Emergency Thoracotomy
3.13.1 If expertise is available, emergency thoracotomy should be performed in the case of penetrating injuries, particularly if the onset of cardiac arrest is recent and vital signs are initially present.

4.0 Head Injury initial management

4.1.1State of consciousness with pupil function and Glasgow Coma Scale (bilateral motor function) must be recorded and documented at repeated intervals.
4.1.2 The goals are normoxia*, normocapnia**, and normotension***. A fall in arterial oxygen saturation below 90% must be avoided.
*Normoxia - sPO2>90%
**Normocapnia - paCO2 = 35 -40 mmHg{4.7kPa}
***Normotension - SBP Ó90 mmHg

4.1.3 Intubation with adequate ventilation (with capnometry and blood gas analysis if available) must be carried out in unconscious patients (reference value GCS Ò8).

4.1.4 A Cranial Computed Tomography scan must be performed in the case of polytrauma after stabilization with suspected traumatic brain injury.
4.1.5 A (monitoring) CT scan must be performed in the case of neurologic deterioration.
4.1.6 Glucocorticoids must not be administered in the treatment of TBI.
4.1.7 If severely elevated intracranial pressure is suspected, particularly with signs of transtentorial herniation (pupil widening, decerebrate rigidity, extensor reaction to painful stimulus, progressive clouded consciousness), the following treatments can be given:

- ŏ Hyperventilation where ABG analysis is available*
- ŏ Mannitol**

* 20 breaths per minute to maintain paCO2 at 30-35 mm of Hg
**20% solution at 0.5-2 gm/kg over 30 to 60 minutes

5.0 Spinal Injury Management

5.1 Assessment for spinal injury

5.1.1 On arrival at the hospital, use a prioritising sequence to assess people with suspected trauma, for example ABCDE:

- ŏ Airway with in-line spinal immobilisation
- ŏ Breathing
- ŏ Circulation
- ŏ Disability (neurological)
- ŏ Exposure and environment.

5.1.2 At all stages of the assessment:

- ŏ protect the person's cervical spine with manual in-line spinal immobilisation, particularly during any airway intervention and
- ŏ avoid moving the remainder of the spine.

5.1.3 History and thorough clinical examination for spinal injury including the functions associated with it must be carried out.
5.1.4. The spine is suspected to be stable, unless any of the following 5 criteria are present,

- impaired consciousness
- ŏ neurologic deficit
- ŏ spinal pain or myogelosis
- ŏ intoxication
- ŏ trauma in the extremities

*myogelosis (area of hard or stiff muscle)
5.1.5 The presence of a spinal injury must be assumed in unconscious patients until evidence to the contrary is found.
5.1.6 Carry out full in-line spinal immobilisation if any of the factors in recommendation 4.1.4 are present or if this assessment cannot be done.

5.2Assessment of Cervical Spine

5.2.1 Assess whether the person is at high, low or no risk for cervical spine injury using the Canadian C-spine rule as follows:

- ➔ the person is at high risk if they have at least one of the following high-risk factors:
  - ŏ age 65 years or older
  - ŏ dangerous mechanism of injury (fall from a height of greater than 1 metre or 5 steps, axial load to the head ï for example diving, high-speed motor vehicle collision, rollover motor accident, ejection from a motor vehicle, accident involving motorised recreational vehicles, bicycle collision, horse riding accidents)
  - ŏ paraesthesia in the upper or lower limbs
- ➔ the person is at low risk if they have at least one of the following low-risk factors:
  - ŏ involved in a minor rear-end motor vehicle collision
  - ŏ comfortable in a sitting position
  - ŏ ambulatory at any time since the injury
  - ŏ no midline cervical spine tenderness
  - ŏ delayed onset of neck pain
- ➔ the person remains at low risk if they are:
  - ŏ unable to actively rotate their neck 45 degrees to the left and right (the range of the neck can only be assessed safely if the person is at low risk and there are no high-risk factors).t
- ➔ the person has no risk if they:
  - ŏ have one of the above low-risk factors and,
  - ŏ are able to actively rotate their neck 45 degrees to the left and right.

5.3 Assessment of Thoracic or Lumbosacral Spine

5.3.1 Assess the person with suspected thoracic or lumbosacral spine injury using these factors:

- ŏ age 65 years or older and reported pain in the thoracic or lumbosacral spine
- ŏ dangerous mechanism of injury (fall from a height of greater than 3 metres, axial load to the head or base of the spine ï for example falls landing on feet or buttocks, high-speed motor vehicle collision, rollover motor accident, lap belt restraint only, ejection from a motor vehicle, accident involving motorised recreational vehicles, bicycle collision, horse riding accidents)
- ŏ pre-existing spinal pathology, or known or at risk of osteoporosis ï for example steroid use
- ŏ suspected spinal fracture in another region of the spine
- ŏ abnormal neurological symptoms (paraesthesia or weakness or numbness)
- ŏ on examination:
  - ➢ abnormal neurological signs (motor or sensory deficit)
  - ➢ new deformity or bony midline tenderness (on palpation)
  - ➢ bony midline tenderness (on percussion)

- ➢ midline or spinal pain (on coughing)
- ŏ on mobilisation (sit, stand, step, assess walking): pain or abnormal neurological symptoms (stop if this occurs).

5.4 When to carry out in-line spinal immobilisation

5.4.1 Carry out or maintain full in-line spinal immobilisation if:

- ŏ a high-risk factor for cervical spine injury is identified and indicated by the Canadian C-spine rule
- ŏ a low-risk factor for cervical spine injury is identified and indicated by the Canadian C-spine rule and the person is unable to actively rotate their neck 45 degrees left and right
- ŏ indicated by one or more of the factors listed in recommendation 5.3.1

5.4.2 Do not carry out or maintain full in-line spinal immobilisation in people if:

- ŏ they have low-risk factors for cervical spine injury and, are pain free and are able to actively rotate their neck 45 degrees left and right
- ŏ they do not have any of the factors listed in recommendation 5.3.1

5.5 How to carry out full in-line spinal immobilisation

5.5.1 The spinal immobilisation devices need to be adjusted In uncooperative, agitated or distressed people, think about letting them find a position where they are comfortable with manual in-line spinal immobilisation.

5.5.2 When carrying out full in-line spinal immobilisation in adults, manually stabilise the head with the spine in-line using the following stepwise approach:

- ŏ Fit an appropriately sized semi-rigid collar unless contraindicated by:
  - ➔ a compromised airway
  - ➔ known spinal deformities, such as ankylosing spondylitis (in these cases keep the spine in the person's current position).
- ŏ Reassess the airway after applying the collar.
- ŏ Place and secure the person on a stretcher.

5.6 When to carry out or maintain full in-line spinal immobilisation and request imaging

5.6.1 Carry out or maintain full in-line spinal immobilisation and request imaging if:

- ŏ a high-risk factor for cervical spine injury is identified and indicated by the Canadian C-spine rule or
- ŏ a low-risk factor for cervical spine injury is identified and indicated by the Canadian C-spine rule and the person is unable to actively rotate their neck 45 degrees left and right or
- ŏ indicated by one or more of the factors listed in recommendation 4.3.1

5.6.2 Do not carry out or maintain full in-line spinal immobilisation or request imaging for people if:

- ŏ they have low-risk factors for cervical spine injury as identified and indicated by the Canadian C-spine rule, are pain free and are able to actively rotate their neck 45 degrees left and right
- ŏ they do not have any of the factors listed in recommendation 4.3.1

5.7 Diagnostic imaging

5.7.1 Imaging for spinal injury should be performed urgently, and the images should be interpreted immediately by a healthcare professional with training and skills in this area after stabilisation.

5.7.2 Perform CT in adults if;

- ŏ imaging for cervical spine injury is indicated by the Canadian C-spine rule (see recommendation 4.6.1) or
- ŏ there is a strong suspicion of thoracic or lumbosacral spine injury associated with abnormal neurological signs or symptoms.

C spine xray should be considered if CT is not available with caution of high false negative rate.

5.7.3 If, after CT, there is a neurological abnormality which could be attributable to spinal cord injury, advice MRI.

5.8 Lumbosacral Spine Imaging

5.8.1 Perform an X-ray as the first-line investigation for people with suspected spinal column injury without abnormal neurological signs or symptoms in the thoracic or lumbosacral regions (T1ï L3).

5.8.2 Perform CT if the X-ray is abnormal or there are clinical signs or symptoms of a spinal column injury.

5.8.3 If a new spinal column fracture is confirmed, image the rest of the spinal column.

5.8.4 After circulatory stabilization and before transfer from the emergency room, a spinal injury should be cleared by clinical examination or imaging . (if available).

5.9 Medications

5.9.1 Do not use the following medications, aimed at providing neuroprotection and prevention of secondary deterioration, in the acute stage after acute traumatic spinal cord injury:

- ŏ Methylprednisolone
- ŏ Nimodipine
- ŏ Naloxone.

5.9.2 Do not use medications in the acute stage after traumatic spinal cord injury to prevent neuropathic pain from developing in the chronic stage.

6.0 Pelvic Fracture Management

6.1 Using a pelvic binder

6.1.1. An acute life-threatening pelvic injury must be excluded when the patient is admitted to the hospital.

6.1.2 The stability of the patientôs pelvis must be clinically examined.
6.1.3 If active bleeding is suspected from a pelvic fracture following blunt high energy trauma, apply a pelvic binder.

6.2 Pelvic imaging

6.2.1 During the diagnostic study a pelvic survey radiograph should be taken and/or computed tomography (CT) be performed once patient is stabilized*.
*unstable patients do portable X-Ray if available
6.2.2 Use CT (if available, otherwise X-ray) for first-line imaging with suspected high energy pelvic fractures once patient is stabilized
6.2.3 Unstable patients with suspected active bleeding from pelvic fracture, use:

- ð pelvic packing to stabilize the patient.

6.3 Removing a pelvic binder

6.3.1 For people with suspected pelvic fractures and pelvic binders, remove the binder as soon as possible if:

- ð there is no pelvic fracture, or
- ð a pelvic fracture is identified as mechanically stable, or
- ð the binder is not controlling the mechanical stability of the fracture, or
- ð there is no further bleeding or coagulation is normal.

Remove all pelvic binders within 24 hours of application.

6.4 Log rolling

6.4.1 Do not log roll people with suspected pelvic fractures before pelvic imaging unless:

- ð an occult penetrating injury is suspected in a person with haemodynamic instability
- ð log rolling is needed to clear the airway (for example, suction is ineffective in a person who is vomiting).
- ð When log rolling, pay particular attention to haemodynamic stability.

7.0 Management of open fractures and complications

7.1 Open fractures

7.1.1 Do not irrigate open fractures of the long bones, hindfoot or midfoot in the emergency department before debridement.
7.1.2 Consider a saline-soaked dressing covered with an occlusive layer (if not already applied) for open fractures in the emergency department before debridement.
7.1.3 In the emergency department, administer prophylactic intravenous antibiotics immediately to people with open fractures if not already given.
7.1.4 Do not base the decision whether to perform limb salvage or amputation on an injury severity tool score.
7.1.5 Perform emergency amputation when:

- ð A limb is the source of uncontrollable life-threatening bleeding, or

- ð A limb is salvageable but attempted preservation would pose an unacceptable risk to the person's life, or
- ð A limb is deemed unsalvageable after orthoplastic assessment

7.1.6 Perform debridement:

- ð Immediately for highly contaminated open fractures
- ð Within 24 hours of injury for all other open fractures management

7.2 Vascular injury

7.2.1 Use hard signs (lack of palpable pulse, continued blood loss, or expanding haematoma) to diagnose vascular injury.

7.2.2 Do not rely on capillary return or Doppler signal to exclude vascular injury.

7.2.3 Perform immediate surgical exploration if hard signs of vascular injury persist after any necessary restoration of limb alignment and joint reduction. Do not delay revascularisation for angiography in people with complex fractures

7.3 Compartment syndrome

7.3.1 In people with fractures of the tibia, maintain awareness of compartment syndrome for 48 hours after injury or fixation by regularly assessing and recording clinical symptoms and signs in hospital

8.0 Pain management in Major trauma

8.1.1 Assess pain regularly in patients with major trauma using a pain assessment scale suitable for patients cognitive function.

8.1.2 For patients with major trauma, use intravenous morphine/opiods as the first-line analgesic and adjust the dose as needed to achieve adequate pain relief.

Dose of Morphine ï 2.5-5 mg/kg q 4h

Pentazocine Dosing: Adult IV: 30 mg every 3-4 hours.

Butorphanol:IV: Initial: 1 mg, may repeat every 3-4 hours as needed.

Buprenorhine:Slow IV: Initial: 0.3 mg every 6 to 8 hours as needed;

8.1.3 Consider ketamine in analgesic doses as a second-line agent.

*Dose of Ketamine 1-4.5 mg/kg (medscape)

8.2 Efficacy of Analgesic Modalities in blunt thoracic trauma

8.2.1 Epidural analgesia is the preferred mode of analgesia delivery in severe thoracic trauma.

9.0 Providing support and Information to patients & relatives

Providing information about patients to the next level hospital/casualty

9.1 Providing support

9.1.1 When communicating with patients, family members and carers

- ð manage expectations and avoid misinformation
- ð answer questions and provide information honestly, within the limits of your knowledge

- ð do not speculate and avoid being overly optimistic or pessimistic when discussing information on further investigations, diagnosis or prognosis
- ð ask if there are any other questions.

9.1.2 The trauma team structure should include a clear point of contact for providing information to patients, their family members and carers.

9.2 Providing information

9.2.1 Explain to patients, family members and carers what is happening and why it is happening. Provide:

- ð information on known injuries
- ð details of immediate investigations and treatment, and if possible include time schedules.

9.2.2 Offer people with fractures the opportunity to see images of their injury, taken before and after treatment.

9.2.3 Provide people with fractures on the following when the management plan is agreed or changed:

- ð expected outcomes of treatment, including time to returning to usual activities and the likelihood of permanent effects on quality of life (such as pain, loss of function and psychological effects)
- ð amputation, if this is a possibility
- ð activities they can do to help themselves
- ð home care options, if needed
- ð rehabilitation, including whom to contact and how (this should include information on the importance of active patient participation for achieving goals and the expectations of rehabilitation)
- ð mobilisation and weight bearing, including upper limb load bearing for arm fractures.

