

# Auckland City Hospital Trauma Guidelines

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# Introduction

These guidelines have been developed following extensive consultation and review. They are endorsed by the Auckland City Hospital Trauma Service in collaboration with other services.

The treatment of severe trauma is 'time critical'. Timely and appropriate intervention reduces preventable levels of mortality, complications and lifelong disability amongst people who sustain a major trauma.

The initial assessment of a trauma patient is a team process. Most patients with major trauma require the input of a number of different specialty groups. Often this does not extend outside the trauma team however the input of orthopaedic, neurosurgical, maxillofacial or plastic surgical teams may be required. Notify specialists early about severely injured patients

Multiple major trauma patients at the same time are common and can place considerable stress on the system. This can lead to situations where patients who have severe but not immediately obvious injuries are overlooked. When this situation arises assistance should be summoned early.

The intent of these guidelines is to provide clear consistent guidelines around the process of care and treatment for trauma patients. It is expected these guidelines will be followed by all staff. Variation from these guidelines are made only after careful consideration.

## These guidelines are in four parts.

- **Part one** explains the trauma call process.
- **Part two** outlines the standard approach for treatment of injuries
- **Part three** has the algorithms for treatment of common injuries
- **Part four** has the northern region inter-hospital transfer guideline that indicate which patients should stay at Auckland City Hospital, and which should be transferred to Middlemore. They also identify specific conditions which indicate transfer into Auckland from regional referral centres.

Auckland City Hospital (ACH) is the regional tertiary referral hospital for the care of the severely injured adults.

ACH receives patients with a wide range of injuries, both directly from the scene and following transfer from other hospitals. ACH provides definitive care for these injuries.

### **Delays to definitive care increase morbidity and mortality.**

ACH has a Trauma Team system which provides immediate skilled emergency care for trauma patients in the Department of Emergency Medicine and facilitates early progress to definitive care. These guidelines describe the approach to major trauma patients.

***Read and know them before you take on a role within the trauma team.***

# Part 1: Trauma Calls

## A. Criteria for a trauma call

**A mandatory trauma call will be made when there is one or more of:**

### 1. RT call

The emergency department is notified of the imminent arrival of an unstable patient (Status 1 or 2, see appendix for ambulance condition status codes)

### 2. Physiology

- Respiratory rate < 10 or > 29
- Systolic blood pressure < 90 mmHg for patients under 55 OR < 110 mmHg for patients over 55
- Heart Rate > 120 bpm
- Glasgow Coma Scale < 13

These physiological parameters may be met in the ambulance, noted at triage or deteriorated to in the emergency department.

### 3. Injury Pattern

- Penetrating injury to the head, neck or torso
- Flail chest
- Complex pelvic injury
- Two or more proximal long bone fractures
- Traumatic amputation proximal to knee or elbow
- Major crush injury
- Penetrating trauma to a limb with arterial injury
- Crushed, mangled, amputated or pulseless limb
- Paraplegia or quadriplegia
- Major burns

A discretionary trauma call can be made by the Emergency Medicine registrar or consultant. This may be made for mechanism, physiology, co-morbidities or a combination of these.

These might include:

- Fall > 3 metres
- Entrapment > 30 minute
- Cyclist or motorcyclist versus car
- Beta-blockers
- Pedestrian versus car or train
- Relative hypotension
- Ejection from a vehicle
- Anti coagulation
- Fatality in the vehicle
- Elderly patient with moderate trauma

A trauma call ends with acceptance to a hospital service (DCCM, a surgical service or the Emergency Department) with a clear plan for definitive care.

### 4. Transfer

Major trauma patient transferred from another hospital to the Emergency Department

### 5. Multiple Casualties

When the Emergency Department is forewarned of the imminent simultaneous arrival of four or more trauma patients, irrespective of their suspected injury severity.

## B. Activating a Code Crimson Call

A Code Crimson call is made either by HEMS or once the patient is in ED and assessed as potentially requiring surgical or interventional radiology to control haemorrhage post trauma.

Assessment is based on the four parameters of the Assessment of Blood Consumption score (ABC):

1. Penetrating truncal mechanism of injury
2. Systolic Blood pressure of 90mmHg or less
3. Pulse of 120/ min or more
4. Positive trauma E-FAST ultrasound scan

You score one point for each parameter met. If the patient scores ≥ 2 points they meet the criteria for Code Crimson activation.

Code Crimson activation will be sent via Switch to all the personnel on the standard Trauma Call activation as well as the following personnel:

1. Surgical Consultant on call
2. Emergency Department Consultant if they are not in the ED
3. Level 8 Anesthetist
4. Level 8 Nursing coordinator
5. Radiology registrar who will contact the on call Interventional Radiologist
6. Blood bank

The aim of the Code Crimson activation is to get all the surgical decision makers and facilitators in the resuscitation room to facilitate rapid access to theatre or interventional radiology 24 hours a day, 7 days a week.

See Part 3 for the Code Crimson algorithm.

## C. Initiating a Trauma Team Call

The trauma call may be initiated at any time: from the receiving of an RT call to definitive care as may otherwise have been arranged. The trauma call and response is designed to decrease time to definitive care, when there is the potential for delays to worsen outcomes.

The **nurse co-ordinator** dials 777 and requests a trauma call to the adult ED in xx number of minutes. The trauma team will not be activated by any other mechanism. There are no partial calls.

The **telephone operator** initiates the trauma team group page and then will log the call from the Emergency Department.

It is the **responsibility of all members of the trauma team to respond immediately to the call**. Delegate to an individual of equal or greater seniority when attendance is not possible. It is the on-call general surgical registrar's responsibility to ensure a representative from one of the surgical services attends every trauma call. If unavailable, the general surgical registrar should first nominate the **orthopaedic** registrar, next the neurosurgical registrar, next the urology registrar. At night, when neurosurgical and urology registrars are not in the hospital, call the **paediatric surgical** registrar.

Early involvement of the Acute Surgeon/Trauma Consultant on duty as indicated

## D. Process of care for a trauma call patient

The principles of the EMST course form the basis of these guidelines. Adaptations to the local 'environment' are included.

**The process of care for trauma call patients is:**

<b>Ambulance hand-over</b>	45 seconds  One person talking, everyone listening  Describes: mechanism and time of injury, injuries noted, signs at the scene, interventions and the response to intervention. (M.I.S.T.)
<b>Primary Survey</b>	ABCDE
<b>Resuscitation</b>	Immediate therapy for life threatening injuries and physiological abnormalities detected in the Primary Survey
<b>Adjuncts to 1° Survey</b>	Monitoring and x-rays, FAST
<b>Secondary Survey</b>	A thorough "top to toe, front to back" examination of the patient. See the 'major trauma form'.
<b>Adjuncts to 2° Survey</b>	NG and IDC. Special investigations including CT or angiography as indicated
<b>Definitive Care</b>	A formal hand-over to the accepting speciality.

## E. Trauma Team Membership and Roles

### Membership

- The team membership is as follows:
- Trauma team leader
- Critical Care Medicine Registrar
- Emergency Medicine Registrar
- General Surgery Registrar
- Airway nurse
- Circulation nurse
- Senior nurse

The trauma team leader is a consultant. This responsibility may be delegated to another individual. Overnight this delegation is automatically given to the senior ED doctor.

The trauma team leader is clearly identified by placing the "trauma team leader" sticker on the scrubs. All trauma team members must have their roles delineated **before** the arrival of the patient.

The team leader does not change during a trauma call.

**All** doctors make themselves known to the team leader before becoming clinically involved with the patient.

### Roles

Know your role **prior** to being a team member. The Trauma Team leader will delegate specific tasks when required.

#### Team Leader

- Decisions
- Direction
- Destination
- Documentation

### Responsibilities:

1. Ensure team is complete and roles allocated prior to patient arrival
2. Obtain essential history from pre-hospital care providers
3. Ensure team members perform their roles in a timely fashion
4. Prioritise injuries and the investigation and management thereof
5. Facilitate passage of patient to definitive care and radiology
6. Reach agreement with the trauma team members on treatment plan and timeframe
7. Contact other specialities (e.g. Orthopaedics or Neurosurgery)
8. Initiate Massive Transfusion Protocol as required <http://adhbintranet/anaesthesia/guidelines/mtp13.pdf>
9. Speak with relatives
10. Ensure appropriate documentation is completed by team members

When possible this should be a 'hands off' role.

### Critical Care Medicine Registrar

- Primary Survey: A, B and D.

#### Responsibilities:

1. Communicate with the patient
2. Establish patent airway and give oxygen
3. Ensure in-line stabilisation of the cervical spine
4. Establish and maintain ventilation
5. Evaluate neurological status
6. Monitor ECG and vital signs
7. Insert arterial line as required
8. Place a gastric tube (orally if the nasal route is contra-indicated)

### Emergency Medicine Registrar

- Primary survey: C and E
- Arrange trauma radiology
- Secondary survey

#### Responsibilities:

1. Stop external bleeding with pressure
2. Complete primary survey (C & E)
3. Insert large bore cannulae (14g/16g in antecubital fossae)
4. Take trauma bloods (**including ethanol**) and cross match suspended red cells
5. Start fluid resuscitation with crystalloid
6. Complete secondary survey including FAST scan where relevant

### General Surgery Registrar

- Expedite surgical and radiological intervention.
- Confirm the secondary survey findings.
- Perform invasive examinations.

#### Responsibilities:

1. Intercostal drainage
2. Arrest external bleeding
3. Urinary catheterisation
4. FAST scan and/or Diagnostic peritoneal lavage (DPL) where indicated
5. Review secondary survey
6. During logroll, examine back and perform rectal examination
7. Arrange CT, angiography if indicated
8. Arrange OR appropriate and gain consent

### Procedural Nurse

#### Prior to patient arrival

- Check and prepare airway equipment
  - oxygen & suction
  - intubation equipment
  - ventilator/capnograph
- Draws up intubation drugs

#### On patient arrival

- Ensure C-spine stabilisation
- Assist with patient transfer onto bed
- Assist with initial airway management
- Cut clothes on patient's right when airway secure

#### During intubation

- Assist with intubation
- Ensure cricoid pressure is applied (by another member of the team) if request from airway doctor
- Secure ET tube and attach to ventilator & capnograph
- Assist with insertion of NG tube
- Apply lacrilube

#### Ongoing care

- Ongoing monitoring of airway & ventilation
- Record ECG
- Assist with/performs IDC - dipsticks & sends spec
- Assist with chest drain insertion / DPL /USS / other procedures

#### Prior to transfer

- Total drainage output – IDC / chest drain & informs documentation nurse
- Ensure portable oxygen available
- Prepare transport box & drugs

## Circulation Nurse

### Prior to patient arrival

- Ensure IV trolley available
- Prime IV lines

### On patient arrival

- Switch timer on
- Assist with patient transfer onto bed
- Cut clothes on patients left
- Attach Propaq
- Perform initial obs (place saturation probe on as 1st action) - BP, P, RR, temp, GCS, O2 sats. Inform team of readings
- Assist with control of haemorrhage

### During intubation /iv access

- Assist with IV lines & fluid infusion
- Administer IV drugs

### Ongoing care

- Continued obs - BP, P, RR, temp, GCS, O2, CO2, MAP - & informs team
- Set up arterial line monitoring
- Continue with administration of IV fluids / drugs
- Apply splints / dressings
- Notify documentation nurse of fluids/drugs administered

### Prior to transfer

- Ensure necessary equipment & fluids available
- If patient is going to a ward ensure arterial line is removed

## Nurse Co-ordinator – Senior Nurse at Foot of Bed

### Prior to patient arrival

- Designate nursing roles & liaise with team leader
- Identify team members
- Prepare documentation – ensures R40 attached to front of resus record
- Inform blood bank and x-ray as appropriate
- Ensure rapid infusion device is set up as indicated
- Ensure art line is set up as indicated

### On patient arrival

- Document:
  - time of arrival
  - history from ambulance officers
  - patient status
  - baseline recordings including GCS and pupil reaction
- Prepare paperwork
- Liaise with clerks re: patient details / valuables / sending bloods
- Attach ID band
- Label and secure property

### During intubation/iv access

- Document time / drug / dose etc

### Ongoing care

- Co-ordinate nurses to assist with log roll
- Continue with documentation
- Provide team with regular updates
- Access drugs
- Double check all infusions where necessary (e.g. blood)
- Ensure specimens are labelled & sent
- Liaise with social worker or ED charge nurse for the ongoing care of the family

### Prior to patient transfer

- Liaise with MBOR / DCCM charge nurse/ duty manager
- Keep ED charge nurse informed
- Ensure documentation completed
- If transferring patient to a ward ensure:
  - Fluid total input / output is transcribed onto hospital fluid balance chart
  - Ongoing medication is transcribed
- Makes decision regarding most appropriate transfer nurse

## Paramedics

### Document on white board:

- Patient identity – name, age, gender
  - Mechanism of injury
  - Location of injury
- Injuries
  - Signs and Symptoms
- Relevant Medical history
- Allergies
- Medications prescribed
- Other Information
- Print e-PRF for inclusion in patient notes.

## F. Standard precautions

Standard infection control and safety precautions should be maintained for all patients including trauma calls. This includes:

- Wash hands before and after all patient or specimen contact
- Wear gown and gloves for potential contact with blood and body fluids
- Wear protective eyewear and mask

Plastic aprons, protective visors and gloves are always available.

**Refer to Auckland DHB Infection Control Manual**

**The risks just aren't worth it!**

## G. Primary Survey (ABCDE)

### ABCDE

The primary survey is achieved through parallel tasking. Knowing your role makes this possible.

### Airway (with C-spine control)

1. Assess the airway and determine its adequacy
2. Create or maintain an airway by
  - a. Looking with suction
  - b. Chin lift or jaw thrust
  - c. Naso/Oropharyngeal airway
  - d. Orotracheal intubation
  - e. Cricothyroidotomy
3. Recognise the potential for cervical spine injury and maintain the spine in a safe neutral position until clinical examination and radiological findings exclude injury.
4. Indications for intubation
  - Airway or breathing compromise (present or predicted)
  - Unprotected airway
  - GCS < 9
  - Combative and uncooperative patients to facilitate on-going investigation and management in a safe environment for patient and staff

### Breathing

1. Administer high flow oxygen
2. Assess the chest by
  - a. Inspection
  - b. Palpation and feeling for the trachea
  - c. Percussion
  - d. Auscultation
3. Recognise and treat:
  - a. tension pneumothorax
  - b. massive haemothorax
  - c. flail chest
  - d. sucking chest wounds
  - e. pericardial tamponade

## Circulation

Assess circulation by

- a. Looking for external haemorrhage
- b. Observing skin colour, temperature and capillary refill
- c. Feeling the pulse
- d. Taking the blood pressure
- e. Checking neck veins

### **The patient with cold pale peripheries has shock until proved otherwise**

1. Arrest external haemorrhage by local pressure or tourniquet
2. Insert at least two large bore (>16g) IV cannulae
  - a. Tibial or Humeral Intraosseous, Jugular or Femoral vein Vascath, or venous cut down if lines not possible
3. Take the trauma bloods (FBC, relevant biochemistry, venous gas, ethanol, cross match, and pregnancy test in females of childbearing age).
4. Begin infusion with 1-2 litres of normal saline in adults.
5. Monitor the patient with an ECG monitor and a pulse oximeter

All fluids should be warmed (up to 39°C).

