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Main references:

1. JHB General Trauma Unit Guidelines
2. Tygerberg Hospital Trauma Unit Guidelines
3. Royal Lancaster Infirmary Emergency Department Guidelines
4. A Guide to the Management of Common Medical Emergencies in Adults (Univ. of Witwatersrand Department of Medicine; Editor - W Kloek)
5. Ngwelezane Department of Medicine Guidelines 2006
6. Cape Triage Score and Trauma Early Warning Score – Cape Triage Group 2006
7. Orthopaedic Guidelines Ngwelezane Hospital 2004; P Rollinson
8. Direct references from the literature
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Common Toxidromes

Substance abuse
- Ecstasy
- Opiates/narcotics
- Amphetamines
- Cocaine

Drug Overdoses
- Paracetamol
- Aspirin
- Tricyclic Antidepressants
- Benzodiazepines
- Warfarin - reversal

Poisons
- Iron
- Carbon Monoxide Poisoning
- Corrosives
- Organophosphates

Paediatric Poisoning

4. PSYCHIATRIC PATIENTS - ACUTE MANAGEMENT

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SOFT TISSUE INJURY
- Back Pain
- Ligament and strain injuries
  - Ankle and foot
  - Knee
  - Hip, elbow, wrist
  - Shoulder (incl. shoulder dislocation)

MINOR ORTHOPAEDIC TRAUMA – FRACTURE/DISLOCATIONS
- Neck strain/whiplash
- Shoulder and humerus
- Elbow
- Forearm/wrist
- Pelvis/hip
- Knee
- Ankle/foot
- Femur shaft

MAJOR ORTHOPAEDIC TRAUMA
- Open/compound fractures
- Emergency amputation
- Mangled Extremity Severity Score

7. APPENDICES

APPENDIX A – RESUS TEAM
APPENDIX B – ANAESTHETIC TECHNIQUES AND SEDATION
APPENDIX C – BLOOD TRANSFUSION
APPENDIX D – PAIN CONTROL
APPENDIX E – SPECIAL DIAGNOSTIC INVESTIGATIONS
APPENDIX F – TRAUMA SCORES
APPENDIX G - TRIAGE
INTRODUCTION

The Ngwelezane Emergency Department serves to provide emergency medical care to all patients who present with trauma, acute illness or minor injuries. The Emergency Medicine Unit (EMU) has 3 areas:

1. Resuscitation
2. Majors (previously RU)
3. Minors (previously casualty)

All patients who attend the emergency unit are sorted (using the Cape Triage Score) according to the severity of their illness/injuries. Once stabilised, the patients are fully examined and investigated in order to diagnose the presenting clinical problem. Patients are then referred to the appropriate speciality. The majors area is essentially a 48 hr stay unit which serves to stabilise and work up critically patients for definitive management. On rare occasions patients may have to be kept beyond this time frame.

The Emergency Department strives to provide a high quality of emergency care to the community of the region and beyond.

Dr Darryl Wood
Principal Specialist
Head of Department
Ngwelezane Emergency Unit

ATTENDANCE AND CLINICAL DUTIES FOR DOCTORS IN E.M.U.

Doctors employed in the Emergency Medicine Unit should fulfill the following clinical duties:

1. Daily working hours are 08:00-16:00 (unless mass casualties are in need of attention)
2. Clinically evaluating and treating all patients who attend the EMU
3. Will be rotated through all sections – majors, minors, resus and other defined areas
4. Practice and teach Triage in the front shop or minor area to prioritize acutely ill patients
5. Attend all morning ward rounds at 08:00am and 15:30 (if designated to majors)
6. All doctors to attend ward rounds, cell phone to be switched off.
7. Attend teaching sessions – Wed at 07:30am and Fri X-Ray meeting at 7:30am
8. All leave/prn days and sick leave to be approved by the head of unit. Do on-call at night in the department from 08:00 until 13:00 the next day (post call knock-off time at discretion of the senior clinician in the department)
9. No annual leave to be taken over the Christmas and New Year period unless approved by the Head of Department
10. Department clinical guidelines should be followed by EMU doctors
11. All equipment to be cleaned appropriately and adjuncts replaced after use. EMU equipment is to be used (or supervised) by EMU staff only e.g. Blood Gas Machine. Please look after our equipment since it takes a lot of effort and man hours to get equipment into the EMU.
Emergency Medicine Service and Patient Flow