9.2.4 Document all key communications with patients, family members and carers about the management plan.

9.2.5 Ensure that all health and social care practitioners have access to information previously given to people with fractures to enable consistent information to be provided.

9.3 Providing information about transfer from an emergency department

9.3.1 For patients who are being transferred from an emergency department to another centre, provide verbal and written information that includes:

- ð the reason for the transfer
- ð the location of the receiving centre and the patient's destination within the receiving centre
- ð the name and contact details of the person responsible for the patient's care at the receiving centre (if possible)
- ð the name and contact details of the person who was responsible for the patient's care at the initial hospital.

9.4 Recording information in before transferring to definitive care settings

9.4.1 Record the following in people with major trauma in hospital settings:

- ABCDE (airway with in-line spinal immobilisation, breathing, circulation, disability [neurological], exposure and environment)
- History and Examination.

9.4.2 If possible, record information on whether the assessments show that the person's condition is improving or deteriorating.

9.4.3 Record pre-alert information using a structured system and include all of the following:

- the patient's age and sex
- time of incident
- mechanism of injury
- injuries suspected
- signs, including vital signs and Glasgow Coma Scale
- treatment so far
- estimated time of arrival at emergency department
- special requirements
- the ambulance call sign, name of the person taking the call and time of call
-

9.5 Training and skills

9.5.1 Ensure that each healthcare professional within the trauma service has the training and skills to deliver, safely and effectively, the interventions they are required to give as per this guideline.

Training in the form of ATLS, NTMC, EMTC etc

9.6 Receiving information in hospital settings

9.6.1 Casualty Medical Officer/Trauma team leader in the emergency department should receive the pre-alert information, and determine the level of trauma team response according to agreed and written local guidelines.

9.6.2 The trauma team leader should be easily identifiable to receive the handover and the trauma team ready to receive the information.

9.6.3 The pre- hospital documentation, including the recorded pre-alert information, should be quickly available to the trauma team and placed in the patient's hospital notes.

9.7 Sharing information in hospital settings

9.7.1 Follow a structured process when handing over care within the emergency department (including shift changes) and to other departments. Ensure that the handover is documented.

9.7.2 Ensure that all patient documentation, including images and reports, goes with the patient when they are transferred to other departments or centres.

9.7.3 Produce a written summary, which gives the diagnosis, management plan and expected outcome and:

- is aimed at and sent to the patient's referring physician/surgeon/primary or secondary care hospital within 24 hours of admission

- ð includes a summary written in plain English/local language that is understandable by patients, family members and carers
- ð is readily available in the patient's records.

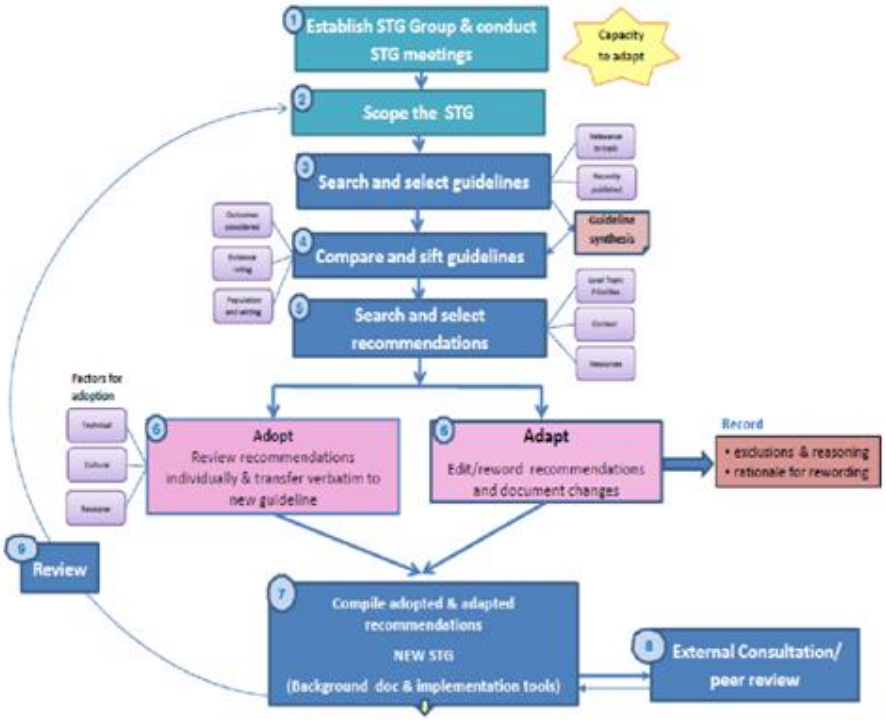
IV. Background

A Task Force was constituted in December 2014 to guide the development of Standard Treatment Guidelines (STG) in India. The Task Force subsequently approved the draft STG development manual of India (Part 1) for development of adapted guidelines. This taskforce essentially decides the clinical subgroup topics as per the public health needs of the country. Each Clinical subgroup is headed by a facilitator which forms the guideline choosing his writing team and expert group for that particular topic.
A meeting was held on 12th May 2016 at National Health System Resource Centre (NHSRC) and management for Major trauma guideline was finalized for the surgery clinical subgroup.

Methods of STG Development in India

The NHSRC with technical support from National Institute for Health and Care Excellence (NICE), United Kingdom (UK), carried out a training workshop in May 2015 to guide the STG group members and chairs on the methodology to follow in developing adapted STGs suitable for the Indian context. This workshop was conducted on 29th& 30th May, 2015 and two members (NR, MK) of the surgery clinical subgroup team attended. Subsequently, NHSRC facilitated the STG development process by providing resources approved by the Ministry of Health & family welfare to the expert group.

The processes and methods used in developing this STG were drawn on those outlined in the STG development manual of India (Part 1) for development of adapted guidelines and summarized in the Stepwise guide on STG development. The figure below contains a schematic of the process followed and each of the steps is detailed in subsequent sections below for the formation of Major trauma management guideline.



How this STG was developed

1. Establish the STG group and conduct STG Meetings

The STG on Major trauma management was developed by a team of experts, subject matter experts, patient representative undertook the development of this STG on Major trauma management. Official letters of invite were sent from NHSRC head office. One of the members who were invited could not attend the meetings and so was subsequently dropped and new experts were invited. The following are the names of the group members, their roles in the development of the STG on Major trauma, along with their specialties and organization are listed below,

Major Trauma Group Members			
Roles	**Name**	**Title**	**Specialist Area**
Facilitator	Prof. Nobhojit Roy	Professor & Head, Department of Surgery, BARC Hospital (HBNI University), Mumbai	Surgeon, Public Health Specialist

Expert	Dr. Manjul Joshipura	President, IATSIC (International Association for Trauma and Surgical Intensive Care) Director of Academy of Traumatology, India	Orthopedic Surgeon
Private Practitioner	Dr. Sudheer Ambekar	Consultant, Division of Skullbase and Cerebrovascular Surgery, Department of Neurological Surgery, Jaslok Hospital and Research Centre, Mumbai	Neurosurgeon
Physician Expert	Kapildev Soni	Assistant Professor in Critical & Intensive care, JPN Apex Trauma Centre, AIIMS, New Delhi	Anesthetist and Critical Care Specialist
Paramedic	Dr. Ganesh Auti	Training Manager and Instructor, Life Supporters Institute of Health Sciences, Mumbai	Pre Hospital Emergency specialist
Rehabilitation Expert	Dr. Swagatika Mishra	Prosthetics & Orthotics Unit and laboratory, Mahatma Gandhi Mission (MGM) Hospital	Orthotist
Primary Care Practitioner	Dr. Aditi Kashikar	MGIMS, Wardha	General Practitioner
Patient Representative	Siddharth David	Tata Institute of Social Sciences	Public Health Researcher
NGO/Patient Rights Group	1.Dr. Raman Kataria 2. Dr. Sushil Patil 3.Dr. Nandakumar Menon	1 and 2.Jan Swasthya Sahyog, Ganiyari Village, Bilaspur District, Chhattisgarh 3. Ashwini, Gudalur, Tamil Nadu	1.Pediatric Surgeon 2.Hospital Administrator 3. Secondary Care Surgeon

Writing Team	1. Dr. Monty Khajanchi (Lead) 2. Dr. Bhakti Sarang 3. Dr.Vineet Kumar 4. Dr. Deepa KV	1. Assistant Professor Surgery, Dept. of Surgery, Seth GSMC and KEM Hospital, Mumbai. 2. Assistant Professor Surgery Dept. of Surgery, Raigad Hospital and Research Centre, Karjat. 3. Assistant Professor Surgery, Dept of Surgery, LTMMC and LTMG Hospital, Mumbai. 4. School of Habitat, Tata Institute of Social Sciences, Mumbai.	General and Trauma Surgeons

Expert Advisor

1. Dr. Nitin Gadgil - Additional Professor, Department of Pathology, LTMMC and LTMG Hospital, Mumbai.
2. Dr. B. Suprabhat S - Assistant Professor, Radiology Terna-Sahyadri Hospital (MUHS University).
3. Francoise Cluzeau ï National Institute for Health and Care Excellence, United Kingdom.

The STG Subgroup met once face-to-face and all meetings (including the smaller weekly ones were quorate (50%=8 members). The working group met every Friday evening, over a period of three months. Some of the members joined the small group meetings via video-conference. In the induction and orientation session held on 29th July, 2016 the facilitator (Chair) welcomed all the members of the subgroup, and set up the rules of operation based on the STG development manual, on the consistent use of terminology and definitions, using the structured powerpoint presentation provided by NHSRC/NICE.
Also, the individual members in the writing team kept in touch via e-mails and Whatsapp.

Discussions over the electronic media:

The documents were shared with all the members by utilizing technology like Google Docs, draw.io and personal e-mails wherever required. Any changes made in the document were shared with all the group members. In the event of any areas of uncertainty requiring a discussion,

opinion was sought over electronic media and all issues were addressed after developing mutual consensus. A group was also created on Whatsapp to enable organization of meetings and discussion of issues. In the initial meetings the recommendations were drafted, and in the subsequent meetings, the recommendations were edited.

Details of the meetings are attached below, and supplementary attachments provided of each meeting. (Press ctrl+click)

Meeting Nos. and Date	Minutes	Confirmed
1. 29th July 2016	STG-MT_1_290716	Yes
2. 05th August, 2016	STG-MT_2_050816	Yes
3. 25th August, 2016	STG-MT_3_250816	Yes
4. 2nd September, 2016	STG-MT_4_020916	Yes
5. 10th September, 2016	STG-MT_5_100916	Yes
6. 17th September, 2016	STG-MT_6_170916	Yes
7. 30th September, 2016	STG-MT_7_300916	Yes
8. 7th October, 2016	STG-MT_8_071016	Yes
9. 14th October, 2016	STG-MT_9_141016	No
10. 21st October, 2016	STG-MT_10_211016	Yes

2. Scope of the STG

To develop the scope of this STG we followed the principle of what the scope will include and exclude. It also identifies only the key aspects of care that ñmustò be included, set the ñboundariesò of the development work and provide a clear ñframeworkò to enable work to stay within the agreed priorities, inform the development of the clinical questions and search strategy, inform ñprofessionalsò and the ñpublicò about expected content of the guideline, keep the STG to a ñreasonable sizeò to ensure that its development can be carried out within the ñallocated periodò. Based on these principles, the scope of the STG underwent multiple revisions.

In the 29th July, 2016 and 05th of August, 2016 meeting, the first draft of scope of the diabetic foot guideline was discussed. The scope was subsequently reviewed and approved by the STG sub group face to face meeting on 17th September, 2016. It was decided in this meeting and in

subsequent emails with the expert and facilitator to include some aspects of pre-hospital care, and also to include basics of fracture management till the point of stabilization.

It was decided that this guideline will not include cost-effectiveness analysis and cost impact analysis. The costing task force instituted by the Ministry of Health & Family Welfare may carry out a cost impact analysis of the STG subsequent to its finalization.

The final version of the Scope is above (pgs 5& 6)

3. Selection and Comparison of Guidelines

Before the first face-to-face meeting of the STG sub-group, the working group searched guidelines.gov, NICE, World Health Organization and Google for guidelines based on the scope defined. In addition, the selected guidelines were compared in terms of relevance to the topic and key clinical issues listed in the scope, evidence ratings, target population and also their applicability or relevance to the Indian context. Currency of the selected guideline was censured by including only guidelines published/ updated in the last 5-8 years. After sifting through all the available guidelines, the group selected four guidelines as the primary source guidelines (Guidelines no. 1-4). The selected four guidelines were subsequently approved as source guidelines by the full STG sub group on Major trauma. Some these guidelines were not included in the guidleines.gov site or in the NICE site and these were selected if their evidence was graded as per the AGREE II method (Appraisal of Guidelines Research and Evaluation). These guidelines were ï Guideline on Treatment of Patients with Severe and Multiple Injuries, German Trauma Society.

In addition to the four source guidelines there were 3 other guidelines selected by the group from whom a few recommendations could be adopted/adapted which fitted the scope of this guideline. The following guidelines were selected,

1) National Clinical Guideline Centre. Major trauma assessment and initial management. London (UK): National Institute for Health and Care Excellence(NICE); 2016 Feb 17.22p.(NICE guideline; no.39)

2) National Clinical Guideline Centre. Spinal Injury assessment and initial management. London (UK): National Institute for Health and Care Excellence(NICE); 2016 Feb 17.23p.(NICE guideline;no.41)

3) National Clinical Guideline Centre. Fractures (Complex): assessment and management. London (UK): National Institute for Health and Care Excellence(NICE); 2016 Feb 17.18p.(NICE guideline;no.37)

4) S3- Guidelines on treatment of patients with severe and multiple injuries. English version of the German guideline S3- Leitlinie Polytrauma/ Schwerverletzten- Behandlung (AWMF-Registry No. 012/019)

5) Singapore: Singapore Ministry of Health. Clinical blood transfusion. Singapore: Singapore Ministry of Health; 2011 Feb. 90 p.
6) National Blood Authority. Patient blood management guidelines: module 4 - critical care. Canberra ACT (Australia): National Blood Authority; 2012. 78 p.
7) Management of pulmonary contusion and flail chest, Journal of Trauma and Acute Care Surgery,2012

The following guidelines were not selected and reasons mentioned as below,

Guidelines available	Rationale
Practice Management Guidelines for Identification of Cervical Spine Injuries Following Trauma: Update From the Eastern Association for the Surgery of Trauma Practice Management Guidelines Committee	Recent guidelines on similar topic were available and their recommendations were more relevant to Indian context
WHO Essential trauma care	The evidence was not graded as per the Agree II method. Also were outdated
Guidelines for a Structured Approach to the Provision of optimal trauma care Royal Australasian College of Surgeons New Zealand Trauma Committee	The evidence was not graded as per the Agree II method.