In massive haemorrhage use the Belmont Rapid Infuser.

### **Exsanguinating patients get group O blood ASAP**

Patients with on-going haemodynamic instability despite crystalloid resuscitation and suspicion of on-going haemorrhage should receive early blood products – initially O negative blood ± MTP activation as required.

<http://adhbintranet/anaesthesia/guidelines/mtp13.pdf>

## Disability

1. GCS
  - a. Are the eyes open ( 'no' means E3 or less)
  - b. Talk to the patient
  - c. Use painful stimulus to finger or toe if required (sternal rub has difficulty distinguishing M3, 4 and 5 )
2. Assess the pupillary size and response
3. Examine for lateralising signs (e.g. differing motor scores on each side) and signs of cord injury
4. Blood Sugar Level

## Exposure/Environmental control

1. Expose the patient so that an adequate complete examination can be performed.
2. Prevent the patient becoming hypothermic, measure their temperature

## Resuscitation and monitoring

Ongoing resuscitation of physiological abnormalities detected in the Primary Survey is very important. Monitoring of the progress of this resuscitation requires consideration of the following:

1. Respiratory rate
2. Perfusion
3. Pulse (palpation, ECG monitor +/- wave form)
4. Blood pressure
5. Oxygenation (pulse oximetry, ABG's)
6. Urine output (urethral catheter should be inserted if not contraindicated)
7. GCS

## Analgesia

Most trauma patients are in significant pain. Early pain management is essential in conjunction with on-going resuscitation.

- In general pain relief is aided by:
- Establishing rapport with the patient
- Splinting of injured extremities
- Gentle movement and handling
- Prevention of shivering
- Cooling of burns

Opioids should be given **intravenously** in severe trauma:

- Titrate in small increments until the desired effect is achieved.
- Beware hypotension, respiratory depression and vomiting.
- May require bolus dose to effectively work in a timely fashion
  - Morphine 0.1 mg/Kg
  - Fentanyl 1.0 mcg/Kg

Local anaesthetics – Regional Blocks/Local Infiltration

Femoral nerve block is very effective for the pain associated with femoral fracture and is necessary in wounds to allow effective exploration.

## Bloods

1. One set of trauma bloods should be sent to the lab for FBC, U&Es, Creat, LFT's, Coags
2. One tube for Group & Hold plus cross-match
3. Venous blood gas

## Radiology

The resuscitation room x-rays are as follows:

### Chest X-ray

This is the only x-ray justified in an unresuscitated patient.

The obvious clinical tension pneumothorax should be treated before a CXR.

### Pelvic X-ray

A pelvic fracture that is not clinically obvious can be the site of unexplained blood loss.

A dislocated hip can be missed in a patient with multiple injuries, especially if unconscious.

### Lateral cervical spine X-ray

This is not performed routinely and is at the discretion of trauma team leader.

Allows early diagnosis clinically of C-spine injury, but does not clear the C-spine.

The C-spine cannot be cleared in the following circumstances:

- a. history of loss of consciousness
- b. abnormal level of consciousness
- c. intoxication
- d. unable to communicate
- e. head or neck injury
- f. neck symptoms or C-spine tenderness
- g. a distracting injury

When not cleared clinically, radiological examination is required. This is usually a CT scan.

## H. Secondary survey

This assessment is a complete examination of the patient from top to toe, both front and back.

Use the "Major Trauma Form"

## History

### AMPLE history.

<b>A</b>	Allergies
<b>M</b>	Medications (Anticoagulants, insulin and cardiovascular medications especially)
<b>P</b>	Previous medical/surgical history
<b>L</b>	Last meal (Time)
<b>E</b>	Events/Environment surrounding the injury; ie. Exactly what happened

## Secondary Survey

### Pitfalls:

1. Head and face
  - a. Posterior scalp lacerations/compound skull fractures
  - b. Pupil changes since primary survey
  - c. Visual deficits
2. Neck
  - a. Injuries under the hard collar are not seen
  - b. In line immobilisation while the collar is off
  - c. Missed cervical vascular injuries – refer to CT Angiogram algorithm
3. Chest
  - a. Clinical rib #s and sternal #s are missed
    - many do not show on the chest X-ray
    - they can compromise the patient
    - X-ray 'proof' is not required
4. Abdomen
  - a. Pain **or** tenderness **or** bruising requires further investigation
  - b. The inaccessible abdomen with appropriate mechanism requires investigation.
    - FAST (or Diagnostic Peritoneal Aspirate) in the unstable
    - CT in stable patients
  - c. Vaginal examination in female patients with pelvic fractures or vaginal bleeding. In pregnancy this examination should be deferred to an obstetric specialist.

- d. A nasogastric tube is contraindicated in the presence of facial fractures (an orogastric tube should be inserted)
  - e. A urinary catheter should only be inserted if there is no blood at the urethral meatus, no perineal bruising, and rectal examination is normal.
5. Back
    - a. Log roll takes 5 people, 3 body, one head, one examining
    - b. Inspection **and** palpation
    - c. Perform the rectal examination at this time if indicated.
  6. Extremities
    - a. Inspect and palpate each limb for tenderness, crepitation, or abnormal movement.
    - b. If the patient is cooperative ask him or her to move the limbs in response to command in preference to passive movement in the first instance.
    - c. Adequately splint any injuries.
    - d. Reassess after splints, traction or manipulation
  7. Neurological examination
    - a. Repeat the Glasgow Coma Scale – record scores for E, V and M as well as the total score
    - b. Re-evaluate the pupils
    - c. Look for any localising/lateralising signs
    - d. Look for signs of cord injury

## Initial Treatment

1. Supplemental O<sub>2</sub>, ensure sats  $\geq$  94%
2. Analgesia
  - a. IV – Morphine, Fentanyl
3. IVF
  - a. Crystalloid
  - b. Blood Products
  - c. FFP, platelets (and cryprecipitate or fibrinogen concentrate in some patients)
4. Early Haemorrhage Control
  - a. Pressure – Direct, Tourniquet
  - b. Interventional
  - c. Surgical
5. Manage Life-threatening chest injuries
  - a. Tension Pneumothorax
  - b. Pericardial Tamponade

6. Drainage of pneumothorax/haemothorax as indicated
7. In-dwelling Catheter if indicated
8. Pelvic Binder
9. Tetanus
10. Prophylactic Antibiotics where indicated

## Ethanol Levels

### Hospital ethanol

All trauma patients should have a hospital ethanol level taken (trauma call or not).

### Police ethanol

Police ethanol samples should be taken on all road crash drivers when:

- a. Requested by police, or
- b. Patient smells of alcohol, or
- c. An urgent hospital ethanol level is  $>3$  mmol/l

The kit is available in the ED and samples can be taken without police presence or request.

## Elderly patients

Elderly patient present special challenges as they have reduced physiologic reserve and their co-morbidities may affect treatment options and outcomes. Pulmonary complications are common and thoracic epidurals or early ventilation should be considered.

Early referral to gerontologist should be made for all elderly patients in the post-resuscitative phase.

## Pregnant Patients

Pregnant trauma patients require special consideration because of the anatomic and physiologic changes that occur in pregnancy and the fact that two patients are being treated (mother and fetus). In general, the best treatment for the fetus is the provision of optimal resuscitation of the mother.

- In late pregnancy, displace the uterus to the left (e.g. by elevating the right hip with a towel or pillow) to avoid IVC compression and hypotension
- Consider the need for anti-D therapy for Rh-negative patients
- Detect fetal heart sounds using auscultation or doppler
- A obstetrician should be consulted early and asked to attend the patients and provide CTG monitoring when appropriate

## Documentation

All members of the trauma team have a responsibility to ensure their actions, findings, names and roles are recorded in a legible fashion in the patient's medical record. The Auckland City Hospital Major Trauma Form is designed to document the trauma call. It forms a part of the clinical record. When used, other documentation is typically not required.

Definitive care decisions may require further documentation: speciality, specialist, plans and prioritisation. When several teams are involved explicit instructions (e.g. NBM, mobility, observations etc.) are required.

# Part 2: Injury treatment

## A. Head Trauma

Algorithm for management of head injury patient is found in Part 3.

Head injury is common and is frequently one of several injuries. Head injury is a part of 'D', and as such A, B and C injuries take priority. Once initial stabilisation has been undertaken patients with GCS < 14 will require neurosurgical assessment including CT scanning at some stage (Figure 1).

Basic neurological examination should include assessment of the Glasgow Coma Scale noting not only the best response but also any localising signs (i.e. also the worst response). It should be remembered that hypoxaemia, shock, alcohol and other drugs all depress the level of consciousness and worsen the neurological signs. Analgesic and anaesthetic drugs and muscle relaxants also interfere with neurological assessment.

### Glasgow Coma Scale

	Response	Score
Eye opening	Spontaneous	4
	To voice *	3
	To pain	2
	Nil	1
Best verbal response	Oriented	5
	Confused **	4
	Inappropriate	3
	Incomprehensible	2
	None	1
Best motor response	Obedient	6
	Localising	5
	Withdrawal	4
	Abnormal flexion	3
	Extension	2
	None	1

\* A patient who does not open their eyes to normal requests to do so is E3.

\*\* A patient who does not know the day of the week is V4.

In general patients should go to the OR for haemostatic surgery prior to having CT scans of the head, although each case needs to be considered on its merits.

## B. Prevention of Secondary Brain Injury

- Adequate Oxygenation
- Prevent Hypercarbia & Hypocarbia (Hypoventilation and Hyperventilation)
- Adequate Perfusion Pressure
- Prevention of Hypoglycaemia
- Reduce agitation
- Early decompression when indicated
- Use of:
  - Mannitol
  - 4 Molar salt
  - Hyperventilation

## C. Spinal Cord Trauma

Algorithm for management of cervical spine injury is found in Part 3.

Physical signs of spinal cord trauma include:

- No movement of arms and/or legs
- Abnormal peripheral vasodilatation
- Lax anal sphincter tone
- Contusions/tenderness/deformity/crepitus on clinical examination of the spine during the log-roll
- Subjective and objective sensory changes

The only cervical spine view indicated in the emergency room is the lateral view. The cervical spine must remain protected until the patient is stable enough to undergo the 3 film cervical series, performed either in the radiology suite or in DCCM. "Clearance" of the cervical spine is undertaken according to the guidelines in figure 2 (Appendix).

Any patient who has a cervical spine injury or severe blunt trauma requiring admission to DCCM should have screening AP and Lateral x-rays of the entire thoracic and lumbar spine. Patients with clinical signs of thoracic or lumbar spine injury similarly require radiologic evaluation.

Presently at ACH steroids are not used in the acute management of cord injuries.

Any patient with isolated spinal cord impairment, refer to the Supra-Regional Spinal Cord Injury Guidelines. These patients are transferred as soon as possible to Middlemore Hospital.

## D. Chest Trauma

Algorithms for management of blunt and penetrating chest trauma are found in Part 3.

Injuries that immediately compromise ventilation and oxygenation should be identified during the initial assessment of the trauma patient and treated appropriately. Examples include pneumothorax and haemothorax. These patients are always admitted.

Some injuries result in severe respiratory compromise hours or even days after injury. Minor injuries can be a marker for more severe injuries. The Trauma Service has a liberal admission policy for patients with seemingly minimal chest trauma.

Patients with the following conditions will be admitted:

1. Sternal fractures
2. Any 1st, 2nd or 3rd rib fractures
3. More than 1 rib fracture in any region (We might not admit an otherwise fit and healthy patient on the basis of a single rib fracture)
4. Pulmonary contusion
5. Subcutaneous emphysema
6. Traumatic asphyxia
7. Flail segment
8. Chest trauma associated with an arrhythmia or other evidence of myocardial injury.

Co-morbid (e.g. CORD, warfarin etc.) and elderly patients may be admitted following any chest trauma.

Patients with chest injuries are admitted under general surgery unless they require admission for another injury requiring surgery i.e. orthopaedic/neurosurgical. They can be referred to the Trauma Service for continuing care as a ward referral. Chest injury patients should not be admitted under medical service due to pain service availability and differing nursing skills. All should receive supplemental oxygen as needed, chest physiotherapy, and adequate analgesia. Consultation with the Pain Service on the day following injury should be considered.

### Indications for tube thoracostomy

Tube thoracostomy (chest tube insertion) is indicated in the following circumstances.

1. Haemothorax on chest x-ray
2. Significant pneumothorax (>20% loss of diameter on chest x-ray)
3. Severe lung injury or any pneumothorax, no matter how small on chest x-ray, in a patient who is to be transported by ground or air, or is to undergo GA or positive pressure ventilation
4. As a diagnostic / therapeutic procedure in the unstable multi-trauma patient with suspected internal haemorrhage into the chest
5. Small pneumothorax or surgical emphysema if patient is to undergo positive pressure ventilation.

## E. Aortic Injury

All trauma patients with an "appropriate mechanism of injury" (total body acceleration/deceleration e.g. road crashes [incl. pedestrians and cyclists] and falls >1 storey) are at risk for thoracic great vessel injury. Concerns must be discussed with consultants.

Suspicious clinical signs include:

- neck haematoma
- unilateral diminution or loss of pulse, asymmetric BP
- radiofemoral delay (pseudocoarctation)
- severe searing transthoracic pain

AP chest x-ray signs include:

- Widened mediastinum >8cm
- Loss of normal aortic contour
- Opacification of aorta-pulmonary window
- Apical capping
- Displacement of main stem bronchi (left down, right up), NG tube to the right
- Fracture of first rib, scapula

The widened mediastinum requires further investigation, most commonly with CT aortogram.

**A widened mediastinum does not necessarily mean an abnormal mediastinum and an abnormal mediastinum may not necessarily be widened.**

The investigations for great vessel injury are:

### CTA Chest

- Can be helpful in resolving the diagnosis of abnormal mediastinum
- Requires the appropriate CT protocol (thoracic aorta dissection protocol)
- Can identify injuries that may otherwise be missed on plain films
- Is not useful for mediastinal haematoma if anatomical boundaries are obliterated by undrained haemothorax etc.

In general, the investigation and the treatment of aortic rupture should follow treatment of expanding intracranial haemorrhage or active chest, abdominal, or pelvic bleeding.

## F. Penetrating Chest Trauma

Algorithms for management penetrating chest trauma are found in Part 3.

Penetrating wounds to the chest are relatively uncommon presentations to Auckland City Hospital. Many will cause pneumothorax or haemothorax and require chest drain. Occasionally mediastinal or cardiac injuries occur. Penetrating cardiac injuries have a high mortality and only 25% (2 or 3 each year) survive to reach our hospital. Diagnosis before tamponade is associated with better outcomes than waiting for cardiac arrest.

Any patient who is haemodynamically unstable after a stab wound to the chest needs the cause established as soon as possible. Finger thoracostomy and tube or chest drains will identify tension pneumothorax or massive haemothorax. Undertake a FAST scan to assess bleeding into the abdomen or pericardium.