EMERGENCY MEDICINE NGWELEZANE HOSPITAL
(emergency = < 48 hrs)

Pre-Hospital

EMRS
AMS
DISASTERS

OPD/WARDS

WALK-INS

Referring Drainage Hospitals x 9

N. KZN AREA 3

NGWELEZANE EMERGENCY DEPARTMENT

TRIAGE

RESUS

• THEATRE
• ICU
• WARD
• 48 HR STAY
• REFERRAL HOSP

MAJORS/ RU

• THEATRE
• ICU
• WARD
• 48 HR STAY
• REFERRAL HOSP
• HOME

MINORS

• HOME
• WARD
• THEATRE

• 48 HR STAY
• REFERRAL HOSP

Ngwelezane Emergency Unit Guidelines 2007
EMERGENCY UNIT ADMISSION CRITERIA FOR THE MAJORS AREA (RU)

The Emergency Unit (EU) has a Majors Area (R.U.) that is geared to manage acute emergencies in unstable patients who require intensive medical management. This unit is a 48 hour stay facility by which time a plan for transfer of the patient to definitive care must be arranged, i.e. the Ward, ICU, High Care, Theatre or another hospital.

All cases for the Emergency Medicine Unit to be discussed with the SENIOR DOCTOR on the floor. Appropriate handover and workup is mandatory for all patients prior to transfer.

Cases referred to the EMU Majors Area for PROCEDURES should be done by the REFERRING doctor.

Referrals that are accepted from drainage hospitals must be communicated to the Senior emergency doctor in the Emergency Unit. On patient arrival, the accepting doctor to see patient in the EMU.

Patients in OPD who need workup for theatre should be admitted via OPD directly to the WARD/THEATRE unless they have unstable vital signs (or TEWS Triage Score >5). The majors (RU) area is not to be utilised as a general pre-op ward.

Chronically ill medical patients (e.g. terminal patients, TB, End Stage HIV, chronic diarrhoea) to be referred to OPD for definitive management.

Patients who do not fit into the below criteria but may need admission to RU/Majors must be discussed with the consultant or senior doctor on the floor (Dr Darryl Wood *7514; Dr Innocent Nwachukwu *7189)

For any disaster (i.e. multiple critically injured/ill patients such as major taxi/bus accidents) in the region, the senior doctor on call must inform Dr Wood *7514 ASAP.

Respective specialists (e.g. medicine, surgery, orthopaedics, paediatrics) on call should be consulted when input is required on unstable patients or new patients admitted to majors (RU).
CRITERIA:
- All patients with a TEWS triage score of > 5

Trauma
- Poly trauma with major injuries / shock (Red/P1)
- Gunshot injuries (excluding minor limb wounds)
- Head injuries with GCS < 14/focal signs/seizures
- Snake bites
- Acute abdomen
- Penetrating stab wounds (head/neck/chest/abdomen)
- Threatened limb
- Long bone/pelvic/open fractures
- Burns - > 20% or inhalation or circumferential or paediatric
- Acute vascular injury

Surgical
- Appendicitis
- Bowel obstruction
- Acute Pancreatitis
- Peritonitis
- Necrotising fasciitis or WET gangrene (not dry gangrene)
- Acute GIT bleed

Medical
- Acute confusion or coma (excluding end stage HIV or terminal patients)
- Diabetic emergencies - DKA/HONK
- Acute coronary syndrome (cardiac chest pain)
- Acute pulmonary oedema
- Acute asthma
- Complicated malaria (hepatorenal, cerebral, severe anaemia < 5)
- Acute renal failure
- Lactic acidosis
- Respiratory distress
- Poisonings/overdoses
- Severe sepsis
- Airway obstruction

Paediatrics
- Trauma
- Head Injuries
- Burns

All paediatric trauma, head injuries and burns are to be assessed and stabilised in the Majors/Resus unit. The PRU paediatrician to assist as a priority when required (policy by Dr Wiseman, Dr Kapongo and Dr Wood)
1. TRAUMA

**RED (priority 1) patients** (any patient who requires resuscitation or Intensive Care)
TEWS* Score ≥ 7
All Red patients will be seen immediately, assessed and resuscitated where appropriate.