5) **Search & select recommendations**

The working group created a draft table with proposed recommendations (adopted/ adapted) selected from the selected source guideline. Each key clinical issue defined in the scope of the STG was reviewed and relevant recommendations were searched for in each of the 4 selected guidelines. None of the 4 guidelines individually covered the whole STG scope, so recommendations from all 4 guidelines were used, found best to the Indian setting (for example available expertise and resources for implementing them in practice) and keeping in mind the scope of the guidelines. Each recommendation listed in the draft was circulated 3 days before the meeting and at first the working group discussed these recommendations at length (in meeting 3, 4 and 5). A systematic approach was followed to ensure high quality of the process. The group either adopted/adapted a recommendation and if adapted reasons for the same were mentioned and documented. Implementation challenges were considered when decisions were made to

adopt or adapt recommendations. Factors considered included public/ private health infrastructure available and affordability and primary, secondary and tertiary care.

a) Adopted recommendation - this entailed transferring a recommendation verbatim to the new STG.

b) Adapted recommendation ï This ranged from a minor edit in order to ensure local compatibility with India, or adding precisions to the wording to clarify the recommendation. It is important that when adapting a recommendation the evidence underpinning the recommendation remains intact.

The draft recommendations were discussed with the full sub-group (meeting 6) on 17th September, 2016 from 0930 am to 0400 pm in BARC Hospital Conference Room, Anushakti Nagar, Mumbai. All group members declared and signed conflict of interest forms, before the meeting. (Minutes attached). There were further changes made during this meeting in the recommendations after full length discussions. All the changes were documented and minuted. Few recommendations were excluded as they were considered inappropriate in view of the required resources/cost and/or feasibility. The working group met after this meeting in person and over video conferencing to discuss the 2nd draft of this guideline (meeting 7, 8, 9 &10).
The working group in these meetings also developed the Patient Information Document, The Quick Reference Guide (Flowcharts). These Recommendations were further emailed to the other members of the group and their comments were discussed again in meeting 10 and changes made accordingly.

The details of adopted and adapted recommendations and the rationale for adaptation are available in the Annexure I named ñAdopt/Adapt guidelinesò.

V Review

Review I: Peer review received on 16th January 2017, from NHSRC internal peer-review committee and Prof. R.S. Mohil
The STG team members over email resolved these comments. All these comments were in track changes mode in the Microsoft word document. The suggestions have been carried out and appropriate changes made in the relevant places in the documents.

To view the comments and replies press the link below,
https://drive.google.com/file/d/0B3VNCDm-CyuAcUV6UjYyNlB0SHc/view?usp=sharing

Review II: A meeting was held on 13th January 2017 at 2.30 P.M. in Room no. 441-A wing, Nirman Bhawan, under the Chairmanship of Dr. Anil Manaktala, DDG (P) to discuss the draft Standard Treatment Guidelines of Major Trauma.
The minutes of this meeting and the comments are as in the below link,
https://drive.google.com/open?id=0B3VNCDm-CyuAY3RMOENrZUo2TWs

STG team members met over video conference and discussed these comments and prepared the rebuttal. The minutes of this comments and the rebuttal can be found in the below link,

Minute - https://drive.google.com/open?id=0B3VNCDm-CyuAWFFfVE44YXZkLW8
Rebuttal - https://drive.google.com/open?id=0B3VNCDm-CyuALUltREFyVWswNms

VI Way Forward for India

It is hoped that this document can lead to the development of further standard treatment guidelines for specific areas of trauma management for the Indian context. It seeks to improve the quality of trauma care services, intends to advocate for changes in health policy and decisions towards better outcomes for trauma.

Trauma can occur to anybody, anywhere and therefore, it is imperative for a nation as large as ours to holistically work with the government and non-government organizations including all sectors of the society to bring awareness and management skills to every individual to handle a situation in a calm and accurate way.

In view of the increasing burden of trauma in India and the rising cost of management of these patients, we would need to look into decreasing this burden and cost by a systematic management approach in each of the following parts:

1. Prevention if done properly, it would lead to **more effectiveness with less expenditure.**
    - ŏ Implementation of rules during driving motored vehicles along with swiftness of penalty for disobeying it is must, like:
        - ʒ helmets even for bicyclists and a separate area for them
        - ʒ seat belts compulsory
        - ʒ speed limits and breaking signals to be taken seriously
        - ʒ driver education on basic first aid must be done in driving tests, etc)
    - ŏ Proper checks and policing on alcohol and drug abuse in vehicle drivers.
    - ŏ Road quality to be improved, especially in prone areas, like improving lighting, filling potholes.
    - ŏ Access improved for health care facilities, especially in the rural areas of India
    - ŏ Implementation of safety rules along with regular drills and checks in large organizations like factories, mines, schools, offices, hospitals, railway stations, etc
    - ŏ Safety measures to prevent burns, falls, electrocution and prevention of railway accidents (simply closing the doors of local trains should be made compulsory).
    - ŏ Identification of risks, research and injury surveillance projects to be undertaken regularly.
    - ŏ Violence minimization in high risk groups like adolescents, alcoholics and drug abusers by awareness sessions to prevent them from entering into abusive relations with society and enabling them to make informed decisions
    - ŏ Children, aged, mentally and physically challenged, and pregnant women are more prone to injury and hence, infrastructure should be made with them in mind.
    - ŏ Awareness programmes to be increased using all forms of media to reach maximum population
2. Pre-hospital care -
    - ŏ Training of paramedical staff to give life saving safe treatment en-route to hospital.

- ŏ Training and awareness sessions for the general public, including schools and colleges, to be propagated on First Aid and CPR could save a lot of lives in the golden hour.
- ŏ Enabling better ambulance facilities to manage emergencies by
  - ʂ Proper and functional equipment of oxygen cylinders
  - ʂ Trained personnel to apply pelvic and spine stabilizers
  - ʂ Essential emergency drug provision and training to use them

3. In-Hospital -
   - ŏ System changes to make sure each of the necessary process measures (time to CT, Time to Operation/intervention) is carried out in time
   - ŏ Trauma team - Comprising minimum of a surgeon, anesthetist, trauma nurse, blood bank officer and an administrator. In addition to this, the super specialty team should be a part of the trauma team wherever available.
   - ŏ Training - Ensure compulsory training provided by the Government/hospital, in recognised national or international courses in advance trauma management for all personnel working in emergency department.
   - ŏ Forming local and National Trauma registry
4. Trauma rehabilitation - is an integral part in getting a seriously injured patient back to productivity and decreasing morbidity.

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Annexure 1
Adopt/ Adapt Tables

1.0 Prehospital Trauma Care

MoHFW Guideline	Adopt/ Adapt	Original Recommendation and Source guideline	Remarks
1.1 Airway management			
1.1.1 Consider using a supraglottic device if the patient's airway reflexes are absent. Use basic airway manoeuvres like inserting a Guedelôs airway** and bag and mask ventilation if required or supraglottic device placement is not possible. *supraglottic device - Laryngeal mask airway, proseal, i-gel etc. **Guedels airway = Oropharyngeal airway/oral airway	Adapt	If RSI cannot be performed at the scene: Consider using a supraglottic device if the patient's airway reflexes are absent. Use basic airway manoeuvres and adjuncts if the patient's airway reflexes are present or supraglottic device placement is not possible NICE Guideline [NG39]	Use of Guedelôs airway with bag and mask ventilation and oxygen supplementation may be a better modality of prehospital transfer than RSI and intubation in the Indian scenario due to lack of trained personnel in the ambulances. Needs further discussion about use of LMAs and other supraglottic devices DGHS comments were to change the language in the second part of the recommendation.
1.2 Chest Trauma			
1.2.1 Use clinical assessment to diagnose pneumothorax for the purpose of triage or intervention	Adopt	Use clinical assessment to diagnose pneumothorax for the purpose of triage or intervention NICE Guideline [NG39]	
1.2.2 In patients with an open	Adapt	In patients with an open	DGHS reviewers

pneumothorax: Cover the open pneumothorax with a three sided occlusive dressing and Observe for the development of a tension pneumothorax		pneumothorax: Cover the open pneumothorax with a simple occlusive dressing and Observe for the development of a tension pneumothorax NICE Guideline [NG39]	comments were to change it to ñsimpleò to ñthree sidedò which the STG team members also felt will be more specific
1.3 Haemorrhage			
1.3.1 Use simple dressings (sterile gauze pads) with direct pressure to control external haemorrhage.	Adapt	Use simple dressings with direct pressure to control external haemorrhage. NICE Guideline [NG39]	
1.3.2 In patients with major limb trauma use a tourniquet if direct pressure has failed to control life threatening haemorrhage. (*Tourniquet can be a bandage roll, rubber tubing , crepe bandage etc.)	Adopt	In patients with major limb trauma use a tourniquet if direct pressure has failed to control life threatening haemorrhage NICE Guideline [NG39]	
1.3.3 If active bleeding is suspected from a pelvic fracture after blunt high-energy trauma: Apply a pelvic binder	Adapt	If active bleeding is suspected from a pelvic fracture after blunt high-energy trauma: Apply a purpose-made pelvic binder or Consider an improvised pelvic binder, but only if a purpose-made binder does not fit NICE Guideline [NG39]	
1.3.4 Use intravenous tranexamic acid as soon as possible in patients with major trauma and active or suspected active bleeding. *Dose of Tranexamic acid - 1 gm administered IV over 10 min followed by 1 gm over 8 hrs IV	Adopt	Use intravenous tranexamic acid as soon as possible in patients with major trauma and active or suspected active bleeding. NICE Guideline [NG39]	
1.3.5 Do not use intravenous tranexamic acid more than 3 hours after injury in patients with	Adapt	Do not use intravenous tranexamic acid more than 3 hours after injury in patients with	

major trauma		major trauma unless there is evidence of hyperfibrinolysis NICE Guideline [NG39]	
1.3.6 For circulatory access in patients with major trauma in pre-hospital settings: Use peripheral intravenous access.	Adapt	For circulatory access in patients with major trauma in pre-hospital settings: Use peripheral intravenous access or If peripheral intravenous access fails, consider intra-osseous access NICE Guideline [NG39]	
1.3.7 In pre-hospital settings, titrate volume resuscitation to maintain a palpable central pulse(carotid or femoral).	Adopt	In pre-hospital settings, titrate volume resuscitation to maintain a palpable central pulse(carotid or femoral). NICE Guideline [NG39]	
1.3.8 In pre-hospital settings only use crystalloids (Ringerôs lactate or Normal saline) to replace fluid volume in patients with active bleeding	Adapt	In pre-hospital settings only use crystalloids to replace fluid volume in patients with active bleeding if blood components are not available NICE Guideline [NG39]	
1.3.9 Minimise ongoing heat loss* in patients with major trauma. *Blankets can be used for reducing heat loss	Adopt	Minimise ongoing heat loss in patients with major trauma NICE Guideline [NG39]	
1.4 Pain management			
1.4.1 Assess pain regularly in patients with major trauma using a pain assessment scale	Adapt	Assess pain regularly in patients with major trauma using a pain assessment scale suitable for the patient's age, developmental stage and cognitive function NICE Guideline [NG39]	
1.4.2 For patients with major trauma, use intravenous morphine/strong opioids as the first line analgesic and adjust the dose as needed to acheive adequate pain relief *To be administered after	Adapt	For patients with major trauma, use intravenous morphine as the first-line analgesic and adjust te dose as needed to achieve adequate pain relief.	Morphine is not available easily so alternative to morphine strong opioids were also included. NSAIDs

medical consult			were also considered as analgesics to be included but to raise the standard of care for pain management we have not included and may dilute the stress on morphine/opioids in trauma
1.5 Spine Trauma			
1.5.1 Carry out full in-line spinal immobilisation *By placing two blocks on either side of the head. Intravenous fluid bottles can also be used to prevent movement.	Adapt	Carry out full in-line spinal immobilisation if any of the above factors in the recommendation above are present or if this assessment cannot be done NICE Guideline [NG37]	
1.6 Fractures: Complex			
1.6.1 Do not irrigate open fractures of the long bones, hindfoot or midfoot in pre-hospital settings	Adopt	Do not irrigate open fractures of the long bones, hindfoot or midfoot in pre-hospital settings. NICE Guideline [NG37]	
1.6.2 Consider a saline soaked dressing covered with an occlusive layer for open fractures in pre-hospital settings.	Adopt	Consider a saline soaked dressing covered with an occlusive layer for open fractures in pre-hospital settings. NICE Guideline [NG37]	
1.6.3 In the pre-hospital setting, consider the following for people with suspected long bone fractures of the legs: A rigid or malleable splint or adjacent leg as a splint if the suspected fracture is above the knee	Adapt	In the pre-hospital setting, consider the following for people with suspected long bone fractures of the legs: A traction splint or adjacent leg as a splint if the suspected fracture is above the knee A vacuum splint for all other suspected long bone fractures	

		NICE Guideline [NG37]	