In stable patients, clinical examination combined with chest x-ray can be used to evaluate the lungs and pleural cavities **but these modalities are insensitive for cardiac injury.** When patients have been stabbed in "the box" the possibility of cardiac injury exists. ("The box" is that part of the anterior chest and abdomen bounded by the clavicles superiorly, the mid-clavicular lines laterally, and the costal margin in the mid-clavicular line.)

Cardiac injury can be identified by: FAST scan, echocardiography, pericardial window or thoracotomy. All of these are operator and skill dependent. Get consultant input immediately for suspected cardiac injury.

### Thoracotomy procedure

#### Emergency Department Thoracotomy

This procedure is a desperate measure performed to try and save "agonal" patients. Most patients will die (70 to 90%). In blunt trauma 99% will die.

**Indications:** A penetrating injury to the chest, where the patient is dying in front of you and will not survive the trip to theatre, and vital signs were present either on arrival in the ED or within the previous 15 minutes but are now absent. Vital signs include a palpable pulse, electrical cardiac activity on an ECG monitor, spontaneous respiration, or reactive pupils.

#### Procedure:

##### Tell the consultant surgeon on call this is happening.

The airway doctor advances the ET tube into the right main bronchus. The operating doctor makes a long left thoracotomy incision (5th space). Extend across the sternum if required. Use the Finochietto retractor. Have good access before proceeding.

**Then** (dependent upon findings):

#### Pericardial tamponade

- Identify the phrenic nerve. Open the pericardium anterior to the phrenic nerve. Evacuate the clot. Plug the hole in the heart (finger, IDC, suture, skin stapler).

#### Lung laceration

- Aortic clamp across the area of bleeding (hilum if necessary). Tell the airway doctor (so ventilation can be adjusted).

#### Hypovolaemic asystole

- Clamp the descending aorta just above diaphragm. Incise the pleura anterior and posterior to the aorta, separate from the oesophagus. Clamp just the aorta. Check the clamp will not fall off.

#### Internal cardiac massage

- Use the flat of your hands, one in front one behind, as using your fingertips can penetrate the heart. Use the internal paddles if defibrillation is required.

#### When to stop:

- The injuries are found to be irreparable (e.g. blunt cardiac rupture), volume replacement is not achieved within 15 minutes of thoracotomy (i.e. the heart remains empty) or the heart is not in a self-sustaining rhythm after 30 minutes

### Indications for operating room thoracotomy

- At Auckland City Hospital, <5% of blunt trauma patients and approximately 25% of penetrating trauma patients undergo operating room thoracotomy. The indications are as follows:
- Massive haemothorax (>1500ml blood drained immediately from chest tube)
- Ongoing bleeding (>200ml/hr for 2-4 hours, ongoing transfusion requirement)
- Significant undrained haemothorax following chest drain insertion warrants thoracotomy or thoracoscopy to evaluate.
- Cardiac tamponade, confirmed by FAST scan or subxiphoid window
- Mediastinal traversing wounds, i.e. cross the midline
- Specific injury requiring surgical intervention (e.g. tracheobronchial, oesophageal)

## G. Abdominal Trauma

Algorithm for evaluation of the abdomen is found in Part 3.

Refer to Appendix I: Evaluation of abdomen in the blunt trauma patient

Injuries may be identified in the primary survey (breathing: diaphragmatic hernia, circulation: blood loss). Decisions for laparotomy may be based on history and exam findings or via the primary survey adjuncts (FAST scan).

The FAST scan should take between 1-5 minutes and has the advantage that it is repeatable and non-invasive. The FAST operator should document the findings in the notes. When a credentialed operator is present, this investigation has acceptable sensitivity to exclude haemoperitoneum, cardiac tamponade and pleural fluid or blood.

The history of abdominal pain, may be all that points to significant intra abdominal injury. Signs may include the 'seat belt' sign, abrasion or bruising, and/or abdominal tenderness and/or gross haematuria. Abdominal CT may identify occult injuries in stable patients.

Patients with altered GCS or who are or will be intubated cannot be reliably assessed for these findings, or monitored for evolving peritonitis. Abdominal CT scan can be used to 'screen' these patients for occult injury.

Abdominal CT reports should include: organ injuries (or absence of), free fluid, air or contrast and fractures identified.

### Blunt Splenic Trauma

Imaging will be performed as detailed below\* on blunt trauma patients who do not have immediate indications for theatre i.e. peritonitis, hypotension.

Evidence of splenic trauma with contrast extravasation, false aneurysm, and/or arteriovenous fistula will proceed directly to angiography from emergency department. This will be organised by phone call from the most senior surgical registrar/consultant available to the interventional consultant.

Any grade 3+ splenic injury without the above findings will prompt a phone call from the surgical consultant to the interventional consultant. If the surgical consultant is not available within 20 minutes to make this call, the most senior surgical fellow/registrar will initiate the communication.

Factors that may prompt angiography in the absence of contrast extravasation, false aneurysm, and/or arteriovenous fistula include but are not limited to:

- Significant hemoperitoneum
- Clinical findings concerning for impending instability
  - Haemoglobin drop
  - Tachycardia
  - Hypotension
  - Fluid requirement >1L or blood product requirement

- Patients who are higher risk for complications from hypotension and/or laparotomy
  - TBI
  - Elderly/comorbid

If it is decided that the patient not require immediate angiography, a plan will be put in place to allow for prompt reconsideration should the patient's condition change. Ideally the patient will be admitted to a monitored setting i.e. HDU.

**\*Imaging** (pertains only to those patients who do not require a chest CT; these patients will continue as before)

- Dual phase abdominal CT (arterial upper abdomen, portal venous abdo and pelvis)
  - Resus patients coming through as a trauma call
  - Non resus patients with positive FAST
- Dual phase abdominal CT including pelvis (arterial abdo and pelvis, portal venous abdo and pelvis):
  - Patients with unstable pelvic fractures.
- Single phase abdominal CT (portal venous phase abdo and pelvis)

## H. Penetrating Abdominal Trauma

Algorithm for management of penetrating lower chest or abdomen stab wound is found in Part 3.

Because the diaphragm reaches the level of the fourth intercostal space on full expiration, any penetrating wound below the nipples anteriorly or tips of the scapulae posteriorly are considered potentially abdominal. Gunshot wounds mandate laparotomy.

## I. Pelvic Trauma

Algorithm for management of fractured pelvis is found in Part 3.

The pelvis should be assessed clinically as part of the Secondary Survey. Be gentle when examining the patient

### 1. Look

- Abrasion or bruising over bony prominences.
- Scrotal or perineal haematoma.
- Blood at the urethral meatus.
- Leg length discrepancy

### 2. Feel/move

- Posterior compression of iliac wings
- Medial compression of iliac wings
- Compression of pubic symphysis
- Hip flexion and rotation
- Rectal examination

All "impaired" patients and any patient with signs or symptoms of pelvic injury should have a plain AP x-ray of the pelvis. When fractures are identified, orthopaedic consultation is necessary.

If a patient with a pelvic fracture is haemodynamically unstable a FAST scan is required:

- If *grossly positive*, the patient **must** go to the OR for a laparotomy.
- If *grossly negative* then pelvic angiography and embolisation of arterial bleeders is next step.

**In major pelvic injury, stressing the pelvis should be avoided as it may dislodge vital clot.**

- Orthopaedic stabilisation of mechanically unstable pelvic fractures follows laparotomy or angiography to reduce venous loss.
- Intensivist, orthopaedic and trauma specialists should be involved early.

## J. Genitourinary Injuries

Anterior pelvic fractures are associated with a high rate of bladder and urethral injuries.

Cystogram can be used to investigate these injuries. Gross haematuria with anterior pelvic fractures will likely have bladder rupture as a cause.

An alternative to cystography in the screening room is a CT cystogram. (The bladder is filled with 300 ml of contrast prior to obtaining a CT 'run' through the pelvis. *Post-drainage* views of the bladder are then taken).

**Retrograde urethrogram** is required for the patient with: blood at the urethral meatus, scrotal bruising, high-riding prostate on PR or the stable patient with multiple grossly displaced superior and inferior pubic rami fractures.

An IDC may still be passed with gentle advancement but any resistance should stop procedure and alternate bladder drainage sought.

## K. Extremity Trauma

Look for deformity or bruising, feel for pain and listen for bruits over haematomas.

Do a neurovascular exam.

X-ray suspicious areas, including the joint either side. A common missed injury is the fracture distal to a fracture in the same limb.

Wounds should be accurately described, so subsequent examinations are not required. Repeated examination of wounds that are under sterile dressings is counterproductive.

After splinting or traction the neurovascular state of the limb is reassessed.

Femur fractures should be immobilised and femoral nerve blocks done.

Dislocated joints (except native hip joints) and fractures should primarily be managed with relocation within resus first prior to OT or other definitive treatment.

Native hip joint dislocations should go to OR for proper assessment. Always come if intubated and ventilated already. Check with Ortho.

## L. External Trauma

Make sure you have seen the entire patient.

External injuries are rarely life-threatening, however active bleeding should be stopped.

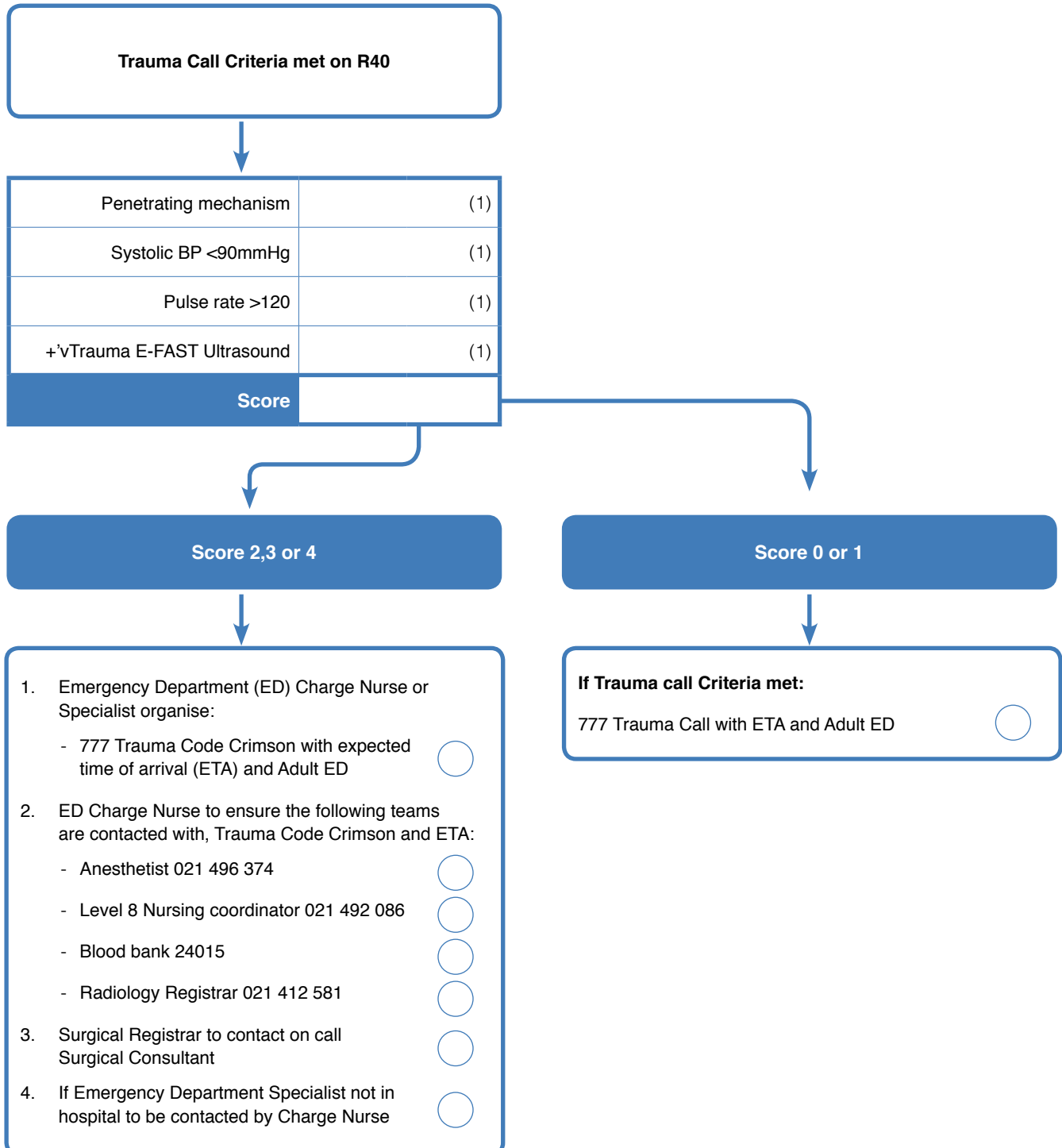
In penetrating injury the most obvious injury may well not be the most important injury.

Multiple injuries are common.

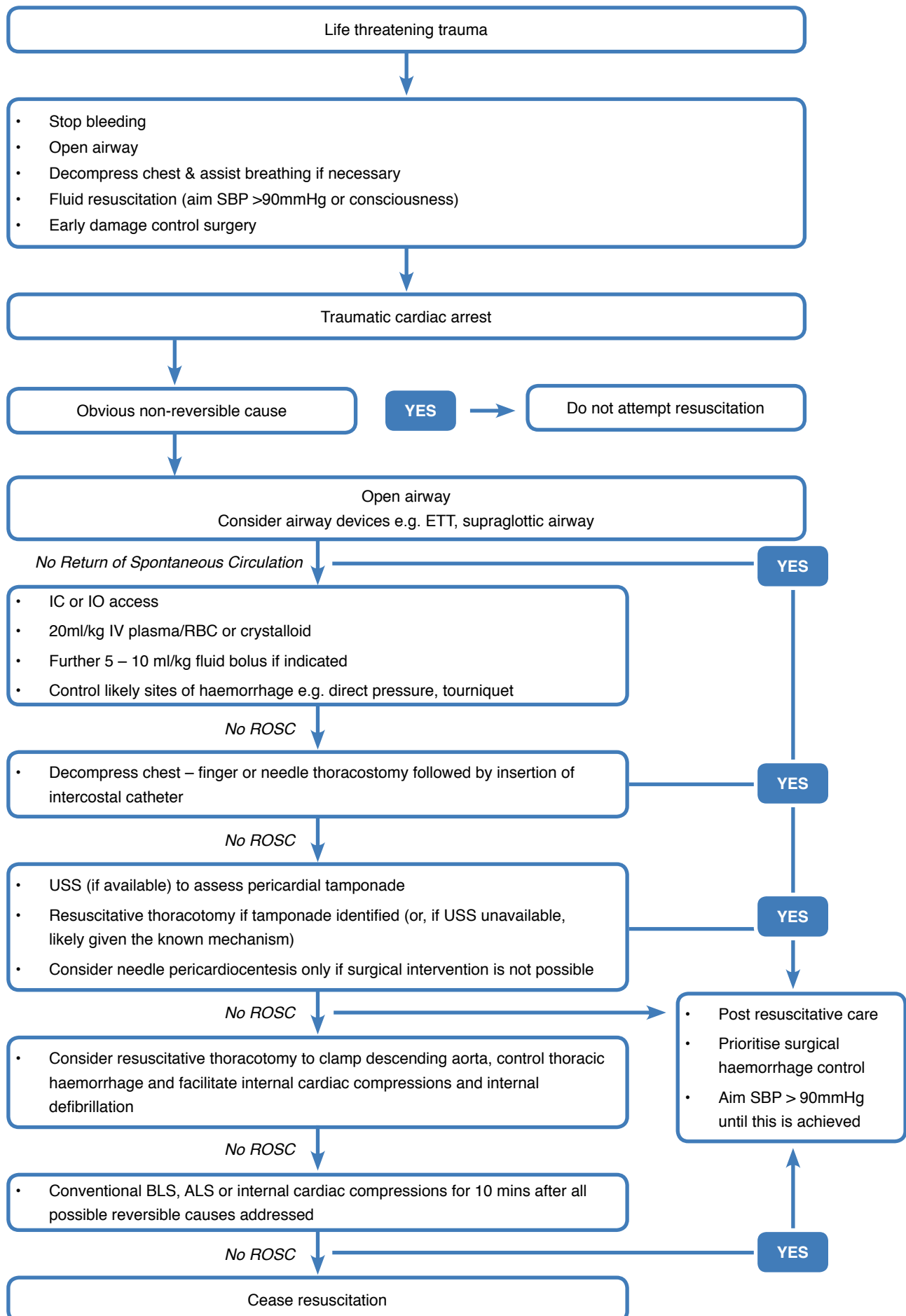
In blunt injury, external signs often provide clues to other more serious but less obvious injuries. Clinical rib fractures and the seat-belt sign are good examples.