**ORANGE Patients** (to be seen by a Dr within 10 min)
TEWS* score 5-6

**YELLOW (Priority Two) patients** (patients who require hospital admission)
TEWS* score 3-4
Ideally seen within 1 hour, resources permitting.

**GREEN (Priority Three) patients** (ambulatory patients)
TEWS* score 1-2
Green patients should ideally be seen within 4 hours. All green patients must be seen and treated, and then must be referred to the nearest appropriate facility.

* TEWS = see appendices on TRIAGE
Resuscitation Policy Emergency Unit

Full resus will be commenced on all patients and continued until more information regarding the injury becomes available.

Except that:
Blunt injury with CPR in progress or patients with pulseless electrical activity (P.E.A.) or asystole will NOT be resuscitated

Definition:
A Resuscitation will be called for each and every patient placed in the Resuscitation Area, based on the decision to do so by any member of the Medical, Nursing or Paramedical staff. This decision is based on the possibility of any such patient becoming unstable by virtue of the mechanism of injury, their anatomy of injury, or their physiological findings (See Triage Criteria).

Examples of the above (though not all-inclusive) would be:

a. All cases designated “Priority 1” or Red by any Casualty or Pre-hospital personnel
b. Any patient with an RTS of 11 or less
   • GCS 12/15 or less
   • Systolic BP 89 or less
   • Respiratory Rate less than 10 or more than 29
c. O₂ saturation 90% or less despite oxygen
d. Temperature of < 33°C
e. Penetrating injury of the neck through Platysma
f. Penetrating injury of the torso (Chest or Abdomen)
g. Spinal injury
h. Possible Vascular injury (assess clinically - 5P’s)
i. Burns > 20% or Inhalation
j. High speed deceleration injuries – EMRS handover (M.I.S.T.) NB!!!
k. All helicopter cases
l. Chest Pain in the presence of ECG changes – medical emergency bays

• ALL paediatric trauma resuscitations will take place in the Majors area (RU) and transferred to PRU once the patient is stable

TRAUMA TEAM SYSTEMS APPROACH TO RESUSCITATION

(See Appendix A)
ATLS SYSTEM FOR TRAUMA

1. PRIMARY SURVEY:

A – Airway (Oxygenation) and C-spine control (head blocks + hard collar); Intubation ?
B – Breathing (assess ventilation) and chest – look for pneumothorax
C – Circulation – 2 x large bore IV lines; Stop Bleeding, Bloods + Xmatch
D – GCS and pupils
E – Expose patient
Adjuncts (BP, Sats, ECG, Urine catheter, NGT, ABG/lactate)
Re-evaluate patient !!!

A. Airway

Intubation
A Rapid Sequence Induction (RSI) and intubation to establish a definitive airway (a cuffed tube in the trachea) will be utilized on any patient who has a compromised airway. (indications for intubation and RSI – see Appendix B)

Neck collars:
STABILISE THE NECK in any of the following circumstances:
- all patients with blunt trauma
- any patient with penetrating injury (GSW) of the head and neck above clavicle and high index of suspicion for C-spine injury
- any case of suspension or strangulation
- all adult drownings
- all electrocutions

Utilise hard collar of appropriate size, and ensure firm fit under the chin. Additional head block immobilisation on all patients. In-line immobilization must be maintained (if indicated) until the cervical spine has been cleared.
This collar must not be removed until cervical spinal X-Rays are completed, evaluated and the spine cleared by the Team Leader and this has been documented - however, the neck must be inspected and palpated, and any jewelry removed before

B. Breathing

Ventilation
All ventilated patients under the care of anaesthetics/ICU. Termination of active ventilation – decision rests with the Emergency Medicine Consultant/Surgeon/Anaesthetist

Thoracotomy -Emergency Room Thoracotomy will be performed for control of haemorrhage in penetrating chest injury only – D/W consultant on call?