*Tourniquet can be a bandage roll, rubber tubing, crepe bandage etc

2.0. Airway and Chest Trauma Management

MoHFW Guideline	Adopt/ Adapt	Original Recommendation and Source Guideline	Reasons for Adaptation
2.1 Airway Assessment			
2.1.1 A clinical examination of the thorax and respiratory function must be carried out.	Adopt	A clinical examination of the thorax and respiratory function must be carried out. German Trauma Society Guideline	
2.1.2 The examination should include as a minimum the measurement of the respiratory rate and auscultation of the lungs. The examination should be repeated.	Adopt	The examination should include as a minimum the measurement of the respiratory rate and auscultation of the lungs. The examination should be repeated German Trauma Society Guideline	
2.1.3. The following can be helpful: inspection (bilaterally unequal in respiratory excursion, unilateral bulging, paradoxical respiration), palpation (pain, crepitations, subcutaneous emphysema, instability) and percussion (hyperresonant percussion) of the thorax together with pulse oxymetry and, in ventilated patients, monitoring ventilation pressure(if available).	Adapt	The following can be helpful: inspection (bilaterally unequal in respiratory excursion, unilateral bulging, paradoxical respiration), palpation (pain, crepitations, subcutaneous emphysema, instability) and percussion (hyperresonant percussion) of the thorax together with pulse oxymetry and, in ventilated patients, monitoring ventilation pressure German Trauma Society Guideline	Ventilation pressure monitoring if available as it is not available in many centres.
2.2 Securing Airway			
2.2.1 Manual in-line stabilization should be carried out for endotracheal intubation with the cervical spine immobilization device temporarily removed.	Adopt	Manual in-line stabilization should be carried out for endotracheal intubation with the cervical spine immobilization device temporarily removed German Trauma Society	

		Guideline	
2.2.2 A difficult airway must be anticipated when endotracheally intubating a trauma patient.	Adopt	A difficult airway must be anticipated when endotracheally intubating a trauma patient. NICE Guideline [NG39]	
2.2.3 The multiply injured patient must be preoxygenated before anesthesia.	Adopt	The multiply injured patient must be preoxygenated before anaesthesia. German Trauma Society Guideline	
2.2.4 Use drug-assisted rapid sequence induction (RSI) of anaesthesia and intubation as the definitive method of securing the airway in patients with major trauma who cannot maintain their airway and/or ventilation.	Adopt	Use drug-assisted rapid sequence induction (RSI) of anaesthesia and intubation as the definitive method of securing the airway in patients with major trauma who cannot maintain their airway and/or ventilation. NICE guideline [NG39]	
2.2.5 If RSI fails, use basic airway manoeuvres and adjuncts and/or a supraglottic device until a surgical airway or assisted tracheal placement is performed.	Adopt	If RSI fails, use basic airway manoeuvres and adjuncts and/or a supraglottic device until a surgical airway or assisted tracheal placement is performed. NICE guideline [NG39]	
2.2.6 If difficult anesthetization and/or endotracheal intubation are expected, an anesthesiologist must carry out or supervise this procedure in-hospital provided this does not cause delay in an emergency life-saving measure. Suitable measures must be in place to ensure that an anesthesiologist is normally on site in time	Adopt	If difficult anesthetization and/or endotracheal intubation are expected, an anesthesiologist must carry out or supervise this procedure in-hospital provided this does not cause delay in an emergency life-saving measure. Suitable measures must be in place to ensure that an anesthesiologist is normally on site in time NICE guideline [NG39]	
2.2.7 After more than 3 intubation attempts, alternative methods must be considered for ventilation and securing an airway.	Adopt	After more than 3 intubation attempts, alternative methods must be considered for ventilation and securing an airway. German trauma Society Guideline	

2.2.8 Alternative methods for securing an airway must be provided when anesthetizing and endotracheally intubating a multiply injured patient. *Alternatives like emergency cricothyroidotomy or surgical airway	Adopt	Alternative methods for securing an airway must be provided when anesthetizing and endotracheally intubating a multiply injured patient NICE Guideline [NG39]	
2.2.9 Etomidate should be avoided as an induction agent due to the associated side effects on adrenal function . *Ketamine can be used as a safe alternative as an induction agent. Dose- 1-2 mg/kg, time to effect of 45-60 seconds.	Adopt	Etomidate should be avoided as an induction agent due to the associated side effects on adrenal function. German Trauma Society Guideline	Ketamine is usually a good alternative here.
2.2.10 ECG, blood pressure measurement, pulse oxymetry and capnography(if available) must be used to monitor the patient for anesthesia induction, endotracheal intubation and emergency anesthesia.	Adapt	ECG, blood pressure measurement, pulse oxymetry and capnography must be used to monitor the patient for anesthesia induction, endotracheal intubation and emergency anesthesia German Trauma Society Guideline	Capnography, if available as many secondary and tertiary centres will not have the equipment needed for capnography in emergency available and with blood pressure and pulse oxymeter a reasonable intubation can be carried out. (experts discussion)
2.2.11 Normoventilation must be carried out in endotracheally intubated and anesthetized trauma patients.	Adopt	Normoventilation must be carried out in endotracheally intubated and anesthetized trauma patients German Trauma Society Guideline	
2.2.12 Ventilation must be monitored and controlled by frequent arterial blood gas analyses(if available) in the hospital. If ABG analysis not available, then keep a check clinically by	Adapt	Ventilation must be monitored and controlled by frequent arterial blood gas analyses in the hospital German Trauma Society Guideline	If available then do, if not, then check Clinically by: Chest rise By four point auscultation of the

observing the chest rise & four point auscultation of the chest.			chest.
2.12.3 In mandible and maxillofacial injuries, primary securing of the airways and hemostasis in the oral and maxillofacial region must be carried out.	Adopt	2.12.3 In mandible and maxillofacial injuries, primary securing of the airways and hemostasis in the oral and maxillofacial region must be carried out.[German Trauma Society Guidelines	
2.3 Chest Trauma Diagnosis and Management			
2.3.1 A suspected diagnosis of pneumothorax and/or hemothorax must be made if breath sounds are weaker or absent on one side (after checking correct placement of the tube). Absence of such auscultation findings largely rules out a larger pneumothorax, especially if the patient is normopneic and has no chest pain.	Adopt	A suspected diagnosis of pneumothorax and/or hemothorax must be made if breath sounds are weaker or absent on one side (after checking correct placement of the tube). Absence of such auscultation findings largely rules out a larger pneumothorax, especially if the patient is normopneic and has no chest pain German Trauma Society Guideline	
2.3.2 A suspected diagnosis of tension pneumothorax should be made if auscultation of the lung reveals no breath sounds unilaterally (after checking correct placement of the tube) and, in addition, typical symptoms are present, particularly severe respiratory disorder or upper inflow congestion combined with arterial hypotension.	Adopt	A suspected diagnosis of tension pneumothorax should be made if auscultation of the lung reveals no breath sounds unilaterally (after checking correct placement of the tube) and, in addition, typical symptoms are present, particularly severe respiratory disorder or upper inflow congestion combined with arterial hypotension German Trauma Society Guideline	
2.3.3 Clinically suspected tension pneumothorax must be decompressed* immediately. *Chest decompression mainly refers to tube thoracostomy/ Chest drain placement.	Adopt	Clinically suspected tension pneumothorax must be decompressed immediately. German Trauma Society Guideline	

2.3.4 Use open thoracostomy instead of needle decompression if the expertise is available, followed by a chest drain via the thoracostomy in patients who are breathing spontaneously. *Open method of chest drain insertion to be preferred over trocar method Needle decompression should not be attempted unless absolutely indicated.	Adopt	Use open thoracostomy instead of needle decompression if the expertise is available, followed by a chest drain via the thoracostomy in patients who are breathing spontaneously. NICE Guideline [NG39]	Needle decompression for the hospitals with less resources.
2.3.5 Observe patients after chest decompression for signs of recurrence of the tension pneumothorax.	Adopt	Observe patients after chest decompression for signs of recurrence of the tension pneumothorax. NICE Guideline [NG39]	
2.3.6 In patients with an open pneumothorax: cover the open pneumothorax with a simple occlusive dressing and observe for the development of a tension pneumothorax	Adopt	In patients with an open pneumothorax: cover the open pneumothorax with a simple occlusive dressing and observe for the development of a tension pneumothorax NICE Guideline [NG39]	
2.3.7 Pneumothorax diagnosed on the basis of an auscultation finding in a patient on positive pressure ventilation should be decompressed.	Adopt	Pneumothorax diagnosed on the basis of an auscultation finding in a patient on positive pressure ventilation should be decompressed German Trauma Society Guideline	
2.3.8 Pneumothorax diagnosed on the basis of an auscultation finding in patients not on ventilation should usually be managed by close clinical observation.	Adopt	Pneumothorax diagnosed on the basis of an auscultation finding in patients not on ventilation should usually be managed by close clinical observation German Trauma Society Guideline	
2.3.9 Pneumothorax should be treated with a chest drain provided the indication exists.	Adopt	Pneumothorax should be treated with a chest drain provided the indication exists. German Trauma Society Guideline	
2.3.10 If there are perforating chest injuries, embedded foreign	Adopt	If there are perforating chest injuries, embedded foreign	

bodies should only be removed during surgery under controlled conditions after opening up the chest.		bodies should only be removed during surgery under controlled conditions after opening up the chest German Trauma Society Guideline	
2.3.11 A penetrating chest injury, which is the cause of hemodynamic instability in the patient, must undergo an immediate exploratory thoracotomy.	Adopt	A penetrating chest injury, which is the cause of hemodynamic instability in the patient, must undergo an immediate exploratory thoracotomy German Trauma Society Guideline	
2.3.12 A thoracotomy can be performed if there is an initial blood loss of > 1,500 ml from the chest drain or if there is persistent blood loss of > 250 ml/h over more than 4 hours.	Adopt	A thoracotomy can be performed if there is an initial blood loss of > 1,500 ml from the chest drain or if there is persistent blood loss of > 250 ml/h over more than 4 hours. German Trauma Society Guideline	
2.4 Imaging in Chest Trauma			
2.4.1 Imaging for chest trauma in patients with suspected chest trauma should be performed urgently, and the images should be interpreted immediately by a healthcare professional with training and skills in this area.	Adopt	Imaging for chest trauma in patients with suspected chest trauma should be performed urgently, and the images should be interpreted immediately by a healthcare professional with training and skills in this area NICE Guideline [NG39]	
2.4.2 Consider immediate chest X-ray and/or eFAST (extended focused assessment with sonography for trauma) as part of the primary survey to assess chest trauma with severe respiratory compromise.	Adapt	Consider immediate chest X-ray and/or eFAST (extended focused assessment with sonography for trauma) as part of the primary survey to assess chest trauma in adults (16 or over) with severe respiratory compromise NICE Guideline [NG39]	As this document focuses only in adults more than 18 years of age.
2.4.3 Consider immediate CT for those with suspected chest trauma without severe respiratory compromise who are responding to resuscitation or	Adapt	Consider immediate CT for adults (16 or over) with suspected chest trauma without severe respiratory compromise who are responding to	As this document focuses only in adults more than 18 years of age.

whose haemodynamic status is normal.		resuscitation or whose haemodynamic status is normal NICE Guideline [NG39]	

* Needle decompression when indicated (shock with distended neck veins, reduced breath sounds, deviated trachea) should be done in the 2nd intercostal space

* Chest tube to be inserted in the 5th intercostal space.
*Triangle of safety is the recommended site for chest tube insertion.
Boundaries are- Anterior- Lateral border of pectoralis major.
Lateral- Lateral border of latissimus dorsi
Inferior- 6th rib or line of 5th intercostal space

3.0 : Hemorrhage and Shock

Original Guidelines Taken from:

1. NICE:
Major trauma (NG39) © NICE 2016

2. German:
S3 ï Guideline on Treatment of Patients with Severe and Multiple Injuries
English Version of the German Guideline S3 ï LeitliniePolytrauma/Schwerverletzten-Behandlung (AWMF-Registry No. 012/019)

3.Singapore:
Singapore Ministry of Health. Clinical blood transfusion. Singapore: Singapore Ministry of Health; 2011 Feb. 90 p.

4. NBA:
The National Blood Authorityôs (Australia)Patient Blood Management Guideline: Module 1 ï Critical Bleeding/Massive Transfusion

5. National Blood Authority. Patient blood management guidelines: module 4 - critical care. Canberra ACT (Australia): National Blood Authority; 2012. 78 p.

MoHFW Guideline	Adopt/ Adapt	Original Recommendation and Source Guideline	Reasons for Adaptation

3.1 Dressings and tourniquets in hospital settings			
3.1.1 Use simple dressings* with direct pressure to control external haemorrhage. *sterile gauze pads	Adopt	Use simple dressings with direct pressure to control external haemorrhage. NICE Guideline [NG39]	The term simple dressings was further elaborated as sterile gauze pads.# [1] #(World Health Organization. Guidelines for essential trauma care/Injuries and Violence Prevention Department, World Health Organization and the International Association for the Surgery of Trauma and Surgical Intensive Care (IATSIC), International Society of Surgery)
3.1.2 In patients with major limb trauma use a tourniquet* if direct pressure has failed to control life-threatening haemorrhage. *(a bandage,a strip of cloth,a band of rubber,etc.,that checks bleeding or blood flow by compressing the blood vessels)	Adopt	1.5.2 In patients with major limb trauma use a tourniquet if direct pressure has failed to control life-threatening haemorrhage NICE Guideline [NG39]	The term tourniquet was further elaborated on for understanding of the all (Websterôs dictionary)
3.2 Haemostatic agents in hospital settings			
3.2.1 Use intravenous tranexamic acid as soon as possible in patients with major trauma and active or suspected active	Adopt	Use intravenous tranexamic acid as soon as possible in patients with major trauma and active or suspected active bleeding.	The dosage of intravenous tranexamic acid was added as per

bleeding. Dosage as German Trauma Society Guideline: Tranexamic acid initially 1 g as saturation over 10 minutes + 1 g over 8 hours (CRASH 2 Trials) * Or 2 g (15ï 30 mg/kg BW)		NICE Guideline [NG39]	the German guidelines which inturn was taken from the CRASH 2 trials
3.2.2 Do not use intravenous tranexamic acid more than 3 hours after injury in patients with major trauma.	Adopt	Do not use intravenous tranexamic acid more than 3 hours after injury in patients with major trauma unless there is evidence of hyperfibrinolysis. NICE Guideline [NG39]	Hyperfibrinolysis tests are not routinely available in the Indian Setting
3.3 Anticoagulant reversal in hospital settings			
3.3.1 Rapidly reverse anticoagulation in patients who have major trauma with haemorrhage.	Adopt	Rapidly reverse anticoagulation in patients who have major trauma with haemorrhage. NICE Guideline [NG39]	
3.3.2 FFP (10-15ml/kg body weight) is recommended when there is bleeding associated with clotting factors deficiency and if no alternative processed products or specific factor concentrates are available. If immediate reversal of warfarin effect is required. Intravenous vitamin K *(5mg) should be concurrently given for sustained reversal of warfarin effect (*Management of bleeding following major trauma: an updated European guideline Rolf Rossaint et al.)	Adapt	FFP recommended : Bleeding associated with clotting factors deficiency if no alternative processed products or specific factor concentrates are available. If immediate reversal of warfarin effect is required. Intravenous vitamin K should be concurrently given for sustained reversal of warfarin effect Singapore Ministry of Health. Clinical blood transfusion Guideline	As specific factor concentrates are not easily available and are expensive,this is not feasible in the Indian Setting.The alternative could therefore be Fresh frozen plasma .