# Part 3: Algorithms

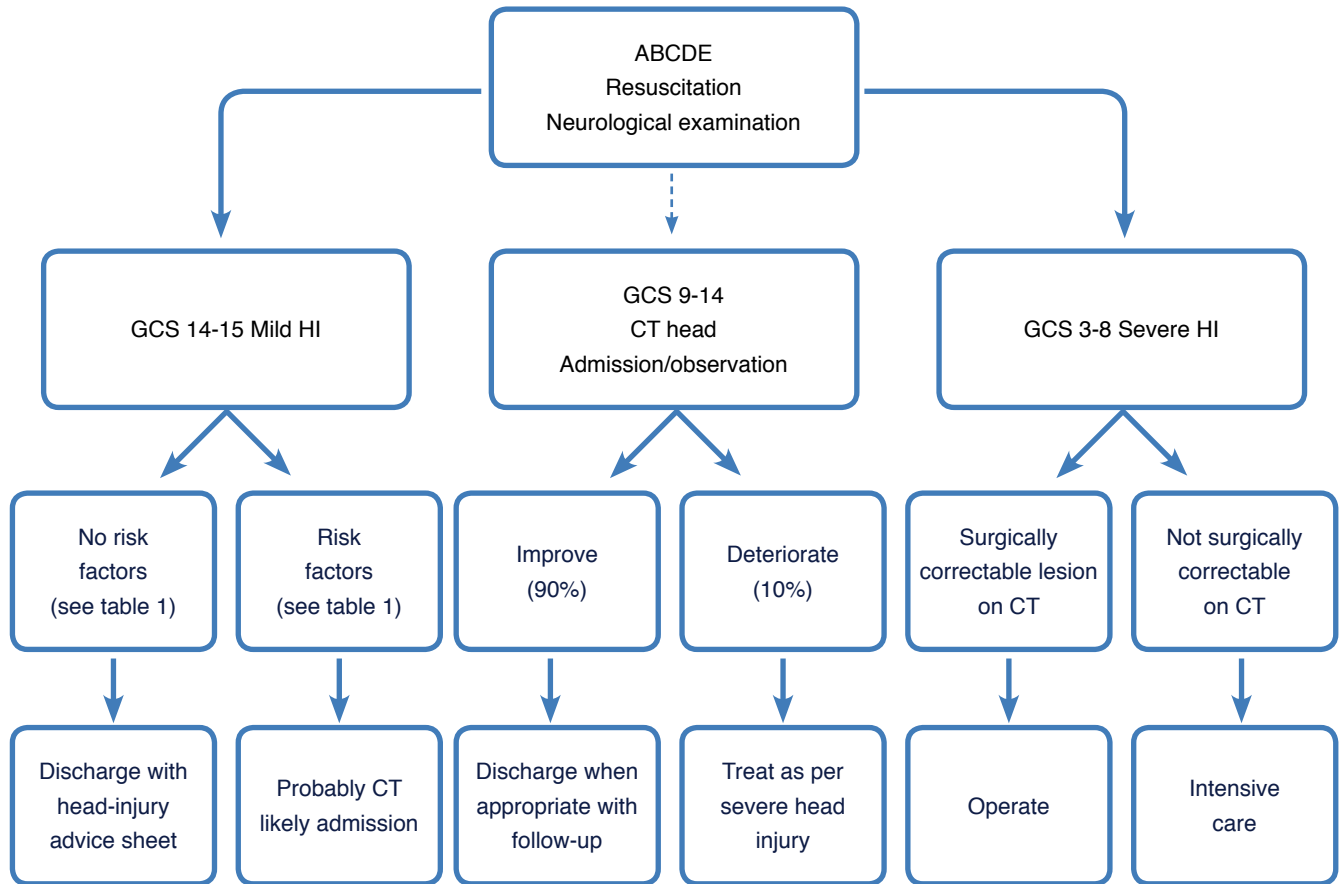
## Trauma Code Crimson



## Traumatic Cardiac Arrest



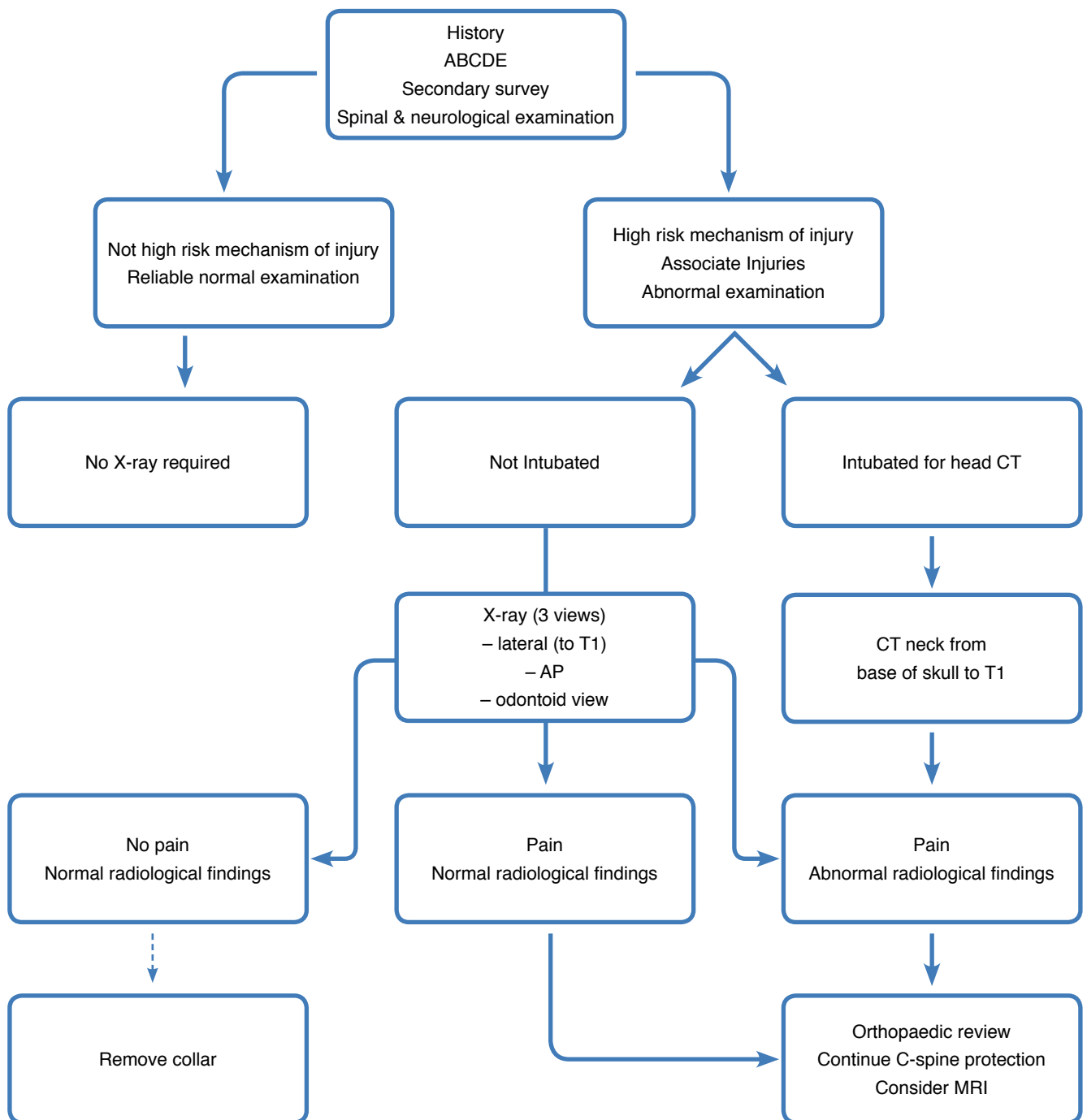
## Management of the head injured patient



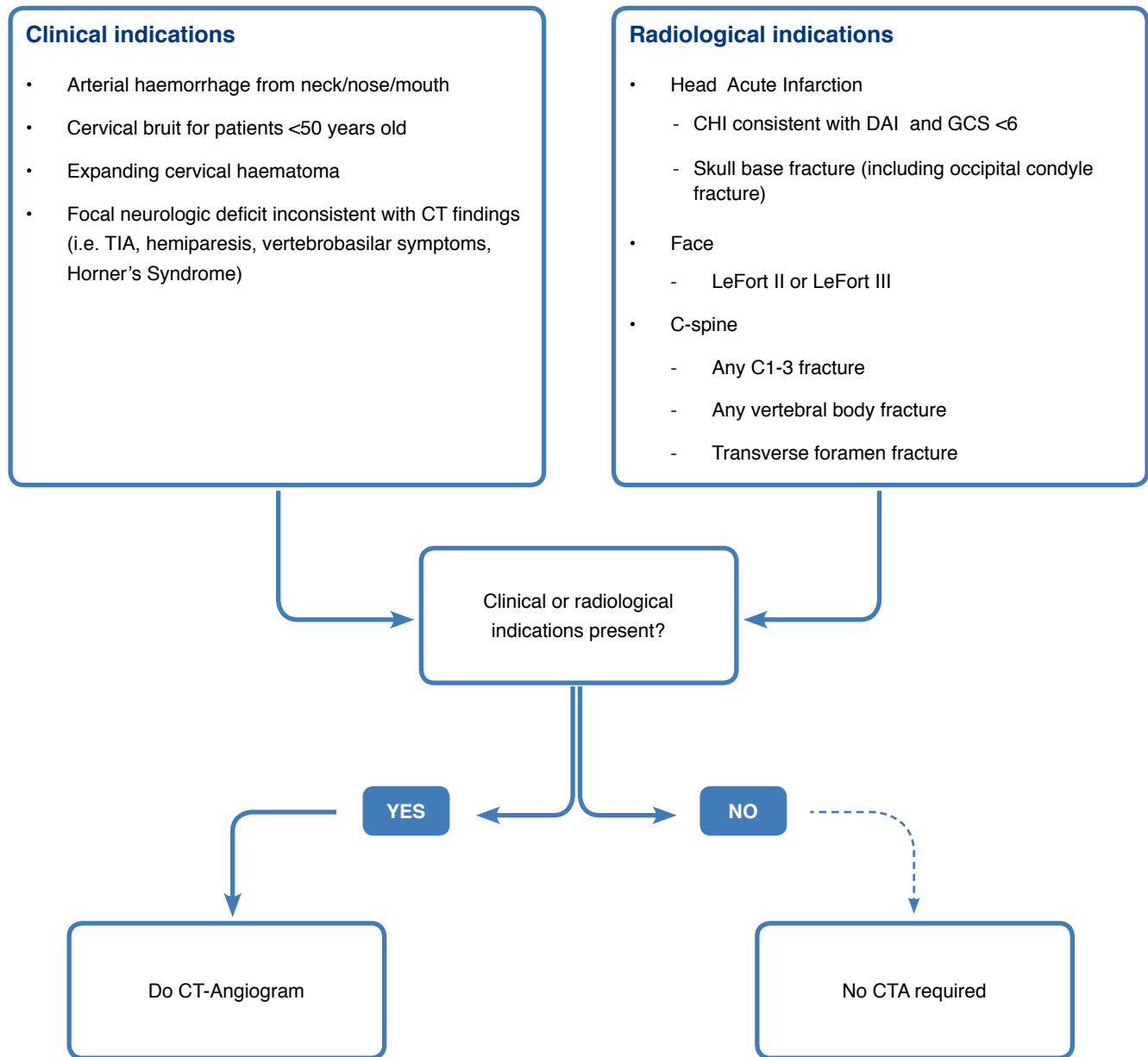
**Risk Factors:** Indicators of an increased risk of a significant intracranial lesion in a patient with apparently mild head injury

- Penetrating head injury
- Moderate to severe headache
- Amnesia
- Skull fracture
- History of loss of consciousness
- Deteriorating level of consciousness
- CSF leak, rhinorrhoea or otorrhoea
- Abnormal CT scan
- Alcohol or drug intoxication
- Significant associated injuries
- No reliable companion at home
- Unable to return promptly
- Anticoagulation – Warfarin, Dabigatran, Clopidogrel, Other