Chest X-Ray. (tension pneumothorax diagnosed clinically not via XRay and decompressed ASAP)

C. Circulation

STOP ANY EXTERNAL BLEEDING ASAP!!!
If the patient is suspected of having a fracture of the pelvis, pelvis to be stabilised with a folded sheet or Pelvigrip. Under no circumstances should the pelvis be "sprung" or manipulated. Blood for Cross matching /B-HCG/FBC/U&E to be taken when placing intravenous lines (ref: Doctor 2).
Intravenous lines:

NB: A CVP is **NOT** an adequate resuscitation access site

1. First: Bilateral large bore I.V. cannulation of ante-cubital veins (exchange for high cap lines)
2. Second: Large bore cannulation of SFV or intraosseus in paeds.

Initiate low volume resuscitation – titrate to patient response (pulse, BP, Urine output):

- Ringer’s Lactate 1L stat
- Colloid (Voluven®) 1 unit – check patient response, repeat 1 unit if no response, order 2 units cross-matched blood and prepare for theatre (call surgeon on call)
- Prepare for massive transfusion protocol (6:6:6 = 6U RBC:6U FDP:6 U platelets (1megaunit)). Ideally to be started in theatre once bleeding controlled
- Consider Calcium Gluconate 10ml slow IV if Ionised <1,0 on gas specimen

Attempt to restore volume only to the point where 70-100ml/hr urine output is generated.

Urine catheter placement after PR examination for male with blunt trauma to the pelvis. If PR abnormal then first retrograde urethrogram before cystogram if frank haematuria is present.

Monitoring:

Volume and rate of fluid administration are controlled according to changes in haemodynamic parameters and other vital signs:

- pulse
- blood pressure and pulse pressure
- central venous pressure
- urine output
- capillary return (normal = less than 2 seconds)
- arterial blood gas exchange
- **Lactate level**
- respiratory rate and CNS status

The emergency trauma MO remains responsible for the continued care of the patient until formal care taken over by the appropriate surgeon, and then should still remain willing to assist where possible.

*All TRAUMA or SEPTIC patients who are admitted to Resus MUST have a serum Lactate requested with the blood gases on admission, and staff must trace the trend until the Lactate is LESS THAN 5mmol/l (this implies that the Resuscitation is adequate). Also all patients who get a CVP line should have a VENOUS GAS done and the SVO2 recorded. An SVO2 of >75% is considered adequate

D. Disability

Note Glasgow Coma Scale/Pupils and record:

- At scene
- On admission
- Post full resuscitation

Intubate if necessary (GCS ≤ 8/15).

E. Environment

**Undress patient completely!**

Maintenance of body temperature is mandatory

a. Do **NOT** cut off clothes unnecessarily.
b. Remove clothes gently and store. Stabilize shoulders and pelvis when removing pants/skirts/underwear to prevent spine movement.
c. Cover patient with sheet
d. All intravenous fluids and peritoneal lavage fluid must be warmed to 39°C. Whole blood is warmed to 37°C.
e. The patient must be kept covered at all times. 
   Bair Hugger to be placed as soon as urine catheter has been inserted.
   N.B. Bair Hugger to be placed directly on patient. 
   Sheet to be placed on top of Bair Hugger.

INITIAL WORKUP (BLOODS/URINE)

a. Cross Match. (At time of siting of i.v. line) 
   Type and hold (all cases) 
   Blood ordered on Team Leader instruction only. 
   2 Units only may be ordered at a time 

b. ABG after primary survey completed (includes Hb, Na and K and lactate) 

c. Urine βHCG (all child bearing age female patients) 

d. Blood glucose (dextrostix) 

e. Amylase

ANALGESIA and INITIAL DRUGS

Analgesics must be administered as soon as possible after admission. (intravenously)

**Morphine Titration**

Morphine: 10mg in 10 ml of sterile water 

*Initial dose:* 0.1mg / Kg. (Approx. 7mg male, 5mg for female) 

**Titrate** pain with 3 mg morphine boluses as required, with careful haemodynamic monitoring

Metacolpramide – 10mg IV if patient nauseas/vomiting

Tetanus Prophylaxis 
Tetanus Toxoid 0.5 ml IMI.