3.3.3 Consult a physician immediately for advice on adults who have active bleeding and need reversal of any anticoagulant agent other than a vitamin K antagonist.	Adapt	Consult a haematologist immediately for advice on adults (16 or over) who have active bleeding and need reversal of any anticoagulant agent other than a vitamin K antagonist. NICE Guideline [NG39]	At the district hospital access to a physician is a more practical approach as hematologist may not be available in this setting. Also adults age group is defined as 18 years and more.
3.3.4 Do not reverse anticoagulation in patients who do not have active or suspected bleeding.	Adopt	Do not reverse anticoagulation in patients who do not have active or suspected bleeding. NICE Guideline [NG39]	
3.4 Trauma induced coagulopathy			
3.4.1 Trauma-induced coagulopathy is an autonomous clinical picture with clear influences on survival. For this reason, coagulation diagnostic tests* and therapy must be started immediately in the emergency room. Coagulation diagnostic tests - Platelets,PT/INR,APTT and Fibrinogen (if available)	Adopt	Trauma-induced coagulopathy is an autonomous clinical picture with clear influences on survival. For this reason, coagulation diagnostic tests and therapy must be started immediately in the emergency room. German Trauma Society Guideline	The coagulation diagnostic tests were further defined to avoid confusion.
3.5 Activating major haemorrhage protocols in hospital settings			
3.5.1 Use physiological criteria that include the patient's haemodynamic status and their response to immediate volume resuscitation to activate the major haemorrhage protocol.	Adopt	Use physiological criteria that include the patient's haemodynamic status and their response to immediate volume resuscitation to activate the major haemorrhage protocol. NICE Guideline [NG39]	

3.5.2 Do not rely on a haemorrhagic risk tool* applied at a single time point to determine the need for major haemorrhage protocol activation. (*For example- ABC score, TASH score, PWH score, McLaughlin score, Emergency transfusion score, Shock Index etc These measure variables at a single point in time.)	Adopt	Do not rely on a haemorrhagic risk tool applied at a single time point to determine the need for major haemorrhage protocol activation. NICE Guideline [NG39]	
3.6 Circulatory access in hospital settings			
3.6.1 For circulatory access in patients with major trauma in hospital settings: use peripheral intravenous access (14 or 16 gauge intravenous cannula) or if peripheral intravenous access fails, a venous cutdown should be done.	Adapt	For circulatory access in patients with major trauma in hospital settings: use peripheral intravenous access or if peripheral intravenous access fails, consider intra-osseous access while central access is being achieved. NICE Guideline [NG39]	Intraosseous access is not considered as the guidelines are dealing with adult population alone for now.Expert group was of the opinion that central access needs training and skill and it is not the best route for fluid resuscitation.Therefore central access is not be advised ,rather a venous cutdown if peripherla intravenous access fails is a more feasible and safe option
3.7 Volume resuscitation in hospital settings			

3.7.1 For patients with active bleeding use a restrictive/balanced approach to volume resuscitation until definitive early control of bleeding has been achieved. *Further explanation of restrictive resuscitation - in order to keep the circulation at a low stable level and not exacerbate the bleeding. (Systolic BP: 90 mmHg or palpable central pulse) and not exacerbate the bleeding. (from the german guidelines)	Adapt	For patients with active bleeding use a restrictive approach to volume resuscitation until definitive early control of bleeding has been achieved. NICE Guideline [NG39]	The guideline was combined with the german guideline for a more detailed explanation of the approach. After DGHS comments the STG tem members added the term ñbalancedò as it may be better understood in the Indian trauma centres
3.7.2 In hospital settings, titrate volume resuscitation to maintain a palpable central pulse (carotid or femoral).	Adapt	In pre-hospital settings, titrate volume resuscitation to maintain a palpable central pulse (carotid or femoral). NICE Guideline [NG39]	Rephrased to in hospital settings.
3.7.3 For patients who have haemorrhagic shock and a traumatic brain injury: if haemorrhagic shock is the dominant condition, continue restrictive volume resuscitation or if traumatic brain injury is the dominant condition, use a less restrictive volume resuscitation approach to maintain cerebral perfusion.	Adopt	For patients who have haemorrhagic shock and a traumatic brain injury: if haemorrhagic shock is the dominant condition, continue restrictive volume resuscitation or if traumatic brain injury is the dominant condition, use a less restrictive volume resuscitation approach to maintain cerebral perfusion. NICE Guideline [NG39]	
3.7.4 Damage Control resuscitation- ŏ In patients who are actively bleeding, the goal can be set at mean	Adapt	Damage Control resuscitation: In patients who are actively bleeding, the goal can be set at permissive hypotension (mean arterial pressure ~ 65 mmHg,	As per the expert group consensus it was decided to keep the goals alone and do away

arterial pressure ~ 65 mmHg and systolic arterial pressure ~ 90 mmHg until surgical hemostasis. ŏ Suitable measures should be taken and treatment given to avoid hypothermia ŏ Acidemia should be avoided and treated by suitable treatment.		systolic arterial pressure ~ 90 mmHg) until surgical hemostasis. This strategy is contraindicated in injuries of the central nervous system. Suitable measures should be taken and treatment given to avoid the patient cooling down. Acidemia should be avoided and treated by suitable shock treatment. German Trauma Society Guideline	with the term permissive hypotension to avoid confusion in the interpretation of the term.Also that this strategy is contraindicated in injuries of the central nervous system was decided to be omitted as the earlier recommendation already mentions about the management in traumatic Brain injury.The other two recommendations have been merged from the German Trauma Society as they were a part of the damage control resuscitation. After the DGHS reviewers comments specific words like ñhypothermiaò was used and the word ñshockò was removed from the ñsuitable shock treatmentò
3.8 Fluid replacement in hospital settings			

3.8.1 In hospital settings, only use crystalloids* to replace fluid volume in patients with active bleeding if blood components are not available. * preferably Normal saline,Ringers lactate. Glucose containing fluid should be avoided in (a head injury) patients, during initial resuscitation.	Adapt	In pre-hospital settings only use crystalloids to replace fluid volume in patients with active bleeding if blood components are not available. NICE Guideline [NG39]	Rephrased to include hospital settings alone and also the specific type of crystalloids to be used.The expert group felt that this was important to mainly discourage the use of 5% Dextrose as a resuscitation fluid.
3.8.2 Human albumin must not be used in hospital volume replacement. (German)	Adapt	Human albumin must not be used in prehospital volume replacement. German Trauma Society Guideline	Rephrased to include hospital settings.
3.8.3 Colloidal solutions can be used in hypotensive trauma patients, if available and preference should be given to HES 130/0.4.	Adapt	If colloidal solutions are used in hypotensive trauma patients, preference should be given to HES 130/0.4. German Trauma Society Guideline	If itôs available, then should be used.The expert group felt that this may not be available in all the settings ,therefore this wording was added.
3.9 Haemorrhage protocols in hospital settings			
3.9.1 Hospitals should have specific major haemorrhage protocols for adults.	Adapt	Hospital trusts should have specific major haemorrhage protocols for adults (16 or over) and children (under 16s). NICE Guideline [NG39]	Link to the massive transfusion protocol.(Appendix) The age was corrected to include adults 18 years and above.

3.9.2 For patients with active bleeding, start with a fixed-ratio protocol (1:1:1 FFP: platelets: RBC) for blood components and change to a protocol guided by laboratory coagulation results at the earliest opportunity. (*In patients with Grade 3 and 4 hemorrhagic shock with imminent threat to life and if components are not available then whole blood can be given to stabilize the patient before transferring to a higher centre.)	Adapt	For patients with active bleeding, start with a fixed-ratio protocol for blood components and change to a protocol guided by laboratory coagulation results at the earliest opportunity. NICE Guideline [NG39]	The Fixed ratio protocol was further defined to be 1:1:1 of FFp:Platelets:Red blood cells as per the PROPPR and PROMMTT trial. The Expert group consensus was that in a low resource setting, blood components will not be readily available and in such a case if a patient presents with grade III or IV hemorrhagic shock and with imminent threat to life then whole blood can be given to stabilize the patient before transferring to a higher centre.
3.9.3 In an actively bleeding patient, the indication for transfusion can be made at hemoglobin levels below 10 g/dl and the hematocrit value maintained at 30%.	Adapt	In an actively bleeding patient, the indication for transfusion can be made at hemoglobin levels below 10 g/dl or 6.2 mmol/l, and the hematocrit value maintained at 30%. German Trauma Society Guideline	Deleted Values which are not routinely used in India
3.9.4 In critically ill trauma patients, transfusion strategy to be employed ð Hb concentration <7 g/dL, RBC transfusion is likely to be	Adapt	In critically ill patients, a restrictive transfusion strategy should be employed . ð Hb concentration <70 g/L, RBC transfusion is likely to be	The scope of the original guideline includes critically ill trauma patients so this word as

appropriate; however, transfusion may not be required in well-compensated patients or where other specific therapy is available. ŏ Hb concentration of 7ï 9 g/dL, RBC transfusion is not associated with reduced mortality. The decision to transfuse patients (with a single unit followed by reassessment) should be based on the need to relieve clinical signs and symptoms of anaemia. ŏ Hb concentration >9 g/dL, RBC transfusion is generally unnecessary.		appropriate; however, transfusion may not be required in well-compensated patients or where other specific therapy is available. ŏ Hb concentration of 70ï 90 g/L, RBC transfusion is not associated with reduced mortality. The decision to transfuse patients (with a single unit followed by reassessment) should be based on the need to relieve clinical signs and symptoms of anaemia. ŏ Hb concentration >90 g/L, RBC transfusion is generally unnecessary. National Blood Authority Guideline-module 4	added. Also the term restrictive was avoided to prevent confusions. Also units are changed to commonly used units in India
3.9.5 Red blood cell (RBC) transfusion should not be dictated by a haemoglobin (Hb) concentration alone, but should also be based on assessment of the patient's clinical status	Adopt	Red blood cell (RBC) transfusion should not be dictated by a haemoglobin (Hb) concentration alone, but should also be based on assessment of the patient's clinical status NBA Guideline - module 4	
3.9.6 Replacement of fibrinogen should be carried out, if test provisions are available, at levels < 1.5 g/l (150 mg/dl).	Adapt	Replacement of fibrinogen should be carried out if levels are at < 1.5 g/l (150 mg/dl). German Trauma Society Guideline	Rephrased to if test provisions are available as it may not be available in the district hospitals.
3.10 Haemorrhage imaging in hospital settings			
3.10.1 Imaging for haemorrhage in patients with suspected haemorrhage should be performed urgently, using FAST,	Adapt	Imaging for haemorrhage in patients with suspected haemorrhage should be performed urgently, and the	Rephrased to specify the imaging modalities to be

and a CT if required, and the images should be interpreted immediately by a healthcare professional with training and skills in this area. *if FAST is not available at the treating centre, then Diagnostic Peritoneal Lavage can be performed to detect occult intraabdominal bleeding.		images should be interpreted immediately by a healthcare professional with training and skills in this area. NICE Guideline [NG39]	used and the sequence in which they may be used . FAST and DPL to be used before CT[3].* *Cha JY, Kashuk JL, Sarin EL, et al. Diagnostic peritoneal lavage remains a valuable adjunct to modern imaging techniques. *J Trauma*. 2009 Aug. 67(2):330-4; discussion 334-6.
3.10.2 Limit diagnostic imaging (such as chest and pelvis X-rays or FAST [focused assessment with sonography for trauma]) to the minimum needed to direct intervention in patients with suspected haemorrhage and haemodynamic instability who are not responding to volume resuscitation.	Adopt	Limit diagnostic imaging (such as chest and pelvis X-rays or FAST [focused assessment with sonography for trauma]) to the minimum needed to direct intervention in patients with suspected haemorrhage and haemodynamic instability who are not responding to volume resuscitation. NICE guideline [NG39]	
3.10.3 Be aware that a negative FAST does not exclude intraperitoneal or retroperitoneal haemorrhage. *To repeat a FAST examination if clinical index of suspicion for intraperitoneal hemorrhage.	Adopt	Be aware that a negative FAST does not exclude intraperitoneal or retroperitoneal haemorrhage. NICE Guideline [NG39]	

3.10.4 Consider immediate CT for patients with suspected haemorrhage only if they are responding to resuscitation or if their haemodynamic status is normal.	Adopt	Consider immediate CT for patients with suspected haemorrhage if they are responding to resuscitation or if their haemodynamic status is normal. NICE Guideline [NG39]	
3.11 Damage control surgery			
3.11.1 Use damage control surgery in patients with haemodynamic instability who are not responding to volume resuscitation.	Adopt	Use damage control surgery in patients with haemodynamic instability who are not responding to volume resuscitation. NICE Guideline [NG39]	
3.12 Resuscitation (Criteria for Cardiac arrest after trauma)			
3.12.1 In the case of definitive cardiac arrest, uncertainties in detecting a pulse or other clinical signs that make cardiac arrest likely, resuscitation must be started immediately	Adopt	A In the case of definitive cardiac arrest, uncertainties in detecting a pulse or other clinical signs that make cardiac arrest likely, resuscitation must be started immediately. German Trauma Society Guideline	
3.12.2 During resuscitation, trauma-specific reversible causes of cardiac arrest ., airway obstruction, esophageal intubation, hypovolemia, tension pneumothorax or pericardial tamponade) should be diagnosed and treated.	Adopt	During resuscitation, trauma-specific reversible causes of cardiac arrest ., airway obstruction, esophageal intubation, hypovolemia, tension pneumothorax or pericardial tamponade) should be diagnosed and treated. German Trauma Society Guideline	
3.12.3 If resuscitation is unsuccessful after eliminating possible causes of cardiac arrest,	Adopt	If resuscitation is unsuccessful after eliminating possible trauma-specific causes of cardiac	

cardiopulmonary resuscitation must be stopped.		arrest, cardiopulmonary resuscitation must be stopped. German Trauma Society Guideline	
3.13 Role of Emergency Thoracotomy			
3.13.1 If expertise is available, emergency thoracotomy should be performed in the case of penetrating injuries, particularly if the onset of cardiac arrest is recent and vital signs are initially present.	Adapt	Emergency thoracotomy should be performed in the case of penetrating injuries, particularly if the onset of cardiac arrest is recent and vital signs are initially present. German Trauma Society Guideline	Rephrased to say that it can be done if the expertise is available at the treating centre.