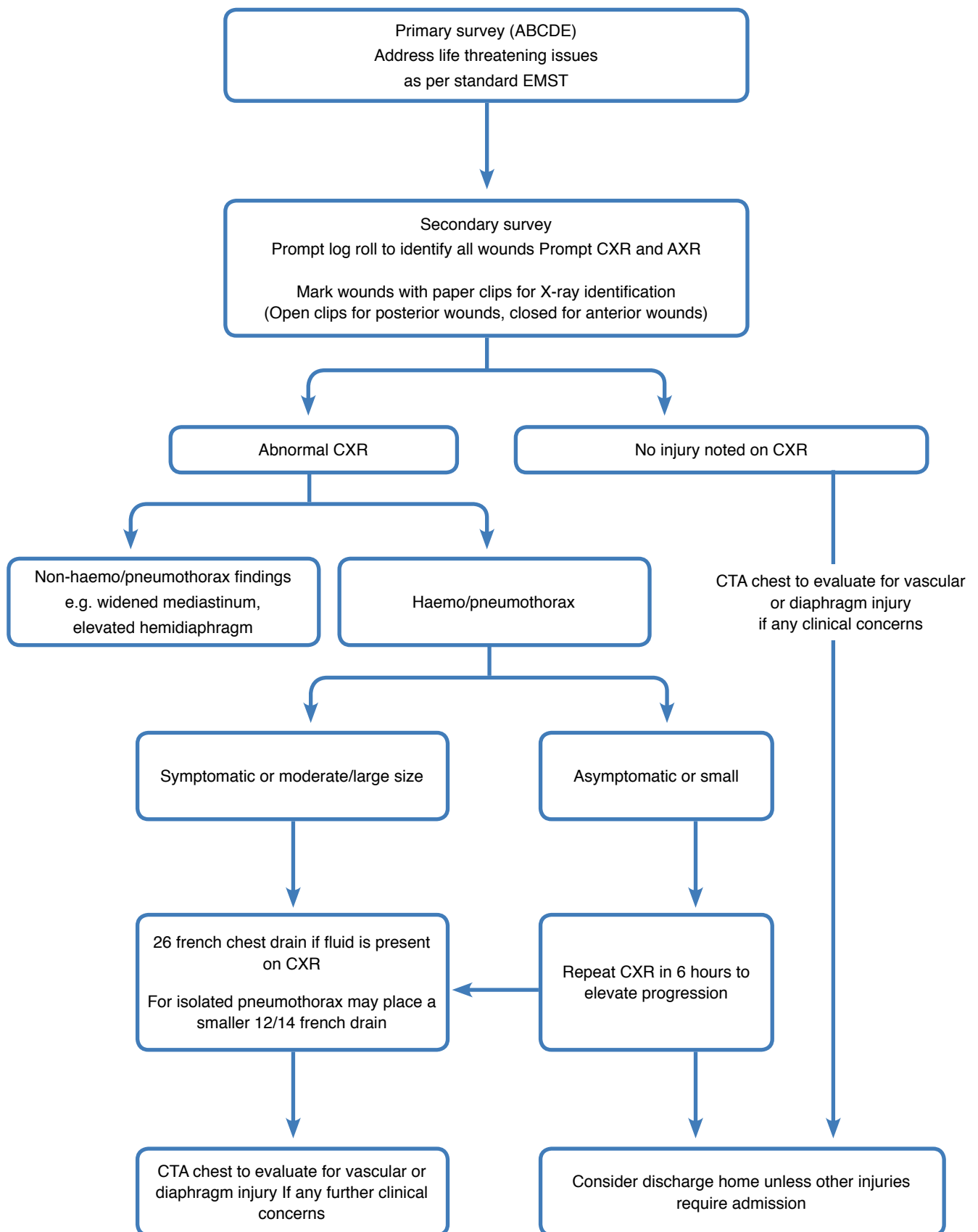
## Management of the cervical spine in trauma



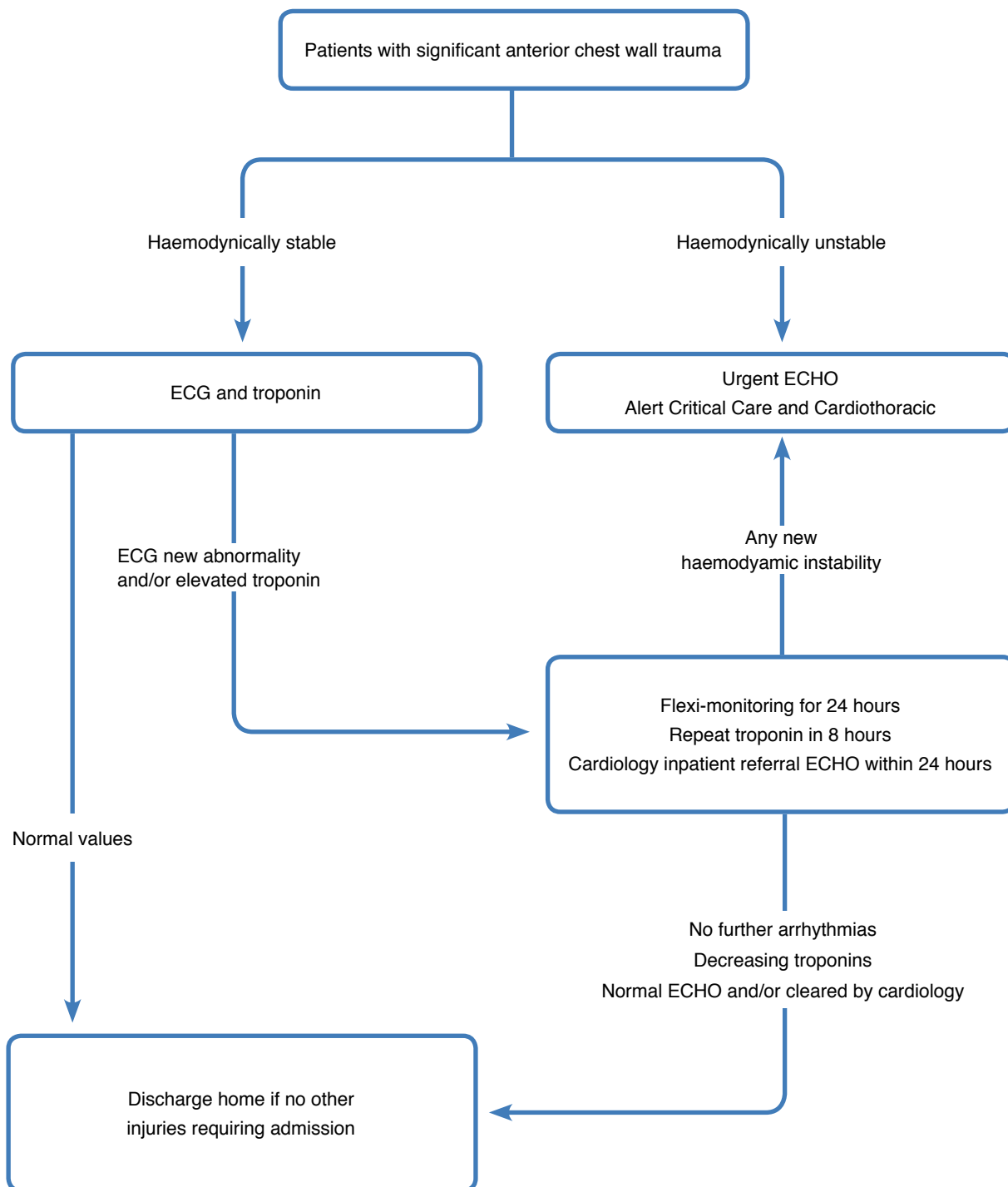
## Indications for CT Angiogram



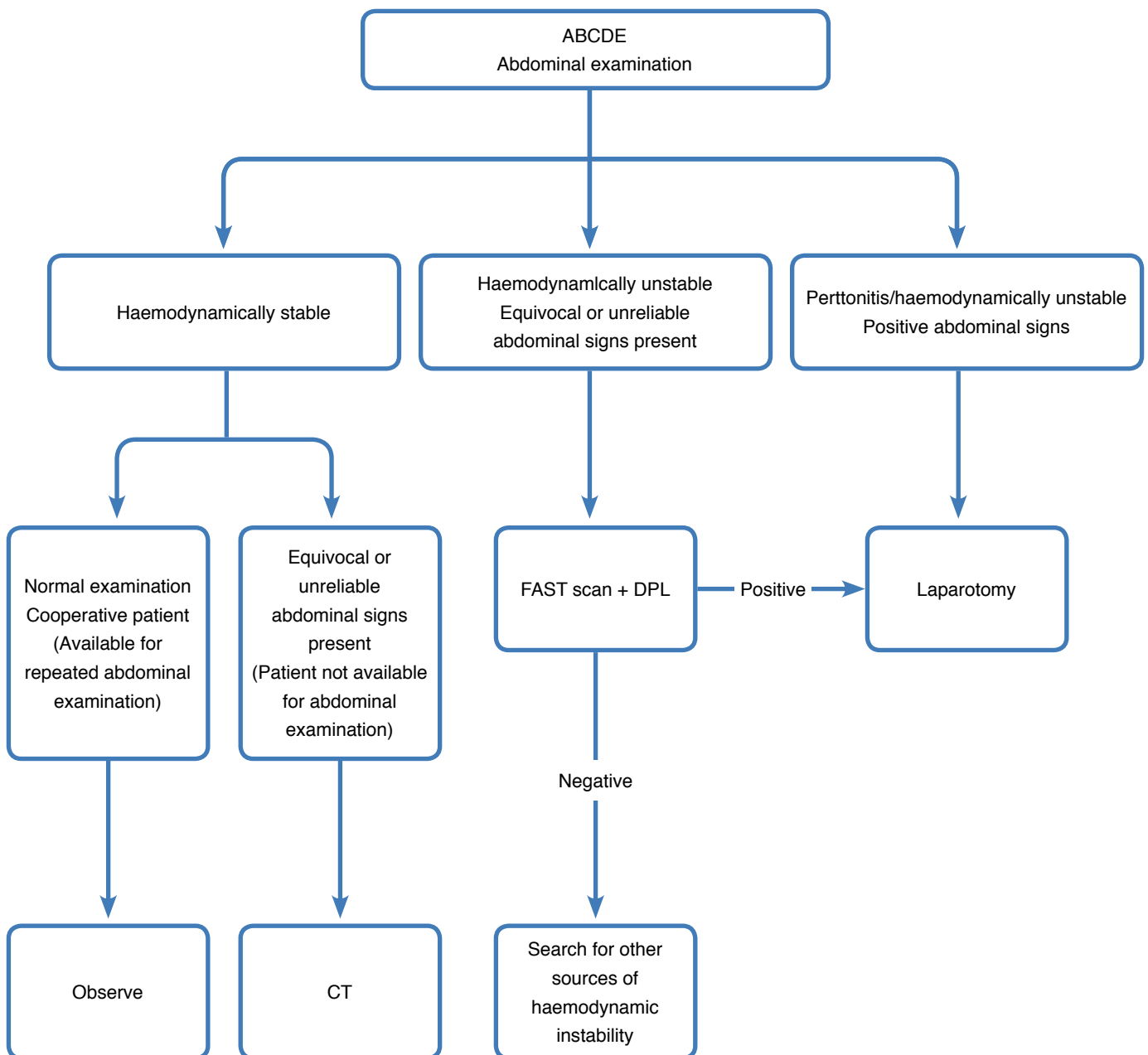
## Management of chest trauma



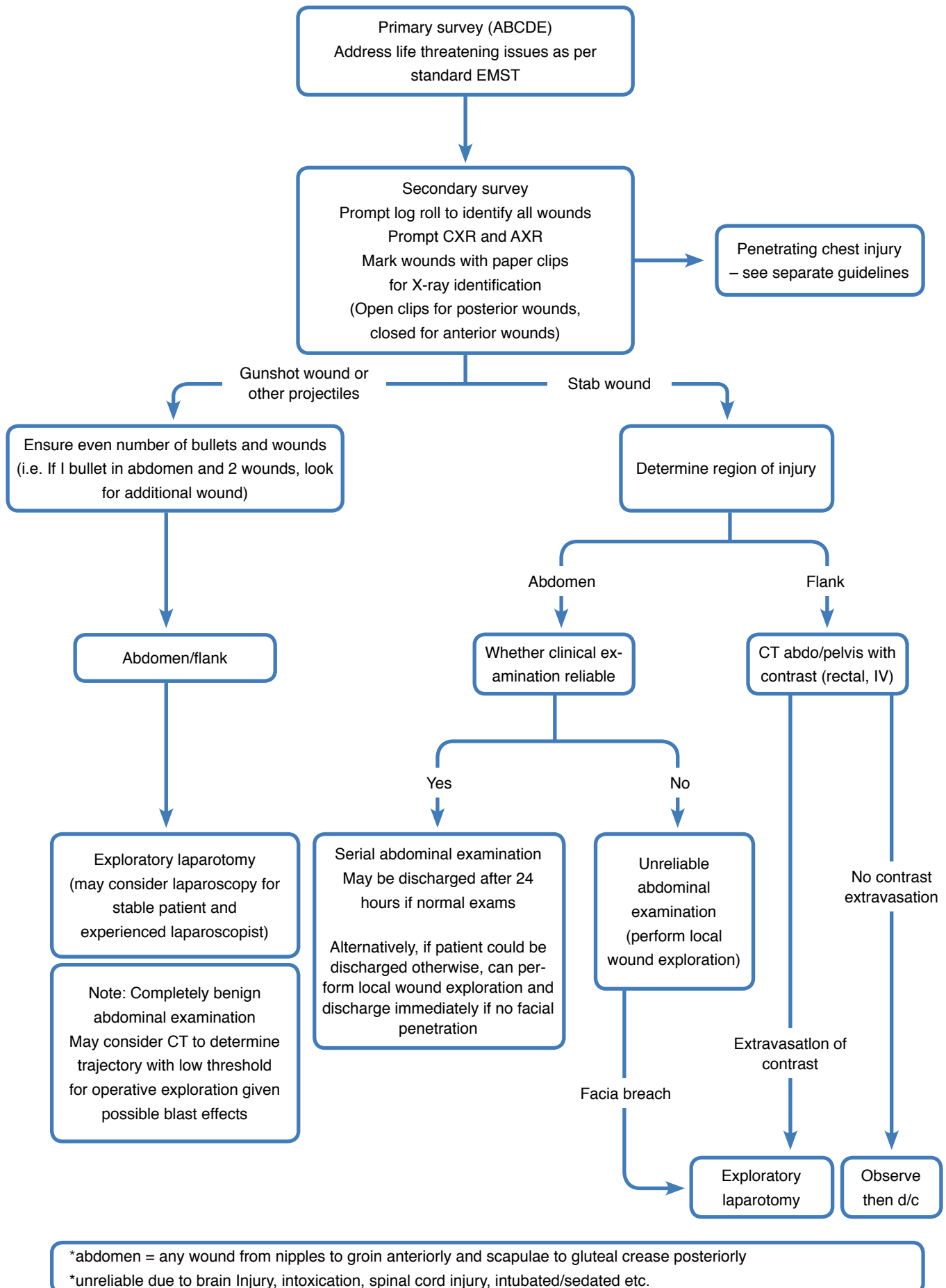
## Management of patient with chest wall trauma