**ADMISSION ANTIBIOTICS**

**Gunshot Wounds**

- Augmentin 1.2g IV push-in

**Abdominal Injury**

- Augmentin 1.2g IV push-in

**Compound Fractures (including external skull fractures)**

- Kefazolin 1 g. IV push-in

**Chest Drains**

- Augmentin 1.2 g. IV push-in

**Major facial injuries**

- Augmentin 1.2g. IV push-in

- Metronidazole 1 g. IV push in

**Vascular procedure:** Cefazolin 1.0 g. IVI.

Antibiotics are not routinely used in 
Fracture of the base of the skull
Stab wounds

**MONITORING**

- ECG 
- Pulse Oximetry 
- Non invasive Blood Pressure

**And after the log-roll**

- Rectal Thermometer 
- Urine Catheter 
  - Use 14 G (i.e. small bore) where possible 
  - MUST be placed prior to peritoneal lavage 
- Nasogastric Tube 
  - Use nasogastric route ONLY where:

<table>
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<th>If patient is allergic to Penicillins, Consider:</th>
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<td>Klacid 1 g IV push-in</td>
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<td>Erythromycin 500 mg IV push-in</td>
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There is no facial fracture
➢ The cribiform plate is intact!
Otherwise use orogastric placement.
MUST be placed prior to peritoneal lavage.
In awake patients spray the back of the throat with Lignocaine.

INITIAL X-RAYS
N.B. Markers MUST be used in penetrating injury.
• Cervical Spine: AP
  Lateral – attending Dr to "pull" on arms to lower the shoulders for
  better view of C7/T1
  Swimmers View.
  N.B. NO peg view at this stage. Unless the patient is stable, awake
  and unintubated
  Adequate views (i.e. full visualisation of the entire cervical spine in
  the extent C1 to C7 and T1) must be obtained.
  Substandard views must be rejected repeated
  In Stable patients, consider CT Scan
• Supine Chest: AP
• Pelvis
  Blunt injury and close proximity injury
NO OTHER X-RAYS ARE PERMITTED AT THIS STAGE!

PRIMARY RESUSCITATION MUST BE COMPLETE BEFORE MOVING ON!
2. SECONDARY SURVEY

Head-to-toe examination, Back and front (Log roll), all systems checked
Adjuncts (Xrays – C-spine, chest and pelvis; Ultrasound, DPL, CT scan etc)
Re-evaluate patient – NB!!!
Transfer/Refer/Theatre

FULL AND COMPREHENSIVE PHYSICAL EXAMINATION INCLUDES
- Primary and secondary survey, with accurate description and documentation of all injuries
- Appropriate neurological examination and accurate Glasgow Coma Scale scoring
- Rectal examination in all patients. (N.B. Part of the Primary Survey)
- Vaginal examination in all female patients. After verbal informed consent in awake patients. Not necessary in children (need EUA), leave to the discretion of the Paediatric Surgeon.

DEFINITIVE X-RAY EXAMINATION

- All injured areas
- Odontoid peg view if required
  - Method: 1. Remove Neck Collar
  - 2. Stabilise neck manually
  - 3. Then open mouth and take x-ray
  - **NB: DO NOT EXTEND THE HEAD**
- Erect Chest X-Ray if spine cleared
  - The erect CXR is obtained AFTER placement of central venous catheters, ET tube and Nasogastric tube and Intercostal drainage tube
  - (unless if indicated as an urgent priority i.e. pneumothorax / haemothorax).
- Any other x-ray views which may be clinically indicated are done during the secondary survey phase:
  - Complete spinal survey and calcaneum views in any case of fall from a height. Check for base of skull fracture (otoscopy)
  - Complete spinal survey in presence of pelvic fracture
  - Complete spinal survey in presence of any spinal fracture
  - Complete spinal survey in presence of fracture of the sternum
  - Suspicion of presence of foreign body
  - Skull X-Rays not indicated for blunt head injuries – CT scan is usually indicated in significant head injuries.
**Intensive Care Unit (ICU) Admission**