4.0 Head Injury

MoHFW Recommendation	Adapt/Adopt	Original Recommendation and Source Guideline	Remarks
4.1.1 State of consciousness with pupil function and Glasgow Coma Scale (bilateral motor function) must be recorded and documented at repeated intervals.	Adopt	State of consciousness with pupil function and Glasgow Coma Scale (bilateral motor function) must be recorded and documented at repeated intervals. NICE Guideline [NG39]	
4.1.2 The goals are normoxia*, normocapnia**, and normotension***. A fall in arterial oxygen saturation below 90% must be avoided.	Adopt	The goals are normoxia, normocapnia, and normotension. A fall in arterial oxygen saturation below 90% must be avoided. NICE Guideline [NG39]	
4.1.3 Intubation with adequate ventilation (with capnometry and blood gas analysis if available) must be	Adapt	Intubation with adequate ventilation (with capnometry and blood gas analysis) must be carried out in	Not all hospitals across may have the facility of capnography or ABG analysis,

carried out in unconscious patients (reference value GCS ≤ 8).		unconscious patients (reference value GCS ≤ 8). NICE Guideline [NG39]	hence intubation is to be supplemented with them if available.
4.1.4 A Cranial Computed Tomography of Brain scan must be performed in the case of polytrauma after stabilization with suspected traumatic brain injury.	Adapt	A CCT scan must be performed in the case of polytrauma with suspected traumatic brain injury.	It is not advisable to send an unstable patient for CT scan in our scenario. Hence the patients can be sent after stabilization only. CCT is changed to CT Brain as it is the term used in India
4.1.5 A (monitoring) CT scan must be performed in the case of neurologic deterioration.	Adopt	A (monitoring) CT scan must be performed in the case of neurologic deterioration. NICE Guideline [NG39]	
4.1.6 Glucocorticoids must not be administered in the treatment of TBI.	Adopt	Glucocorticoids must not be administered in the treatment of TBI. NICE Guideline [NG39]	
4.1.7 If severely elevated intracranial pressure is suspected, particularly with signs of transtentorial herniation (pupil widening, decerebrate rigidity, extensor reaction to painful stimulus, progressive clouded consciousness), the following treatments can be given : - Hyperventilation where ABG analysis is available# - Mannitol##	Adapt	If severely elevated intracranial pressure is suspected, particularly with signs of transtentorial herniation (pupil widening, decerebrate rigidity, extensor reaction to painful stimulus, progressive clouded consciousness), the following treatments can be given: - Hyperventilation - Mannitol - Hypertonic saline solution NICE Guideline [NG39]	Hypertonic saline is expensive and not available universally. Hyperventilation is advisable if ABG analysis is available to maintain paCO2 at 30-35 mm of Hg. Mannitol is to be used in isolated head injury in normotensive patients.

*normoxia - spO2 > 90%
**Normocapnia - paCO2 = 35-40 mmHg{4.7kPa}
***Normotension - SBP Ó90 mmHg

20 breaths per minute to maintain paCO2 at 30-35 mm of Hg
20% solution at 0.5-2 gm/kg over 30 to 60 minutes

5.0 Spinal Trauma

MoHFW Recommendation	Adapt/Adopt	Original Recommendation & Source Guideline	Remarks
5.1 Assessment for spinal injury			
5.1.1 On arrival at the hospital, use a prioritising sequence to assess people with suspected trauma, for example ABCDE: ð airway with in-line spinal immobilisation ð breathing ð circulation ð disability (neurological) ð exposure and environment.	Adapt	On arrival at the scene of the incident, use a prioritising sequence to assess people with suspected trauma, for example <C>ABCDE: ð catastrophic haemorrhage ð airway with in-line spinal immobilisation ð breathing ð circulation ð disability (neurological) ð exposure and environment. NICE Guidelines [NG41].	This is true in the pre-hospital settings to look for catastrophic haemorrhage not in hospital as per experts group discussion.
5.1.2 At all stages of the assessment: ð protect the person's cervical spine with manual in-line spinal immobilisation, particularly during any airway intervention and ð avoid moving the remainder of the spine.	Adopt	At all stages of the assessment: ð protect the person's cervical spine with manual in-line spinal immobilisation, particularly during any airway intervention and ð avoid moving the remainder of the spine. NICE Guidelines [NG41]	
5.1.3 History and thorough clinical examination for spinal injury including the functions associated with it must be carried out.	Adapt	The medical history has high importance and should be taken. GoR B German Trauma Society Guideline	The following three recommendations can be made into one.

	Adapt	The clinical examination for spinal injuries has a high importance in the emergency room and should be carried out. (GoR B) German Trauma Society Guideline	
	Adapt	A thorough physical examination including the spine and the functions associated with it must be carried out. (GoR A) German Trauma Society Guideline	
5.1.4. The spine is suspected to be stable, unless any of the following 5 criteria are present, • impaired consciousness • neurologic deficit • spinal pain or myogelosis • intoxication • trauma in the extremities *myogelosis (area of hard or stiff muscle)	Adapt	If the following 5 criteria are absent, it can be assumed that no unstable spinal injury is present: • impaired consciousness • neurologic deficit • spinal pain or myogelosis • intoxication • trauma in the extremities GoR A German Trauma Society Guideline	Internal Harmonization group in the review felt there were too many negatives, so made changes in the wording too make it simpler to read.
5.1.5 The presence of a spinal injury must be assumed in unconscious patients until evidence to the contrary is found.	Adopt	The presence of a spinal injury must be assumed in unconscious patients until evidence to the contrary is found. (GoR A) German Trauma Society Guideline	
5.1.6 Carry out full in-line spinal immobilisation if any of the factors in recommendation 4.1.4 are present or if this assessment cannot be done.	Adopt	Carry out full in-line spinal immobilisation if any of the factors in recommendation 1.1.3 are present or if this assessment cannot be done. NICE Guidelines [NG41]	
5.2Assessment of Cervical Spine			
5.2.1 Assess whether the person is at high, low or no risk for	Adopt	Assess whether the person is at high, low or no risk for cervical	

cervical spine injury using the Canadian C-spine rule as follows: ð the person is at high risk if they have at least one of the following high-risk factors: o age 65 years or older o dangerous mechanism of injury (fall from a height of greater than 1 metre or 5 steps, axial load to the head ï for example diving, high-speed motor vehicle collision, rollover motor accident, ejection from a motor vehicle, accident involving motorised recreational vehicles, bicycle collision, horse riding accidents) o paraesthesia in the upper or lower limbs ð the person is at low risk if they have at least one of the following low-risk factors: o involved in a minor rear-end motor vehicle collision o comfortable in a sitting position o ambulatory at any time since the injury o no midline cervical spine tenderness o delayed onset of neck pain ð the person remains at low risk if they are: o unable to actively rotate their neck 45 degrees to the left and right (the range of the neck can only be assessed safely if the person is at low risk and there are no high-risk factors). ð the person has no risk if they: o have one of the above		spine injury using the Canadian C-spine rule as follows: ð the person is at high risk if they have at least one of the following high-risk factors: o age 65 years or older o dangerous mechanism of injury (fall from a height of greater than 1 metre or 5 steps, axial load to the head ï for example diving, high-speed motor vehicle collision, rollover motor accident, ejection from a motor vehicle, accident involving motorised recreational vehicles, bicycle collision, horse riding accidents) o paraesthesia in the upper or lower limbs ð the person is at low risk if they have at least one of the following low-risk factors: o involved in a minor rear-end motor vehicle collision o comfortable in a sitting position o ambulatory at any time since the injury o no midline cervical spine tenderness o delayed onset of neck pain ð the person remains at low risk if they are: o unable to actively rotate their neck 45 degrees to the left and right (the range of the neck can only be assessed safely if the person is at low risk and there are no high-risk factors). ð the person has no risk if they: o have one of the above low-risk factors and	

low-risk factors and o are able to actively rotate their neck 45 degrees to the left and right.		o are able to actively rotate their neck 45 degrees to the left and right. NICE Guideline [NG41]	
5.3 Assessment of Thoracic or Lumbosacral Spine			
5.3.1 Assess the person with suspected thoracic or lumbosacral spine injury using these factors: ŏ age 65 years or older and reported pain in the thoracic or lumbosacral spine ŏ dangerous mechanism of injury (fall from a height of greater than 3 metres, axial load to the head or base of the spine ï for example falls landing on feet or buttocks, high-speed motor vehicle collision, rollover motor accident, lap belt restraint only, ejection from a motor vehicle, accident involving motorised recreational vehicles, bicycle collision, horse riding accidents) ŏ pre-existing spinal pathology, or known or at risk of osteoporosis ï for example steroid use ŏ suspected spinal fracture in another region of the spine ŏ abnormal neurological symptoms (paraesthesia or weakness or numbness) ŏ on examination: o abnormal neurological signs (motor or sensory deficit) o new deformity or bony midline tenderness (on palpation) o bony midline tenderness (on percussion) ŏ midline or spinal pain (on coughing)on mobilisation (sit, stand, step, assess walking):	Adopt	Assess the person with suspected thoracic or lumbosacral spine injury using these factors: ŏ age 65 years or older and reported pain in the thoracic or lumbosacral spine ŏ dangerous mechanism of injury (fall from a height of greater than 3 metres, axial load to the head or base of the spine ï for example falls landing on feet or buttocks, high-speed motor vehicle collision, rollover motor accident, lap belt restraint only, ejection from a motor vehicle, accident involving motorised recreational vehicles, bicycle collision, horse riding accidents) ŏ pre-existing spinal pathology, or known or at risk of osteoporosis ï for example steroid use ŏ suspected spinal fracture in another region of the spine ŏ abnormal neurological symptoms (paraesthesia or weakness or numbness) ŏ on examination: o abnormal neurological signs (motor or sensory deficit) o new deformity or bony midline tenderness (on palpation) o bony midline tenderness (on percussion) o midline or spinal pain (on coughing) ŏ on mobilisation (sit, stand, step, assess walking): pain or	

pain or abnormal neurological symptoms (stop if this occurs).		abnormal neurological symptoms (stop if this occurs). NICE Guidelines [NG41]	
5.4 When To carry out in-line spinal immobilisation			
5.4.1 Carry out or maintain full in-line spinal immobilisation if: ð a high-risk factor for cervical spine injury is identified and indicated by the Canadian C-spine rule ð a low-risk factor for cervical spine injury is identified and indicated by the Canadian C-spine rule and the person is unable to actively rotate their neck 45 degrees left and right ð indicated by one or more of the factors listed in recommendation 4.3.1	Adopt	Carry out or maintain full in-line spinal immobilisation if: ð a high-risk factor for cervical spine injury is identified and indicated by the Canadian C-spine rule ð a low-risk factor for cervical spine injury is identified and indicated by the Canadian C-spine rule and the person is unable to actively rotate their neck 45 degrees left and right ð indicated by one or more of the factors listed in recommendation 1.1.7. NICE Guidelines [NG41]	
5.4.2 Do not carry out or maintain full in-line spinal immobilisation in people if: ð they have low-risk factors for cervical spine injury and, are pain free and are able to actively rotate their neck 45 degrees left and right ð they do not have any of the factors listed in recommendation 5.3.1	Adopt NICE Guidelines [NG41].	Do not carry out or maintain full in-line spinal immobilisation in people if: ð they have low-risk factors for cervical spine injury as identified and indicated by the Canadian C-spine rule, are pain free and are able to actively rotate their neck 45 degrees left and right ð they do not have any of the factors listed in recommendation 1.1.7. NICE Guidelines [NG41]	
5.5 How to carry out full in-line spinal immobilisation			
5.5.1 The spinal immobilisation devices need to be adjusted In uncooperative, agitated or distressed people, think about letting them find a position where they are comfortable with manual in-line spinal immobilisation.	Adapt	The use of spinal immobilisation devices may be difficult (for example in people with short or wide necks, or people with a pre-existing deformity) and could be counterproductive (for example increasing pain, worsening neurological signs and symptoms). In uncooperative, agitated or distressed people, including children, think about	The first part of the recommendation was deleted as the expert group members felt it would add confusion

		letting them find a position where they are comfortable with manual in-line spinal immobilisation. NICE Guidelines [NG41]	
5.5.2 When carrying out full in-line spinal immobilisation in adults, manually stabilise the head with the spine in-line using the following stepwise approach: ð Fit an appropriately sized semi-rigid collar unless contraindicated by: o a compromised airway o known spinal deformities, such as ankylosing spondylitis (in these cases keep the spine in the person's current position). ð Reassess the airway after applying the collar. ð Place and secure the person on a stretcher.	Adapt	When carrying out full in-line spinal immobilisation in adults, manually stabilise the head with the spine in-line using the following stepwise approach: ð Fit an appropriately sized semi-rigid collar unless contraindicated by: o a compromised airway o known spinal deformities, such as ankylosing spondylitis (in these cases keep the spine in the person's current position). ð Reassess the airway after applying the collar. ð Place and secure the person on a scoop stretcher. ð Secure the person with head blocks and tape, ideally in a vacuum mattress. NICE Guidelines [NG41]	Modified as per the Indian settings
5.6 When to carry out or maintain full in-line spinal immobilisation and request imaging			
5.6.1 Carry out or maintain full in-line spinal immobilisation and request imaging if: ð a high-risk factor for cervical spine injury is identified and indicated by the Canadian C-spine rule or ð a low-risk factor for cervical spine injury is identified and indicated by the Canadian C-spine rule and the person is unable to actively rotate their neck 45 degrees left and right or ð indicated by one or more of the factors listed in recommendation 5.3.1	Adopt	Carry out or maintain full in-line spinal immobilisation and request imaging if: ð a high-risk factor for cervical spine injury is identified and indicated by the Canadian C-spine rule or ð a low-risk factor for cervical spine injury is identified and indicated by the Canadian C-spine rule and the person is unable to actively rotate their neck 45 degrees left and right or ð indicated by one or more of the factors listed in recommendation 1.1.7. NICE Guidelines [NG41].	