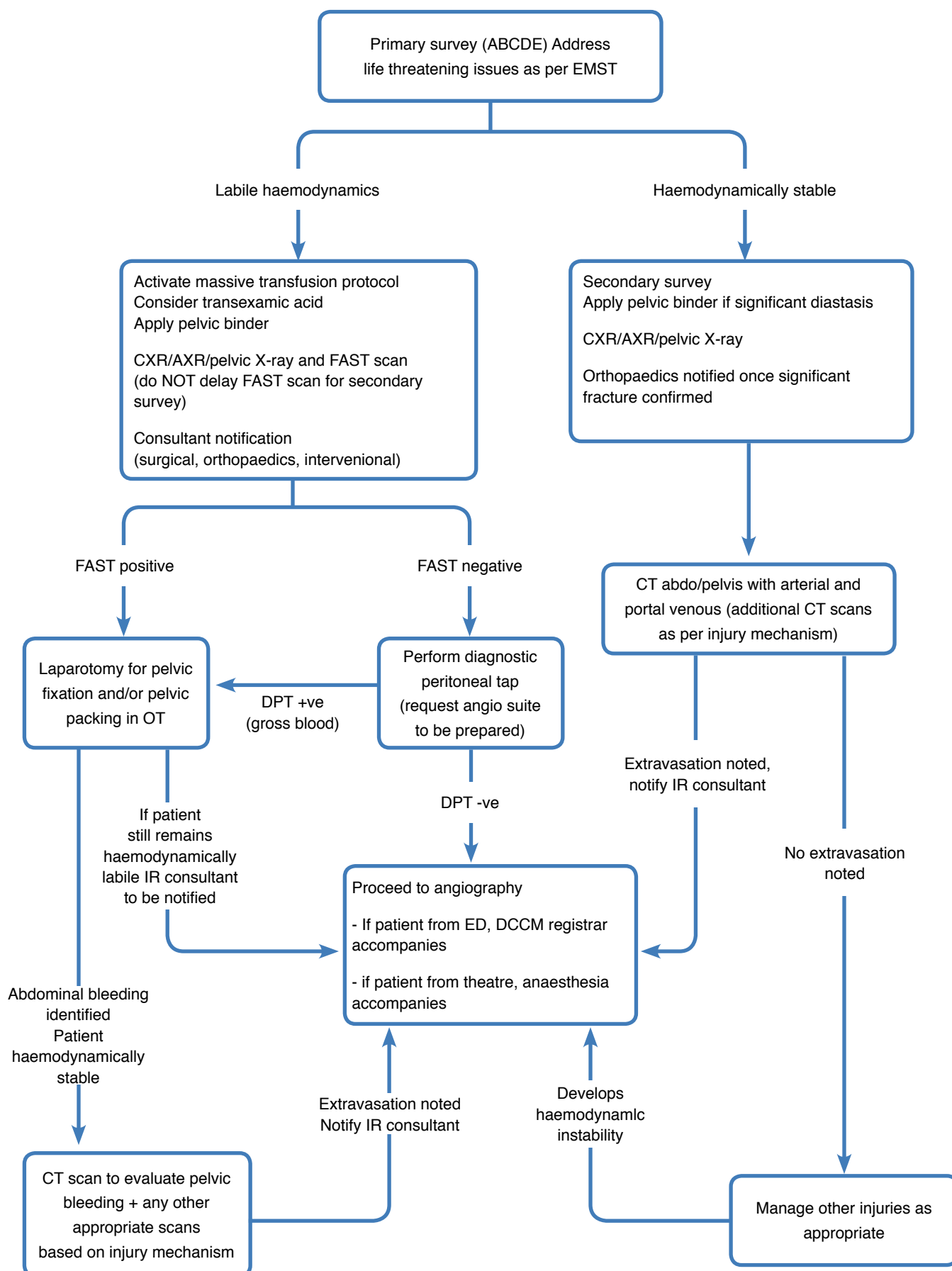
## Abdominal evaluation in the blunt trauma patient



## Management of penetrating lower chest or abdominal stab wound



## Management of fractured pelvis in the trauma patient



# Part 4: Northern region inter-hospital transfer guidelines



## Northern Regional Trauma Network

1. These criteria should prompt bypass or immediate transfer to definitive care facilities. Starship (paeds) and Auckland (adults) is the definitive care facility for most multi-trauma.
2. This is a guideline only. It does not replace clinical judgement.
3. All transfers must be safe and confer clinical benefit to the patient.
4. Notification between senior transferring and accepting medical staff precedes all transfers.
5. These guidelines have been agreed by all involved clinicians and endorsed by the four Northern Region CMOs.

### Trauma inter-hospital transfer guidelines for Auckland and Starship Hospital

Condition	Go To	Regional referral centre P = Paeds A = Adults	Comment
<b>Traumatic Brain Injury</b>			
All brain injuries	Starship/Auckland	P/A	
<b>Spine</b>			
Suspect spinal injury, no motor deficit	Starship/Auckland	P	
Spinal cord injury: • Isolated with motor deficit • Multitrauma but not TBI or chest injuries	Paeds – Starship Adults – Middlemore	P	Refer to Supra-regional Spinal Cord Injury Guidelines
Spinal cord injury – with other major injuries such as TBI or chest	Starship/Auckland or Middlemore	P/A	Adults – determine whether appropriate to transfer to Middlemore Hospital
<b>Vascular Injuries</b>			
Blunt Carotid/Vertebral Injuries	Starship/Auckland	P/A	
<b>Burns/Plastics</b>			
Burns > 20% or less but affects special sites	Middlemore		Refer to Burn Guideline D/w Burn Service at Middlemore on 09 250 3800, and fax referral to 09 276 0114
Burns <20%			Refer to Burn Guideline D/w Burn Service at Middlemore if grafting required
Degloving of face or other special sites or extensive / complex facial lacerations	Middlemore		D/w Plastic Surgical Registrar at Middlemore on 021 784 057
<b>Maxillo Facial</b>			
All Max Fax injury – Paeds	Starship	P	D/w Max Fax at Middlemore
Isolated Max Fax injury – Adults	Auckland		D/w Max Fax (021 292 1593) or Plastic Surgical Registrar (021 784 057) at Middlemore
Max Fax injury with TBI or chest injuries – Adults	Auckland	A	D/w Max Fax at Middlemore
<b>Chest</b>			
All chest injuries	Starship/Auckland	P/A	
<b>Abdominal Injuries</b>			
All abdominal injuries	Starship/Auckland	P/A	
<b>Special limb injuries</b>			
Upper limb with major nerve injury, +/- arterial injury	Middlemore		Call Plastic Surgical Registrar at Middlemore on 021 784 057
Upper limb with arterial injury (but no nerve injury)	Starship/Auckland	P/A	
Upper limb - amputation of viable digit (excluding simple terminalisation) or partial limb amputation	Middlemore		Call Plastic Surgical Registrar at Middlemore on 021 784 057
Mangled lower limb with tissue loss	Middlemore		Refer to Mangled Limb Algorithm. D/w Orthopaedic Registrar at Middlemore on 021 594 764
Lower limb - penetrating injury with major nerve injury +/- arterial injury	Middlemore		Call Plastic Surgical Registrar at Middlemore on 021 784 057
Lower limb • penetrating injury with arterial injury (but no nerve injury) • blunt injury with ischaemia +/- nerve injury		P/A	
<b>Orthopaedic</b>			
All orthopaedic injuries	Starship/Auckland	P/A	
<b>Urology</b>			
All urology injuries	Starship/Auckland	P/A	



## Northern Regional Trauma Network

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3. All transfers must be safe and confer clinical benefit to the patient.
4. Notification between senior transferring and accepting medical staff precedes all transfers.
5. These guidelines have been agreed by all involved clinicians and endorsed by the four Northern Region CMOs.

### Trauma inter-hospital transfer guidelines for Kaitiaki, Dargaville and Bay of Islands Hospitals

Condition	Hospital to refer to	Comment
<b>Traumatic Brain Injury</b>		
GCS ≥ 13 +/- concussion, not resolving	Whangarei or Starship/Auckland	D/w Whangarei ED SMO on 021 672 512
GCS 9 - 12	Whangarei or Starship/Auckland	D/w Whangarei ED SMO on 021 672 512
GCS <9 and/or open brain injury e.g. compound skull fracture	Starship/Auckland	Paeds: Call Starship Adults: Call 0800 4 TRAUMA
<b>Spine</b>		
Suspect spinal injury, no motor deficit		X-ray and d/w Whangarei Orthopaedic team and/or refer to Whangarei Hospital for further imaging as needed.
Spinal cord injury: • Isolated with motor deficit • Multitrauma but not TBI or chest injuries	Paeds - Starship Adults - Middlemore	Refer to Supra-regional Spinal Cord Injury Guidelines
Spinal cord injury - with other major injuries such as TBI or chest	Paeds - Starship Adults - Middlemore or Auckland	For adult patients d/w Intensive Care at Middlemore to determine whether appropriate to transfer to Middlemore, otherwise transfer to Auckland by calling 0800 4 TRAUMA
<b>Vascular Injuries</b>		
Blunt Carotid/Vertebral/Thoracic Aortic Injuries	Starship/Auckland	Paeds: Call Starship Adults: Call 0800 4 TRAUMA
<b>Burns/Plastics</b>		
Burns > 20% , or less but affects special sites	Middlemore	Refer to Burn Guideline D/w Burn Service at Middlemore on 09 250 3800, and fax referral to 09 276 0114
Burns <20%		Refer to Burn Guideline D/w Burn Service at Middlemore if grafting required
Degloving of face or other special sites or extensive / complex facial lacerations	Middlemore	D/w Plastic Surgical Registrar at Middlemore on 021 784 057
<b>Maxillo Facial</b>		
All Max Fax injury - Paeds	Starship	
Isolated Max Fax injury - Adults	Middlemore	D/w Max Fax (021 292 1593) or Plastic Surgical Registrar (021 784 057) at Middlemore
Max Fax injury with TBI or chest injuries - Adults	Auckland	Adults: Call 0800 4 TRAUMA
<b>Chest</b>		
All paediatric chest injuries - serious	Starship	
Penetrating chest injury - with shock +/- haemodynamic instability	Starship /Auckland	If (adult) patient has > 1,500ml blood loss in chest drain, not responding to resuscitation, needs urgent thoracotomy. Transfer when stabilised. Call 0800 4 TRAUMA
Multiple rib #, flail chest/ sternum injury	Whangarei	
Pulmonary contusions/Pneumothorax/Haemothorax	Whangarei	
<b>Abdominal Injuries</b>		
Paediatric simple abdominal trauma	Whangarei	
Paediatric complex abdominal trauma	Starship	
Penetrating abdominal Injury	Whangarei or Auckland	If transfer to Auckland required, call 0800 4 TRAUMA
Blunt abdominal injury	Whangarei	
Complex liver injury	Auckland	Call 0800 4 TRAUMA
Perineal Injury	Whangarei	
<b>Special limb injuries</b>		
Upper limb with major nerve injury, +/- arterial injury	Middlemore	Call Plastic Surgical Registrar at Middlemore on 021 784 057
Upper limb with arterial injury (but no nerve injury)	Starship / Auckland	Paeds: Call Starship Adults: Call 0800 4 TRAUMA
Upper limb - amputation of viable digit (excluding simple terminalisation) or partial limb amputation	Middlemore	Call Plastic Surgical Registrar at Middlemore on 021 784 057
Mangled lower limb with tissue loss		D/w Orthopaedic Service at Whangarei Hospital to determine whether to transfer to Whangarei or Middlemore
Lower limb - penetrating injury with major nerve injury +/- arterial injury	Middlemore	Call Plastic Surgical Registrar at Middlemore on 021 784 057
Lower limb • penetrating injury with arterial injury (but no nerve injury) • blunt injury with ischaemia +/- nerve injury		D/w Orthopaedic Service at Whangarei Hospital to determine whether to transfer to Whangarei or Auckland
<b>Orthopaedic</b>		
Open or complex pelvic # +/- haemodynamic instability	Starship/Auckland	Paeds: Call Starship Adults: Call 0800 4 TRAUMA
Two or more long bone #, acetabulum #	Whangarei	
<b>Urology</b>		
Ruptured kidney or urethral injuries	Starship/Whangarei	



## Northern Regional Trauma Network

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4. Notification between senior transferring and accepting medical staff precedes all transfers.
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### Trauma inter-hospital transfer guidelines for Whangarei Hospital

Condition	Go To	Comment
<b>Traumatic Brain Injury</b>		
GCS $\geq$ 13 +/- concussion, not resolving	Whangarei	CT
GCS 9 - 12	Whangarei or Starship/Auckland	CT, d/w Neurosurgery at Auckland
GCS $<$ 9 and/or open brain injury e.g. compound skull fracture	Starship/Auckland	Paeds: Call Starship Adults: Call 0800 4 TRAUMA
Extra axial lesion on CT	Starship/Auckland	Paeds: Call Starship Adults: Call 0800 4 TRAUMA
<b>Spine</b>		
Suspect spinal injury, no motor deficit	Whangarei	
Spinal cord injury:	Paeds - Starship Adults - Middlemore	Refer to Supra-regional Spinal Cord Injury Guidelines
• Isolated with motor deficit		
• Multitrauma but not TBI or chest injuries		
Spinal cord injury - with other major injuries such as TBI or chest	Paeds - Starship Adults - Middlemore or Auckland	For adult patients d/w Intensive Care at Middlemore to determine whether appropriate to transfer to Middlemore, otherwise transfer to Auckland by calling 0800 4 TRAUMA
<b>Vascular Injuries</b>		
Blunt Carotid/Vertebral/Thoracic Aortic Injuries	Starship/Auckland	Paeds: Call Starship Adults: Call 0800 4 TRAUMA
<b>Burns/Plastics</b>		
Burns $>$ 20%, or less but affects special sites	Middlemore	Refer to Burn Guideline D/w Burn Service at Middlemore on 09 250 3800, and fax referral to 09 276 0114
Burns $<$ 20%		Refer to Burn Guideline D/w Burn Service at Middlemore if grafting required
Degloving of face or other special sites or extensive / complex facial lacerations	Middlemore	D/w Plastic Surgical Registrar at Middlemore on 021 784 057
<b>Maxillo Facial</b>		
All Max Fax injury - Paeds	Starship	
Isolated Max Fax injury - Adults	Middlemore	D/w Max Fax (021 292 1593) or Plastic Surgical Registrar (021 784 057) at Middlemore
Max Fax injury with TBI or chest injuries - Adults	Auckland	Call 0800 4 TRAUMA
<b>Chest</b>		
All paediatric chest injuries - serious	Starship	Paeds: Call Starship
Penetrating chest injury - with shock +/- haemodynamic instability	Adults - Whangarei or Auckland	If transfer to Auckland required, call 0800 4 TRAUMA
Multiple rib #, flail chest/ sternum injury	Whangarei or Auckland	Call 0800 4 TRAUMA
Pulmonary contusions/Pneumothorax/Haemothorax	Whangarei	
<b>Abdominal Injuries</b>		
Paediatric simple abdominal trauma	Whangarei	
Paediatric complex abdominal trauma	Starship	
Penetrating abdominal injury	Whangarei or Auckland	If transfer to Auckland required, call 0800 4 TRAUMA
Blunt abdominal injury	Whangarei	
Complex liver injury - stable	Auckland	Call 0800 4 TRAUMA
Complex liver injury - unstable, $\geq$ Grade 3 liver trauma	Auckland	Call 0800 4 TRAUMA
Perineal Injury	Whangarei	
<b>Special limb injuries</b>		
Upper limb with major nerve injury, +/- arterial injury	Middlemore	Call Plastic Surgical Registrar at Middlemore on 021 784 057
Upper limb with arterial injury (but no nerve injury)	Starship / Auckland	Paeds: Call Starship Adults: Call 0800 4 TRAUMA
Upper limb - amputation of viable digit (excluding simple terminalisation) or partial limb amputation	Middlemore	Call Plastic Surgical Registrar at Middlemore on 021 784 057
Mangled lower limb with tissue loss	Middlemore	Refer to Mangled Limb Algorithm. D/w Orthopaedic Registrar at Middlemore on 021 594 764
Lower limb - penetrating injury with major nerve injury +/- arterial injury	Middlemore	Call Plastic Surgical Registrar at Middlemore on 021 784 057
Lower limb	Starship / Auckland	If transfer required: Paeds: Call Starship Adults: Call 0800 4 TRAUMA
• penetrating injury with arterial injury (but no nerve injury)		
• blunt injury with ischaemia +/- nerve injury		
<b>Orthopaedic</b>		
Open or complex pelvic # +/- haemodynamic instability	Starship/Auckland	Paeds: Call Starship Adults: Call 0800 4 TRAUMA
Two or more long bone #, acetabulum #	Whangarei	
<b>Urology</b>		
Ruptured kidney or urethral injuries	Whangarei	



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4. Notification between senior transferring and accepting medical staff precedes all transfers.
5. These guidelines have been agreed by all involved clinicians and endorsed by the four Northern Region CMOs.
6. At Waitakere Hospital CT imaging with contrast is not available after-hours or weekends. When advanced imaging is not available the most serious injury should be assumed and the patient transferred directly to the hospital of definitive care. This will most often be Auckland/Starship.