5.6.2 Do not carry out or maintain full in-line spinal immobilisation or request imaging for people if: ð they have low-risk factors for cervical spine injury as identified and indicated by the Canadian C-spine rule, are pain free and are able to actively rotate their neck 45 degrees left and right ð they do not have any of the factors listed in recommendation 5.3.1	Adopt	Do not carry out or maintain full in-line spinal immobilisation or request imaging for people if: ð they have low-risk factors for cervical spine injury as identified and indicated by the Canadian C-spine rule, are pain free and are able to actively rotate their neck 45 degrees left and right ð they do not have any of the factors listed in recommendation NICE Guidelines [NG41].	
5.7 Diagnostic imaging			
5.7.1 Imaging for spinal injury should be performed urgently, and the images should be interpreted immediately by a healthcare professional with training and skills in this area after stabilisation.	Adapt	Imaging for spinal injury should be performed urgently, and the images should be interpreted immediately by a healthcare professional with training and skills in this area. NICE Guidelines [NG41].	After stabilisation was added to emphasize that no patients be sent for imaging if unstable.
5.7.2 Perform CT in adults if; ð imaging for cervical spine injury is indicated by the Canadian C-spine rule (see recommendation 5.6.1) or ð there is a strong suspicion of thoracic or lumbosacral spine injury associated with abnormal neurological signs or symptoms. C spine xray should be considered if CT is not available with caution of high false negative rate.	Adapt	Perform CT in adults (16 or over) if: ð imaging for cervical spine injury is indicated by the Canadian C-spine rule (see recommendation 1.4.7) or ð there is a strong suspicion of thoracic or lumbosacral spine injury associated with abnormal neurological signs or symptoms. NICE Guidelines [NG41].	Xray role in Cervical spine. District Hospital with or Ct scan available. KS: Don't advocate X-Ray because it has high false negative and would cause more morbidity. NK: Lateral C-spine X-ray if true positive then it would be good.
5.7.3 If, after CT, there is a neurological abnormality which could be attributable to spinal cord injury, advice MRI if available.	Adapt	If, after CT, there is a neurological abnormality which could be attributable to spinal cord injury, perform MRI. NICE Guideline [NG41]	Expert group feels we would advice MRI as for this reasons patient should not be transferred
5.8 Lumbosacral Spine Imaging			

5.8.1 Perform an X-ray as the first-line investigation for people with suspected spinal column injury without abnormal neurological signs or symptoms in the thoracic or lumbosacral regions (T1ï L3).	Adopt	Perform an X-ray as the first-line investigation for people with suspected spinal column injury without abnormal neurological signs or symptoms in the thoracic or lumbosacral regions (T1ï L3). NICE Guideline [NG41]	
5.8.2 Perform CT if the X-ray is abnormal or there are clinical signs or symptoms of a spinal column injury.	Adopt	Perform CT if the X-ray is abnormal or there are clinical signs or symptoms of a spinal column injury. NICE Guideline [NG41]	
5.8.3 If a new spinal column fracture is confirmed, image the rest of the spinal column.	Adopt	If a new spinal column fracture is confirmed, image the rest of the spinal column. NICE Guideline [NG41]	
5.8.4 After circulatory stabilization and before transfer from the emergency room, a spinal injury should be cleared by clinical examination or imaging . (if available).	Adapt	After circulatory stabilization and before transfer to the intensive care unit, a spinal injury should be cleared by imaging diagnostic tests. (GoR B) German Trauma Society Guideline	Changes made as per the Indian settings. Imaging diagnostic tests were difficult to understand so was changed as per the expert group members
5.9 Medications			
5.9.1 Do not use the following medications, aimed at providing neuroprotection and prevention of secondary deterioration, in the acute stage after acute traumatic spinal cord injury: ð methylprednisolone ð nimodipine ð naloxone.	Adopt	Do not use the following medications, aimed at providing neuroprotection and prevention of secondary deterioration, in the acute stage after acute traumatic spinal cord injury: ð methylprednisolone ð nimodipine ð naloxone. NICE Guideline [NG41]	
5.9.2 Do not use medications in the acute stage after traumatic spinal cord injury to prevent neuropathic pain from developing in the chronic stage.	Adopt	Do not use medications in the acute stage after traumatic spinal cord injury to prevent neuropathic pain from developing in the chronic stage. NICE Guidelines [NG41]	

6.0 Pelvic Fracture Management:

MoHFW Recommendation	Adapt/Adopt	Original Recommendation & Source Guideline	Remarks
6.1 Using a pelvic binder			
6.1.1. An acute life-threatening pelvic injury must be excluded when the patient is admitted to the hospital.	Adopt	An acute life-threatening pelvic injury must be excluded when the patient is admitted to the hospital. (GoR A) Guideline German Trauma Society	
6.1.2 The stability of the patientôs pelvis must be clinically examined.	Adopt	The stability of the patientôs pelvis must be clinically examined. (GoR A) Guideline German Trauma Society	
6.1.3 If active bleeding is suspected from a pelvic fracture following blunt high energy trauma, apply a pelvic binder.	Adapt	1.1.1 If active bleeding is suspected from a pelvic fracture following blunt high energy trauma: ŏ apply a pelvic binder, or ŏ consider an improvised pelvic binder but only if a purpose made binder does not fit. NICE Guidelines [NG38].	Changes made as per the availability in the Indian settings.
6.2 Pelvic imaging			
6.2.1 During the diagnostic study a pelvic survey radiograph should be taken and/or computed tomography (CT) be performed once patient is stabilized*. (*unstable patients do portable X-Ray if available)	Adapt	During the diagnostic study a pelvic survey radiograph should be taken and/or computed tomography (CT) be performed. (GoR A) German Trauma Society Guideline	Emphasizing on the fact that unstable patient should not be sent for diagnostic imaging.
6.2.2 Use CT (if available, otherwise x-ray) for first-line imaging with suspected	Adapt	Use CT for first-line imaging in adults (16 or over) with suspected high energy pelvic	Emphasizing on the fact that unstable patient

high energy pelvic fractures once patient is stabilized*		fractures NICE Guidelines [NG38].	should not be sent for diagnostic imaging The expert group felt that in the Indian settings the CT may not be available everywhere.
6.2.3 Unstable patients with suspected active bleeding from pelvic fracture, use: ð pelvic packing to stabilize the patient.	Adapt	For first line invasive treatment of active arterial pelvic bleeding, use: ð interventional radiology if emergency laparotomy is not needed for abdominal injuries ð pelvic packing if emergency laparotomy is needed for abdominal injuries. NICE Guidelines [NG38].	Interventional radiology is not available in most centres across India and so the expert group members felt that it is best to do open packing in these patients.
6.3 Removing a pelvic binder			
6.3.1 For people with suspected pelvic fractures and pelvic binders, remove the binder as soon as possible if: ð there is no pelvic fracture, or ð a pelvic fracture is identified as mechanically stable, or ð the binder is not controlling the mechanical stability of the fracture, or ð there is no further bleeding or coagulation is normal. ð Remove all pelvic binders within 24 hours of application.	Adopt	For people with suspected pelvic fractures and pelvic binders, remove the binder as soon as possible if: ð there is no pelvic fracture, or ð a pelvic fracture is identified as mechanically stable, or ð the binder is not controlling the mechanical stability of the fracture, or ð there is no further bleeding or coagulation is normal. ð Remove all pelvic binders within 24 hours of application. NICE Guidelines [NG38]	
6.4 Log rolling			
6.4.1 Do not log roll people with suspected pelvic fractures before pelvic imaging unless: ð an occult penetrating injury is	Adopt	Do not log roll people with suspected pelvic fractures before pelvic imaging unless: ð an occult penetrating injury is	

suspected in a person with haemodynamic instability ð log rolling is needed to clear the airway (for example, suction is ineffective in a person who is vomiting). ð When log rolling, pay particular attention to haemodynamic stability.		suspected in a person with haemodynamic instability ð log rolling is needed to clear the airway (for example, suction is ineffective in a person who is vomiting). ð When log rolling, pay particular attention to haemodynamic stability. NICE Guidelines [NG38].	

*Stabilization, by consensus, we mean,
Vital signs i.e. heart rate, blood pressure and pulse oxygen saturation is near normal limits for two consecutive readings 15 minutes apart. An unconscious, semiconscious patients airway needs to be secured even if he is hemodynamically stable before shifting for further imaging.

7.0 Orthopaedic trauma

MoHFW Guideline	Adopt/ Adapt	Original Recommendation and Source Guideline	Remarks
7.1 Open fractures			
7.1.1 Do not irrigate open fractures of the long bones, hindfoot or midfoot in the emergency department before debridement.	Adopt	Do not irrigate open fractures of the long bones, hindfoot or midfoot in the emergency department before debridement. NICE guideline [NG. 37]	
7.1.2 Consider a saline-soaked dressing covered with an occlusive layer (if not already applied) for open fractures in the emergency department before debridement.	Adopt	Consider a saline-soaked dressing covered with an occlusive layer (if not already applied) for open fractures in the emergency department before Debridement. NICE guideline [NG. 37]	
7.1.3 In the emergency department, administer prophylactic intravenous antibiotics immediately to people with open fractures if not already given.	Adopt	In the emergency department, administer prophylactic intravenous antibiotics immediately to people with open fractures if not already given. NICE guideline [NG. 37]	

7.1.4 Do not base the decision whether to perform limb salvage or amputation on an injury severity tool score.	Adopt	Do not base the decision whether to perform limb salvage or amputation on an injury severity tool score. NICE guideline [NG. 37]	
7.1.5 Perform emergency amputation when: ð A limb is the source of uncontrollable life-threatening bleeding, or ð A limb is salvageable but attempted preservation would pose an unacceptable risk to the person's life, or ð A limb is deemed unsalvageable after orthoplastic assessment	Adopt	Perform emergency amputation when: ð A limb is the source of uncontrollable life-threatening bleeding, or ð A limb is salvageable but attempted preservation would pose an unacceptable risk to the person's life, or ð A limb is deemed unsalvageable after orthoplastic assessment NICE guideline [NG. 37]	
7.1.6 Perform debridement: ð Immediately for highly contaminated open fractures ð Within 24 hours of injury for all other open fractures	Adapt	Perform debridement: ð Immediately for highly contaminated open fractures ð Within 12 hours of injury for high-energy open fractures (likely Gustiloï Anderson classification type IIIA or type IIIB) that are not highly contaminated ð Within 24 hours of injury for all other open fractures NICE guideline [NG. 37]	Points deleted were too specific for open fractures so were deleted after expert groups consensus
7.2 Vascular injury			
7.2.1. Use hard signs (lack of palpable pulse, continued blood loss, or expanding haematoma) to diagnose vascular injury.	Adopt	Use hard signs (lack of palpable pulse, continued blood loss, or expanding haematoma) to diagnose vascular injury. NICE guideline [NG. 37]	
7.2.2 Do not rely on capillary return or Doppler signal to exclude vascular injury.	Adopt	Do not rely on capillary return or Doppler signal to exclude vascular injury. NICE guideline [NG. 37]	

7.2.3 Perform immediate surgical exploration if hard signs of vascular injury persist after any necessary restoration of limb alignment and joint reduction.	Adopt	Perform immediate surgical exploration if hard signs of vascular injury persist after any necessary restoration of limb alignment and joint reduction. NICE guideline [NG. 37]	
7.2.4 Do not delay revascularisation for angiography in people with complex fractures	Adopt	Do not delay revascularisation for angiography in people with complex fractures. NICE guideline [NG. 37]	
7.3 Compartment syndrome			
7.3.1 In people with fractures of the tibia, maintain awareness of compartment syndrome for 48 hours after injury or fixation by regularly assessing and recording clinical symptoms and signs in hospital	Adapt	In people with fractures of the tibia, maintain awareness of compartment syndrome for 48 hours after injury or fixation by:- ð Regularly assessing and recording clinical symptoms and signs in hospital ð Considering continuous compartment pressure monitoring in hospital when clinical symptoms and signs cannot be readily identified (for example, because the person is unconscious or has a nerve block) ð Advising people how to self-monitor for symptoms of compartment syndrome, when they leave hospital NICE guideline [NG. 37]	Few points deleted as they are not feasible in the Indian settings

8.0 Pain Management in Major trauma

MoHFW Recommendations	Adopt/ Adapt	Original recommendation & Source guideline	Reasons for adaptation