### Trauma inter-hospital transfer guidelines for Waitakere Hospital

Condition	Go To	Comment
<b>Traumatic Brain Injury</b>		
GCS $\geq$ 13 +/- concussion, not resolving	Paeds - Starship Adults - North Shore	
All other TBI with GCS $<$ 13, +/- open brain injury, +/- extra axial lesion on CT	Starship/Auckland	Paeds: Call Starship Adults: Call 0800 4 TRAUMA
<b>Spine</b>		
Suspect spinal injury, no motor deficit	North Shore	+/- CT
Spinal cord injury: • Isolated with motor deficit • Multitrauma but not TBI or chest injuries	Paeds - Starship Adults - Middlemore	Refer to Supra-regional Spinal Cord Injury Guidelines.
Spinal cord injury - with other major injuries such as TBI or chest	Paeds - Starship Adults - Middlemore or Auckland	For adult patients d/w Intensive Care at Middlemore to determine whether appropriate to transfer to Middlemore, otherwise transfer to Auckland by calling 0800 4 TRAUMA. See Note 6.
<b>Vascular Injuries</b>		
Blunt Carotid/Vertebral/Thoracic Aortic Injuries	Starship/Auckland	Paeds: Call Starship Adults: Call 0800 4 TRAUMA. See Note 6.
<b>Burns/Plastics</b>		
Burns $>$ 20% , or less but affects special sites	Middlemore	Refer to Burn Guideline D/w Burn Service at Middlemore on 09 250 3800, and fax referral to 09 276 0114
Burns $<$ 20%		Refer to Burn Guideline. D/w Burn Service at Middlemore if grafting required
Degloving of face or other special sites or extensive / complex facial lacerations	Middlemore	D/w Plastic Surgical Registrar at Middlemore on 021 784 057
<b>Maxillo Facial</b>		
All Max Fax injury - Paeds	Starship	
Isolated Max Fax injury - Adults	Middlemore	D/w Max Fax (021 292 1593) or Plastic Surgical Registrar (021 784 057) at Middlemore
Max Fax injury with TBI or chest injuries - Adults	Auckland	Call 0800 4 TRAUMA
<b>Chest</b>		
All paediatric chest injuries - serious	Starship	
Penetrating chest injury - with shock +/- haemodynamic instability	Auckland	Call 0800 4 TRAUMA. Consider need for resuscitative thoracotomy in ED to stabilise prior to transfer.
Multiple rib #, flail chest/ sternum injury	Auckland	If minor - North Shore. If severe - Auckland. See Note 6.
Pulmonary contusions/Pneumothorax/Haemothorax	Auckland	See Note 6
<b>Abdominal Injuries</b>		
All paediatric abdominal trauma	Starship	
Penetrating abdominal injury	Auckland	Call 0800 4 TRAUMA
Blunt abdominal injury	See comment	Default hospital is Auckland - all 0800 4 TRAUMA. See Note 6. If definitive imaging is available and no solid organ injury and clinically stable, then transfer to North Shore.
Complex liver injury - stable or unstable	Auckland	Call 0800 4 TRAUMA
Perineal Injury	Auckland	Call 0800 4 TRAUMA
<b>Special limb injuries</b>		
Upper limb with major nerve injury, +/- arterial injury	Middlemore	Call Plastic Surgical Registrar at Middlemore on 021 784 057
Upper limb with arterial injury (but no nerve injury)	Starship / Auckland	Paeds: Call Starship Adults: Call 0800 4 TRAUMA
Upper limb - amputation of viable digit (excluding simple terminalisation) or partial limb amputation	Middlemore	Call Plastic Surgical Registrar at Middlemore on 021 784 057
Mangled lower limb with tissue loss	Middlemore	Refer to Mangled Limb Algorithm. D/w Orthopaedic Registrar at Middlemore on 021 594 764
Lower limb - penetrating injury with major nerve injury +/- arterial injury	Middlemore	Call Plastic Surgical Registrar at Middlemore on 021 784 057
Lower limb • penetrating injury with arterial injury (but no nerve injury) • blunt injury with ischaemia +/- nerve injury	Starship / Auckland	Paeds: Call Starship Adults: Call 0800 4 TRAUMA
<b>Orthopaedic</b>		
Open or complex pelvic # +/- haemodynamic instability	Starship/Auckland	Paeds: Call Starship Adults: Call 0800 4 TRAUMA
Two or more long bone #	Paeds - Starship Adults - see comment	Paeds: Call Starship Adults: Default hospital is Auckland. Call 0800 4 TRAUMA. If definitive imaging is available and no multi-system injury and stable, then transfer to North Shore. See Note 6
Acetabulum #	North Shore	D/w on-call Orthopaedic Consultant prior to transfer. See Note 6
<b>Urology</b>		
Ruptured kidney or urethral injuries	Starship/Auckland	Paeds: Call Starship Adults: Call 0800 4 TRAUMA. See Note 6.



## Northern Regional Trauma Network

1. These criteria should prompt bypass or immediate transfer to definitive care facilities. Startship (paeds) and Auckland (adults) is the definitive care facility for most multi-trauma.
2. This is a guideline only. It does not replace clinical judgement.
3. All transfers must be safe and confer clinical benefit to the patient.
4. Notification between senior transferring and accepting medical staff precedes all transfers.
5. These guidelines have been agreed by all involved clinicians and endorsed by the four Northern Region CMOs.

### Trauma inter-hospital transfer guidelines for North Shore Hospital

Condition	Go To	Comment
<b>Traumatic Brain Injury</b>		
GCS $\geq$ 13 +/- concussion, not resolving	North Shore	CT
All other TBI with GCS $<$ 13, +/- open brain injury, +/- extra axial lesion on CT	Starship/Auckland	Paeds: Call Starship Adults: Call 0800 4 TRAUMA
<b>Spine</b>		
Suspect spinal injury, no motor deficit	North Shore	
Spinal cord injury:	Paeds - Starship Adults - Middlemore	Refer to Supra-regional Spinal Cord Injury Guidelines
<ul style="list-style-type: none"> <li>Isolated with motor deficit</li> <li>Multitrauma but not TBI or chest injuries</li> </ul>		
Spinal cord injury - with other major injuries such as TBI or chest	Paeds - Starship Adults - Middlemore or Auckland	For adult patients d/w Intensive Care at Middlemore to determine whether appropriate to transfer to Middlemore, otherwise transfer to Auckland by calling 0800 4 TRAUMA
<b>Vascular Injuries</b>		
Blunt Carotid/Vertebral/Thoracic Aortic Injuries	Starship/Auckland	Paeds: Call Starship Adults: Call 0800 4 TRAUMA
<b>Burns/Plastics</b>		
Burns $>$ 20%, or less but affects special sites	Middlemore	Refer to Burn Guideline D/w Burn Service at Middlemore on 09 250 3800, and fax referral to 09 276 0114
Burns $<$ 20%		Refer to Burn Guideline D/w Burn Service at Middlemore if grafting required
Degloving of face or other special sites or extensive / complex facial lacerations	Middlemore	D/w Plastic Surgical Registrar at Middlemore on 021 784 057
<b>Maxillo Facial</b>		
All Max Fax injury - Paeds	Starship	
Isolated Max Fax injury - Adults	Middlemore	D/w Max Fax (021 292 1593) or Plastic Surgical Registrar (021 784 057) at Middlemore
Max Fax injury with TBI or chest injuries - Adults	Auckland	Call 0800 4 TRAUMA
<b>Chest</b>		
All paediatric chest injuries - serious	Starship	
Penetrating chest injury - with shock +/- haemodynamic instability	Auckland	Call 0800 4 TRAUMA Consider need for resuscitative thoracotomy prior to transfer
Multiple rib #, flail chest/ sternum injury	North Shore or Auckland	If minor - North Shore. If severe - Auckland, by calling 0800 4 TRAUMA
Pulmonary contusions/Pneumothorax/Haemothorax	North Shore	
<b>Abdominal Injuries</b>		
All paediatric abdominal injuries	Starship	
Penetrating abdominal injury	Auckland	Call 0800 4 TRAUMA
Blunt abdominal injury	North Shore	
All complex liver injuries	Auckland	Call 0800 4 TRAUMA
Perineal injury	Auckland	Call 0800 4 TRAUMA
<b>Special limb injuries</b>		
Upper limb with major nerve injury, +/- arterial injury	Middlemore	Call Plastic Surgical Registrar at Middlemore on 021 784 057
Upper limb with arterial injury (but no nerve injury)	Starship / Auckland	Paeds: Call Starship Adults: Call 0800 4 TRAUMA
Upper limb - amputation of viable digit (excluding simple terminalisation) or partial limb amputation	Middlemore	Call Plastic Surgical Registrar at Middlemore on 021 784 057
Mangled lower limb with tissue loss	Middlemore	Refer to Mangled Limb Algorithm. D/w Orthopaedic Registrar at Middlemore on 021 594 764
Lower limb - penetrating injury with major nerve injury +/- arterial injury	Middlemore	Call Plastic Surgical Registrar at Middlemore on 021 784 057
Lower limb	Starship / Auckland	Paeds: Call Starship Adults: Call 0800 4 TRAUMA
<ul style="list-style-type: none"> <li>penetrating injury with arterial injury (but no nerve injury)</li> <li>blunt injury with ischaemia +/- nerve injury</li> </ul>		
<b>Orthopaedic</b>		
Open or complex pelvic # +/- haemodynamic instability	Starship/Auckland	Paeds: Call Starship Adults: Call 0800 4 TRAUMA
Two or more long bone #	Paeds: Starship Adults: see comment	Paeds: Call Starship Adults: If no multi-system injury and stable manage at North Shore. Otherwise transfer to Auckland. Call 0800 4 TRAUMA.
Acetabulum #	North Shore	
<b>Urology</b>		
Ruptured kidney or urethral injuries	Starship/Auckland	Call 0800 4 TRAUMA



## Northern Regional Trauma Network

1. These criteria should prompt bypass or immediate transfer to definitive care facilities. Startship (paeds) and Auckland (adults) is the definitive care facility for most multi-trauma.
2. This is a guideline only. It does not replace clinical judgement.
3. All transfers must be safe and confer clinical benefit to the patient.
4. Notification between senior transferring and accepting medical staff precedes all transfers.
5. These guidelines have been agreed by all involved clinicians and endorsed by the four Northern Region CMOs.

### Trauma inter-hospital transfer guidelines for Middlemore Hospital

Condition	Go To	Regional referral centre P = Paeds A = Adults	Comment
Traumatic Brain Injury			
GCS≥ 13 +/- concussion, not resolving	Middlemore		
GCS 9 - 12			CT, d/w Neurosurgeons at Auckland, if transfer required call:
GCS <9 and/or open brain injury e.g. compound skull fracture			* Paeds call Starship
Extra axial lesion on CT			* Adults call 0800 4 TRAUMA
Spine			
Suspect spinal injury, no motor deficit	Middlemore		
Spinal cord injury:	Paeds - Starship Adults - Middlemore	A	Refer to Supra-regional Spinal Cord Injury Guidelines
• Isolated with motor deficit			
• Multitrauma but not TBI or chest injuries			
Spinal cord injury - with other major injuries such as TBI or chest	Paeds - Starship Adults - Middlemore		Paeds: all paeds go to Starship Adults: determine if appropriate to keep or refer to Auckland for tertiary services. Call 0800 4 TRAUMA
Vascular Injuries			
	There is a 24*7 Vascular Service at Middlemore. All vascular injuries should be discussed with that service first. The Vascular Consultant will give clear advice on whether to transfer the patient to Auckland and to which service the patient should be referred.		
Blunt Carotid/Vertebral/Thoracic Aortic Injuries	Discuss with Middlemore Vascular Consultant.		May require transfer to Auckland. If transfer required, for Paeds call Starship, for Adults call 0800 4 TRAUMA
Burns/Plastics			
Burns > 20% , or less but affects special sites	Middlemore	P/A	D/w Plastic Surgical Registrar at Middlemore on 021 784 057
Burns <20%	Middlemore		
Degloving of face or other special sites or extensive / complex facial lacerations	Middlemore	P/A	
Maxillo Facial			
All Max Fax injury - Paeds	Starship		Isolated Paediatric Max Fax Injury may be managed at Middlemore. D/w Max Fax or Plastics Registrar
Isolated Max Fax injury - Adults	Middlemore	A	
Max Fax injury with TBI or chest injuries - Adults	Middlemore		Determine if appropriate to keep or refer to Auckland for tertiary services. Call 0800 4 TRAUMA
Chest			
All paediatric chest injuries - serious	Starship		
Penetrating chest injury - with shock +/- haemodynamic instability	Middlemore		Determine if appropriate to keep or refer to Auckland for tertiary services. Call 0800 4 TRAUMA
Multiple rib #, flail chest/ sternum injury	Middlemore		
Pulmonary contusions/Pneumothorax/Haemothorax	Middlemore		
Abdominal Injuries			
Paediatric simple abdominal trauma	Starship		
Paediatric complex abdominal trauma	Starship		
Penetrating abdominal Injury	Middlemore		
Blunt abdominal injury	Middlemore		
Complex liver injury – stable	Middlemore		
Complex liver injury - unstable, ≥ Grade 3 liver trauma	Middlemore		Determine if appropriate to keep or refer to Auckland for tertiary services. Call 0800 4 TRAUMA
Perineal Injury	Middlemore		
Special limb injuries			
Upper limb with major nerve injury, +/- arterial injury	Middlemore	P/A	
Upper limb with arterial injury (but no nerve injury)	Middlemore		
Upper limb - amputation of viable digit (excluding simple terminalisation) or partial limb amputation	Middlemore	P/A	
Mangled lower limb with tissue loss	Middlemore	P/A	
Lower limb - penetrating injury with major nerve injury +/- arterial injury	Middlemore	P/A	
Lower limb	Middlemore		
• penetrating injury with arterial injury (but no nerve injury)			
• blunt injury with ischaemia +/- nerve injury			
Orthopaedic			
Open or complex pelvic # +/- haemodynamic instability	Paeds - Starship Adults - Middlemore		
Two or more long bone #	Paeds - Starship Adults - Middlemore		
Acetabulum #	Middlemore		
Urology			
Ruptured kidney	Paeds - Starship Adults - Middlemore		Determine if appropriate to keep or refer to Auckland for tertiary services. Call 0800 4 TRAUMA
Urethral injuries	Paeds - Starship Adults - Auckland		Discuss with Urology Registrar at Auckland

# Appendices

## Appendix A: Ambulance Triage Codes

Ambulance condition status codes:					
	Status 1	Status 2	Status 3	Status 4	Status Zero
<b>Patient condition</b>	Critical Extreme	Serious	Moderate	Minor	Dead
<b>Stability</b>	Unstable	Unstable	Stable	Stable	
<b>Potential to deteriorate</b>	Obvious	Probable	Unlikely	None	
<b>Special criteria</b>	Under CPR GCS<9 Airway obstr. Uncontrolled haemorrhage  Assist. Resps.  Syst. BP<90 P>130 or <50	Not under CPR GCS<9			

## Appendix B: Techniques; FAST, DA, DPL

### FAST scan

1. The Hepatorenal pouch (of Morison). This is the RUQ scan and should be done first, as it is the most sensitive for fluid identification. If it is positive there is no need to go on to the other four quadrants unless a pericardial effusion is suspected.
2. The Subphrenic/Splenic Recess. This can be the hardest scan to do and is looking for fluid between the spleen and L) kidney.
3. The Suprapubic Region. This looks for fluid in the pelvis. This scan can be misleading, as fluid tracking from a pelvic fracture may be present. Also in women there may be fluid present in the pouch of Douglas that could be physiological.
4. The Sub-Xiphisternal/Pericardial View. This can be useful for both blunt and penetrating trauma in identification of pericardial tamponade.