8.1 Pain management in Major trauma			
8.1.1 Assess pain regularly in patients with major trauma using a pain assessment scale suitable for patients cognitive function.	Adapt	Assess pain regularly in patients with major trauma using a pain assessment scale suitable for the patient's age, developmental stage and cognitive function. NICE Guidelines [NG39].	Removed developmental stage and age as we are dealing with only adults in this guideline
8.1.2 For patients with major trauma, use intravenous morphine/opioids as the first-line analgesic and adjust the dose as needed to achieve adequate pain relief.	Adapt	For patients with major trauma, use intravenous morphine as the first-line analgesic and adjust the dose as needed to achieve adequate pain relief. NICE Guidelines [NG39].	Expert group feels to add opioids like Buprenorphine, Pentazocine and other opioids as not all hospitals have Morphine license.
8.1.3 Consider ketamine in analgesic doses as a second-line agent.	Adopt	5. Consider ketamine in analgesic doses as a second-line agent. NICE Guidelines [NG39].	
8.2 Efficacy of Analgesic Modalities in blunt thoracic trauma			
8.2.1 Epidural analgesia is the preferred mode of analgesia delivery in severe thoracic trauma.	Adapt	The use of optimal analgesia and aggressive chest physiotherapy should be applied to minimize the likelihood of respiratory failure and ensuing ventilatory support. Epidural catheter is the preferred mode of analgesia delivery in severe FC injury. Management of pulmonary contusion and flail chest: an Eastern Association for the Surgery of Trauma practice management guideline.	Expert group feels it is important to mention analgesia for severe thoracic trauma as pain is a neglected entity in our injured group of patients. Though this is a specific management we would like to mention in the guideline for pain management in severe thoracic trauma

9.0 Providing support and Information to patients & relatives
Providing information about patients to the next level hospital/casualty

Indian Recommendation	Adapt/Adopt	Original Recommendation & Source Guideline	Remarks
9.1 Providing support			
9.1.1 When communicating with patients, family members and carers ð manage expectations and avoid misinformation ð answer questions and provide information honestly, within the limits of your knowledge ð do not speculate and avoid being overly optimistic or pessimistic when discussing information on further investigations, diagnosis or prognosis ð ask if there are any other questions.	Adopt	When communicating with patients, family members and carers: ð manage expectations and avoid misinformation ð answer questions and provide information honestly, within the limits of your knowledge ð do not speculate and avoid being overly optimistic or pessimistic when discussing information on further investigations, diagnosis or prognosis ð ask if there are any other questions. NICE Guideline [NG39]	
9.1.2 The trauma team structure should include a clear point of contact for providing information to patients, their family members and carers.	Adopt	The trauma team structure should include a clear point of contact for providing information to patients, their family members and carers. NICE Guideline [NG39]	
9.2 Providing information			
9.2.1 Explain to patients, family members and carers what is happening and why it is happening. Provide: ð information on known injuries ð details of immediate investigations and treatment, and if possible include time schedules.	Adopt	Explain to patients, family members and carers, what is happening and why it is happening. Provide: ð information on known injuries ð details of immediate investigations and treatment, and if possible include time schedules.	

		NICE Guideline [NG39]	
9.2.2 Offer people with fractures the opportunity to see images of their injury, taken before and after treatment.	Adopt	Offer people with fractures the opportunity to see images of their injury, taken before and after treatment. NICE Guideline [NG39]	
9.2.3 Provide people with fractures on the following when the management plan is agreed or changed: ð expected outcomes of treatment, including time to returning to usual activities and the likelihood of permanent effects on quality of life (such as pain, loss of function and psychological effects) ð amputation, if this is a possibility ð activities they can do to help themselves ð home care options, if needed ð rehabilitation, including whom to contact and how (this should include information on the importance of active patient participation for achieving goals and the expectations of rehabilitation) ð mobilisation and weight bearing, including upper limb load bearing for arm fractures.	Adapt	Provide people with fractures with both verbal and written information on the following when the management plan is agreed or changed: ð expected outcomes of treatment, including time to returning to usual activities and the likelihood of permanent effects on quality of life (such as pain, loss of function and psychological effects) ð amputation, if this is a possibility ð activities they can do to help themselves ð home care options, if needed ð rehabilitation, including whom to contact and how (this should include information on the importance of active patient participation for achieving goals and the expectations of rehabilitation) ð mobilisation and weight bearing, including upper limb load bearing for arm fractures. NICE Guideline [NG39]	
9.2.4 Document all key communications with patients, family members and carers about the management plan.	Adopt	Document all key communications with patients, family members and carers about the management plan. NICE Guideline [NG39]	

9.2.5 Ensure that all health and social care practitioners have access to information previously given to people with fractures to enable consistent information to be provided.	Adopt	Ensure that all health and social care practitioners have access to information previously given to people with fractures to enable consistent information to be provided. NICE Guideline [NG39]	
9.3 Providing information about transfer from an emergency department			
9.3.1 For patients who are being transferred from an emergency department to another centre, provide verbal and written information that includes: ð the reason for the transfer ð the location of the receiving centre and the patient's destination within the receiving centre ð the name and contact details of the person responsible for the patient's care at the receiving centre (if possible) ð the name and contact details of the person who was responsible for the patient's care at the initial hospital.	Adapt	For patients who are being transferred from an emergency department to another centre, provide verbal and written information that includes: ð the reason for the transfer ð the location of the receiving centre and the patient's destination within the receiving centre ð the name and contact details of the person responsible for the patient's care at the receiving centre ð the name and contact details of the person who was responsible for the patient's care at the initial hospital. NICE Guideline [NG39]	Expert group feels it is difficult to give always the name and contact details of the person in the receiving centre.
9.4 Recording information in before transferring to definitive care settings			
9.4.1 Record the following in people with major trauma in hospital settings before transferring to a higher centre: ð ABCDE (airway with in-line spinal immobilisation, breathing, circulation, disability [neurological], exposure and environment)	Adapt	Record the following in people with suspected spinal injury in pre-hospital settings: ð <C>ABCDE (catastrophic haemorrhage, airway with in-line spinal immobilisation, breathing, circulation, disability [neurological], exposure and environment) NICE Guidelines [NG39]	We needed to include this point for inter hospital transfer. Also the expert groups feels it will be difficult to define catastrophic hemorrhage so have excluded this point.
9.4.2 If possible, record	Adopt	1.9.2 If possible, record	

information on whether the assessments show that the person's condition is improving or deteriorating.		information on whether the assessments show that the person's condition is improving or deteriorating. NICE Guidelines [NG39]	
9.4.3 Record pre-alert information using a structured system and include all of the following: ŏ the patient's age and sex ŏ time of incident ŏ mechanism of injury ŏ injuries suspected ŏ signs, including vital signs and Glasgow Coma Scale ŏ treatment so far ŏ estimated time of arrival at emergency department ŏ special requirements ŏ the ambulance call sign, name of the person taking the call and time of call	Adapt	1.9.3 Record pre-alert information using a structured system and include all of the following: ŏ the patient's age and sex ŏ time of incident ŏ mechanism of injury ŏ injuries suspected ŏ signs, including vital signs and Glasgow Coma Scale ŏ treatment so far ŏ estimated time of arrival at emergency department ŏ special requirements ŏ the ambulance call sign, name of the person taking the call and time of call. NICE Guidelines [NG39]	Ambulance call sign, name of the person and time of call of the person was not felt important to be by the expert group.
9.5 Training and skills			
9.5.1 Ensure that each healthcare professional within the trauma service has the training and skills to deliver, safely and effectively, the interventions they are required to give as per this guideline.	Adapt	Ensure that each healthcare professional within the trauma service has the training and skills to deliver, safely and effectively, the interventions they are required to give, in line with the NICE guidelines on non-complex fractures, complex fractures, major trauma, major trauma services and spinal injury assessment. NICE Guidelines [NG39]	Changed as per needed in this guideline for the Indian settings Training in the form of ATLS, NTMC, EMTC etc.
9.6 Receiving information in hospital settings			
9.6.1 Casualty Medical Officer/Trauma team leader in	Adapt	A senior nurse or trauma team leader in the emergency	Changes are made as per the Indian

the emergency department should receive the pre-alert information, and determine the level of trauma team response according to agreed and written local guidelines.		department should receive the pre-alert information, and determine the level of trauma team response according to agreed and written local guidelines. NICE Guideline [NG39]	Settings
9.6.2 The trauma team leader should be easily identifiable to receive the handover and the trauma team ready to receive the information.	Adopt	The trauma team leader should be easily identifiable to receive the handover and the trauma team ready to receive the information. NICE Guideline [NG39]	
9.6.3 The pre- hospital documentation, including the recorded pre-alert information, should be quickly available to the trauma team and placed in the patient's hospital notes.	Adopt	The pre- hospital documentation, including the recorded pre-alert information, should be quickly available to the trauma team and placed in the patient's hospital notes. NICE Guideline [NG39]	
9.7 Sharing information in hospital settings			
9.7.1 Follow a structured process when handing over care within the emergency department (including shift changes) and to other departments. Ensure that the handover is documented.	Adopt	Follow a structured process when handing over care within the emergency department (including shift changes) and to other departments. Ensure that the handover is documented. NICE Guideline [NG39]	
9.7.2 Ensure that all patient documentation, including images and reports, goes with the patient when they are transferred to other departments or centres.	Adopt	Ensure that all patient documentation, including images and reports, goes with the patient when they are transferred to other departments or centres. NICE Guideline [NG39]	
9.7.3 Produce a written summary, which gives the diagnosis, management plan and expected outcome and: ð is aimed at and sent to the	Adapt	Produce a written summary, which gives the diagnosis, management plan and expected outcome and: ð is aimed at and sent to the	Changes made as per the feasibility in the Indian settings

patient's referring physician/surgeon/primary or secondary care hospital within 24 hours of admission ð includes a summary written in plain English/local language that is understandable by patients, family members and carers ð is readily available in the patient's records.		patient's GP within 24 hours of admission ð includes a summary written in plain English that is understandable by patients, family members and carers ð is readily available in the patient's records. NICE Guideline [NG39]	

Annexure II: Abbreviations

1.	ABG	Arterial Blood Gas
2.	APTT	Activated Partial Thromboplastin Time
3.	CT	Computed Tomography
4.	FAST	Focussed assessment with sonography for trauma
5.	FFP	Fresh Frozen Plasma
6.	Hb	Hemoglobin
7.	HES	Hydroxyethyl starch
8.	i.v.	Intravenous
9.	INR	International Normalized ratio
10.	MAP	Mean Arterial Pressure
11.	mmHg	Millimeters of Mercury
12.	$PaCO_2$	Partial Pressure of Carbon dioxide
13.	PT	Prothrombin Time
14.	RBC	Red Blood Cell
15.	SBP	Systolic Blood Pressure
16.	SpO_2	Oxygen Saturation of blood
17.	STG	Standard Treatment Guideline

Annexure III: Definitions

1.	Chest decompression	mainly refers to tube thoracostomy/ Chest drain placement.
2.	Hemorrhagic Risk Tools	ABC score, TASH score, PWH score, McLaughlin score, Emergency transfusion score, Shock Index etc. These measure variables at a single point in time.
3.	Myogelosis	An area of hard or stiff muscle
4.	Normocapnia	$PaCO_2$ = 35 mm Hg {4.7kPa}
5.	Normotension	SBP > 90 mm Hg
6.	Normoxia	SpO_2 > 90%
7.	Restrictive resuscitation	Fluid infusion in order to keep the circulation at a low stable level (Systolic BP: 90 mmHg or palpable central pulse) and not exacerbate the bleeding. (from the german guidelines)
8.	Simple dressings	sterile gauze pads
9.	Supraglottic device	Laryngeal mask airway, proseal, i-gel etc.
10.	Tourniquet	can be a bandage roll, rubber tubing, crepe bandage, that checks bleeding or blood flow by compressing the blood vessels.

Annexure IV: Tables

Grades of Haemorrhage

Class of haemorrhagic shock				
	I	II	III	IV
Blood loss (mL)	Up to 750	750–1500	1500–2000	> 2000
Blood loss (% blood volume)	Up to 15	15–30	30–40	> 40
Pulse rate (per minute)	< 100	100–120	120–140	> 140
Blood pressure	Normal	Normal	Decreased	Decreased
Pulse pressure (mm Hg)	Normal or increased	Decreased	Decreased	Decreased
Respiratory rate (per minute)	14–20	20–30	30–40	> 35
Urine output (mL/hour)	> 30	20–30	5–15	Negligible
Central nervous system/ mental status	Slightly anxious	Mildly anxious	Anxious, confused	Confused, lethargic

Diagrams and Important Information

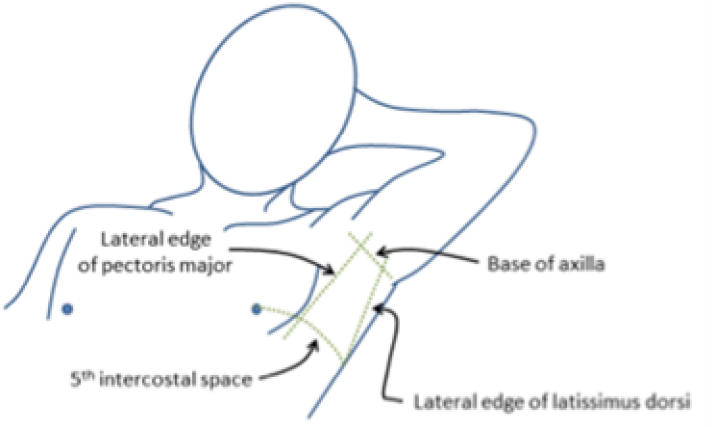
1. Where to Insert Chest Tube?

   Triangle of safety is the recommended site for chest tube insertion.

   Boundaries are- Anterior- Lateral border of pectoralis major.

   Lateral- Lateral border of latissimus dorsi.

   Inferior- 6th rib or line of 5th intercostal space.



Annexure V: Doses

1.	Buprenorphine	Initial: 0.3 mg i.v. every 6 to 8 hours as needed(slow)
2.	Butorphanol	Initial: 1 mg i.v. may repeat every 3-4 hours as needed
3.	FFP(Fresh Frozen Plasma)	10-15ml/kg body weight
4.	Ketamine	1-2 mg/kg i.v or 5-6mg/kg im after ruling out raised intracranial pressure
5.	Mannitol	20% solution at 0.5-2 gm/kg over 30 to 60 minutes
6.	Morphine	0.1-0.2 mg/kg q 4-6h i.v
7.	Pentazocine	15-30 mg i.v. every 3-4 hours
8.	Tranexamic acid	Dosage as German guidelines-Tranexamic acid initially 1 g as saturation over 10 minutes + 1 g over 8 hours (CRASH 2 Trials) * or 2 g (15ï 30 mg/kg BW)
9.	Vitamin K	i.v. 5mg bolus