### DPL technique

1. Ensure that the patient has a gastric tube and urinary catheter in place
2. Prep the abdomen with Betadine and drape the umbilical region.
3. Inject local anaesthetic with adrenaline in the midline subumbilical region (supraumbilical if pelvic fracture present).
4. Vertically incise the skin and subcutaneous tissue down to the fascia.
5. Insert a small self-retaining retractor to hold the tissues open and stop any bleeding.
6. Incise the fascia and identify the peritoneum. Insert a purse-string suture to stop leakage of lavage fluid.
7. Make a small hole in the peritoneum and insert the lavage catheter, directing it into the pelvis.
8. Connect the catheter to a syringe and aspirate.
9. If < 10mls of frank blood is aspirated instil 1 litre of warmed crystalloid and agitate the abdomen gently.
10. Allow the fluid to siphon off. At least 250mls must be removed for the lavage result to be representative.
11. Remove the catheter and suture the fascia and skin.



NAME: \_\_\_\_\_ HOSP. No.: \_\_\_\_\_

DATE OF BIRTH: \_\_\_\_/\_\_\_\_/\_\_\_\_

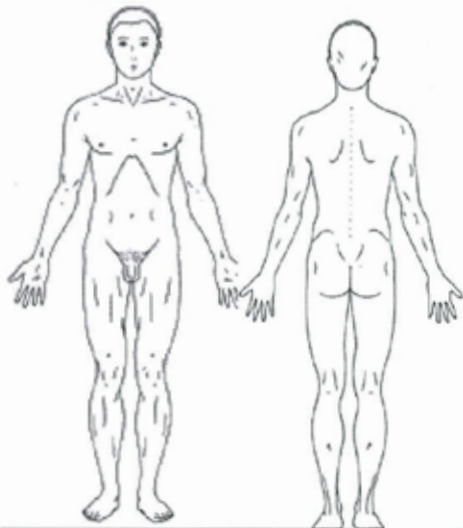
WARD/UNIT: \_\_\_\_\_

Please attach patient label here

HISTORY		Description of mechanism of injury	
<p>Date of injury ____/____/____ Time of injury _____ hrs</p> <p>Mechanism of injury:</p> <p><input type="checkbox"/> RTC Speed _____ km/hr</p> <p><i>No Yes</i></p> <p><input type="checkbox"/> Seatbelt worn</p> <p><input type="checkbox"/> Rollover</p> <p><input type="checkbox"/> Ejected</p> <p><input type="checkbox"/> Death in vehicle</p> <p><input type="checkbox"/> Trapped _____ mins</p> <p><input type="checkbox"/> MB/cyclist Speed (est) _____ km/hr</p> <p><input type="checkbox"/> Helmet worn</p> <p><input type="checkbox"/> Pedestrian</p> <p><input type="checkbox"/> Sport</p> <p><input type="checkbox"/> Assault <input type="checkbox"/> Blunt <input type="checkbox"/> Stab <input type="checkbox"/> Gunshot</p> <p><input type="checkbox"/> Burn</p> <p><input type="checkbox"/> Fall Height _____ metres</p> <p><input type="checkbox"/> Crush</p> <p><input type="checkbox"/> Other _____</p> <p>Allergies _____</p> <p>Last Tetanus <input type="checkbox"/> &lt;10 years ago <input type="checkbox"/> &gt;10 years ago</p> <p>Medicines _____</p> <p>Comorbidity/past history _____</p>		<p>Pre-hospital</p> <p>Scene location _____</p> <p>Arrived in ED at _____ hrs on ____/____/____</p> <p>by <input type="checkbox"/> Ambulance <input type="checkbox"/> Helicopter <input type="checkbox"/> Other _____</p> <p><input type="checkbox"/> Advance notification</p> <p>Scene Recordings</p> <p>HR _____/min</p> <p>RR _____/min</p> <p>BP _____ mmHg</p> <p>GCS _____/15 E ____/4 V ____/5 M ____/6</p> <p>Treatment</p> <p><input type="checkbox"/> Semirigid Collar</p> <p><input type="checkbox"/> Artificial Airway</p> <p><input type="checkbox"/> Bag/mask assisted ventilation</p> <p><input type="checkbox"/> Intubated</p> <p><input type="checkbox"/> IV line - site _____ size _____ g</p> <p><input type="checkbox"/> Fluids given crystalloid _____ ml</p> <p style="padding-left: 100px;">colloid _____ ml</p> <p><input type="checkbox"/> Splints - site _____</p> <p><input type="checkbox"/> Other _____</p>	
PRIMARY SURVEY		Intervention	
<p><b>A</b>irway</p> <p><input type="checkbox"/> Normal <input type="checkbox"/> Compromised</p> <p>Cervical spine</p> <p><input type="checkbox"/> Normal <input type="checkbox"/> Suspect injury</p>		<p><i>No Yes</i></p> <p><input type="checkbox"/> Oxygen mask _____ l/min or _____ %</p> <p><input type="checkbox"/> Airway &amp; bag</p> <p><input type="checkbox"/> ETT - size _____ intubated by _____</p> <p><input type="checkbox"/> Surgical airway - by _____</p>	
<p><b>B</b>reathing</p> <p>RR _____/min (on arrival) SaO<sub>2</sub> _____ %</p> <p><i>No Yes</i></p> <p><input type="checkbox"/> Tracheal deviation</p> <p><input type="checkbox"/> Respiratory distress</p> <p><input type="checkbox"/> Major chest wall trauma</p> <p><input type="checkbox"/> Tension pneumothorax</p> <p><input type="checkbox"/> Massive haemothorax</p>		<p><i>No Yes</i></p> <p><input type="checkbox"/> Chest drain</p> <p style="padding-left: 20px;">size: right _____</p> <p style="padding-left: 20px;">left _____</p> <p><input type="checkbox"/> Other intervention (state) _____</p>	
<p><b>C</b>irculation</p> <p>HR _____/min (on arrival)</p> <p>SBP _____ mmHg (on arrival)</p> <p>Peripheries</p> <p><input type="checkbox"/> Warm, perfused <input type="checkbox"/> Cool, shutdown</p> <p>Haemorrhage</p> <p><input type="checkbox"/> No <input type="checkbox"/> Yes or suspected</p> <p style="padding-left: 20px;"><input type="checkbox"/> External</p> <p style="padding-left: 20px;"><input type="checkbox"/> Internal</p> <p style="padding-left: 40px;"><input type="checkbox"/> Chest</p> <p style="padding-left: 40px;"><input type="checkbox"/> Abdomen</p> <p style="padding-left: 40px;"><input type="checkbox"/> Pelvis/retroperitoneal</p> <p style="padding-left: 40px;"><input type="checkbox"/> Limbs</p>		<p><i>No Yes</i></p> <p><input type="checkbox"/> IV line site 1 _____ size _____ g</p> <p style="padding-left: 40px;">site 2 _____ size _____ g</p> <p><input type="checkbox"/> Arterial line - site _____</p> <p><input type="checkbox"/> NGT/OGT</p> <p><input type="checkbox"/> Urinary catheter</p> <p><input type="checkbox"/> DPL</p> <p><input type="checkbox"/> FAST</p> <p><input type="checkbox"/> Resuscitation fluids (in ED)</p> <p style="padding-left: 20px;">crystalloid _____ ml</p> <p style="padding-left: 20px;">colloid _____ ml</p> <p style="padding-left: 20px;">blood O neg _____ units</p> <p style="padding-left: 20px;">X-matched _____ units</p>	
<p><b>D</b>isability</p> <p>GCS (arrival) _____/15 E ____/4 V ____/5 M ____/6</p> <p style="padding-left: 20px;">(time _____ hrs) _____/15 E ____/4 V ____/5 M ____/6</p>		<p>Pupil size R. L. mm</p> <p>reactive? <input type="checkbox"/> <input type="checkbox"/></p> <p>Arms move? <input type="checkbox"/> <input type="checkbox"/></p> <p>Legs move? <input type="checkbox"/> <input type="checkbox"/></p>	
<p><b>E</b>xposure Temperature _____ °C</p>			

MAJOR TRAUMA FORM

CR XXX

Secondary Survey		Description	Investigations																					
<b>Head</b> <i>No Yes</i> Scalp <input type="checkbox"/> <input type="checkbox"/> Laceration Skull <input type="checkbox"/> <input type="checkbox"/> Vault Fracture <input type="checkbox"/> <input type="checkbox"/> Basal Fracture Suspected Face <input type="checkbox"/> <input type="checkbox"/> Laceration <input type="checkbox"/> <input type="checkbox"/> Fracture <input type="checkbox"/> <input type="checkbox"/> Midface/maxilla instability Eyes <input type="checkbox"/> <input type="checkbox"/> Orbit, globe or eyelid injury <input type="checkbox"/> <input type="checkbox"/> Decreased Visual Acuity Ears <input type="checkbox"/> <input type="checkbox"/> Haemotympanum side:____ <input type="checkbox"/> <input type="checkbox"/> CSF leak side:____ Nose <input type="checkbox"/> <input type="checkbox"/> Bleeding Mouth <input type="checkbox"/> <input type="checkbox"/> Tooth #			Blood Hb _____ g/l Glucose _____ mmol/l Cr _____ mmol/l EtOH taken? <input type="checkbox"/> _____ mmol/l X-match _____ units Preg. test ____ X-ray C-spine																					
<b>Neck</b> <i>No Yes</i> <input type="checkbox"/> <input type="checkbox"/> C-spine injury suspected <input type="checkbox"/> <input type="checkbox"/> Soft tissue injury (larynx, etc) <input type="checkbox"/> <input type="checkbox"/> Laceration through platysma			CXR																					
<b>Chest</b> <i>No Yes</i> <input type="checkbox"/> <input type="checkbox"/> Chest wall injury side:____ <input type="checkbox"/> <input type="checkbox"/> # ribs <input type="checkbox"/> <input type="checkbox"/> Flail segment <input type="checkbox"/> <input type="checkbox"/> Open pneumothorax <input type="checkbox"/> <input type="checkbox"/> Surgical emphysema <input type="checkbox"/> <input type="checkbox"/> Pneumothorax <input type="checkbox"/> <input type="checkbox"/> Haemothorax <input type="checkbox"/> <input type="checkbox"/> Pulmonary contusion			Pelvis  Ultrasound (FAST) DPL CT Head Abdomen Chest Angiography Aorta Peripheral																					
<b>Abdomen</b> <i>No Yes</i> <input type="checkbox"/> <input type="checkbox"/> Skin contusion/abrasion <input type="checkbox"/> <input type="checkbox"/> Distension <input type="checkbox"/> <input type="checkbox"/> Tenderness <input type="checkbox"/> <input type="checkbox"/> Guarding PR <input type="checkbox"/> <input type="checkbox"/> Lax anal tone <input type="checkbox"/> <input type="checkbox"/> Blood <input type="checkbox"/> <input type="checkbox"/> High prostate PV <input type="checkbox"/> <input type="checkbox"/> Injury Perineum <input type="checkbox"/> <input type="checkbox"/> Blood at urethral meatus <input type="checkbox"/> <input type="checkbox"/> Haematuria			Other contrast study Urethrogram Cystogram  ECG																					
<b>Orthopaedic Injury</b> <i>No Yes</i> <input type="checkbox"/> <input type="checkbox"/> Spinal <input type="checkbox"/> <input type="checkbox"/> Shoulder girdle <input type="checkbox"/> <input type="checkbox"/> Upper limb <input type="checkbox"/> <input type="checkbox"/> Wrist or hand <input type="checkbox"/> <input type="checkbox"/> Pelvis <input type="checkbox"/> <input type="checkbox"/> Lower limb <input type="checkbox"/> <input type="checkbox"/> Ankle or foot																								
<b>Injury Diagram</b> 		<b>Plan</b> <b>Investigation:</b> ..... ..... ..... <b>Treatment:</b> ..... ..... ..... Time out of ED: _____ hrs Destination _____																						
A= Abrasion    GSW= Gun shot wound B= Burn        L= Laceration C= Contusion   S= Swelling CR=Crush      SW= Stab wound D= Dislocat <sup>n</sup> T= Tenderness #= Fracture		<b>Examining doctors</b> <table border="0"> <thead> <tr> <th></th> <th>Name</th> <th>Signature</th> </tr> </thead> <tbody> <tr> <td>Team leader</td> <td>_____</td> <td>_____</td> </tr> <tr> <td>ED</td> <td>_____</td> <td>_____</td> </tr> <tr> <td>DCCM</td> <td>_____</td> <td>_____</td> </tr> <tr> <td>Gen Surg</td> <td>_____</td> <td>_____</td> </tr> <tr> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td></td> <td>_____</td> <td>_____</td> </tr> </tbody> </table>			Name	Signature	Team leader	_____	_____	ED	_____	_____	DCCM	_____	_____	Gen Surg	_____	_____		_____	_____		_____	_____
	Name	Signature																						
Team leader	_____	_____																						
ED	_____	_____																						
DCCM	_____	_____																						
Gen Surg	_____	_____																						
	_____	_____																						
	_____	_____																						

## Summary of Injuries

Region	Description of Injury
Head incl. Face	<div></div> <div></div> <div></div> <div></div> <div></div>
Spine incl. C-Spine	<div></div> <div></div> <div></div> <div></div> <div></div>
Chest	<div></div> <div></div> <div></div> <div></div> <div></div>
Abdominal & Pelvic	<div></div> <div></div> <div></div> <div></div> <div></div>
Extremities	<div></div> <div></div> <div></div> <div></div> <div></div>
Soft Tissue	<div></div> <div></div> <div></div> <div></div> <div></div>

### Narrative of Events