**Criteria:**

1. Post damage control laparotomy
2. Post cardiac resuscitation (CPR/Defib. Etc)
3. Post thrombolysis for AMI
4. Severe acidosis despite fluids (BE > -6, PH< 7.1)
5. Severe respiratory failure requiring ventilator support (PaO₂ < 60mmHg, Sats < 90%, PaCO₂ > 60mmHg)
6. Acute Renal Failure
7. Hypothermia (T < 34°C esp. if associated with coagulopathy, acidosis or myocardial depression)
8. Severe facial injuries with airway compromise
9. GCS < 8 requiring ventilation
10. Polytrauma with airway/breathing compromise requiring ventilation
11. Major inhalational burns (Survival = % burns + age)
12. Patients requiring inotrope support
13. Complicated malaria
14. Tetanus
15. Severe Organophosphate poisoning
16. Severe asthma that requires ventilation
17. Uncontrolled status epilepticus

All patients for ICU require 2x IV lines, CVP, urine catheter, CXR, ABG and baseline bloods.

*After initial resuscitation and stabilisation, the following patients are NOT eligible for a Trauma ICU bed or Ventilation.*

- Age >75 years
- Burn > 60% BSA
- Persistent GCS of less than 5/15 despite full resuscitation
- Quadriplegia
- AIDS related disease
- Futile Care
  - Futile resuscitation (CPR in progress)
  - Futile admission to hospital
  - Futile admission to I.C.U.
  - Futile transfers – burns, etc.
PROTOCOL FOR MANAGEMENT OF BURNS

PRE-HOSPITAL OR ON ADMISSION:

a. Cool burned surface with water/cooled NS if time from injury < 2 hours
b. Cover with Burnshield® (if available) – Avoid Flammazine in first 48 hrs
c. Cover with an occlusive dressing (cling/glade wrap) to prevent evaporation and cooling
d. Maintain core temperature at 37°C. (*i.e. cool the burn not the patient*)

ASSESSMENT OF EXTENT ON ADMISSION

1. Wallace's Rule of Nines (see Diagram)
2. Palm of patient’s hand = 1%
3. Age Dependant in Children (see Diagram)

BURNS ADMISSION

(All acute burns > 15% or requiring plastic surgery, to be transferred ASAP to The Albert Luthuli Burns Unit if beds are available. Patient to be resuscitated, stabilised and transferred)

Trauma:  > 15 % BSA
(Burns > 60% will not be admitted to the I.C.U.)
Circumferential (limb or torso)
Associated Injuries/Epileptic
Inhalation/Airway injury (add 20%)
Electrical (for cardiac monitor)

Plastic Surgery:  Hands & Feet
Face
Perineum

Paediatric Surgery:  Under 16 yrs age
Unless sexually mature (i.e. presence of pubic hair)

INITIAL MANAGEMENT

PRIMARY SURVEY

- A = Airway - always consider inhalation injury; 60% Oxygen by mask or ET intubation if indicated (early rather than later).
- B = Breathing – check oxygen sats and ventilation; measure ABG + carboxyhb.
- C = Intravenous access with 16 g x 2; Central venous catheterisation if indicated (>20% BSA); Foley indwelling catheter and hourly output monitoring (1 ml / kg / hr)
- D = GCS; Sedation and Analgesia by Morphine titration ivi
- E = expose patient to assess extent of burns; cool the burn not the patient

ADJUNCTS = Nasogastric intubation (if > 30% BSA); Sucralfate 1 g 6hrly via NGT if an ileus is present; Chest x-ray (preferably erect) after placement of IV access and CVP lines

SECONDARY SURVEY

Evaluation of other concomitant injuries; Consider immediate debridement in theatre, Escharotomy, Fasciectomy and Occlusive dressing; Splint hands in the Functional position

- ADMISSION BLOOD INVESTIGATIONS :
  ➢ Full Blood Count and haematocrit
  ➢ Urea & Electrolytes & Creatinine; LFTs (albumin)
  ➢ Compatibility Specimen
- Blood gases
- Tetanus prophylaxis

**FLUID MANAGEMENT**

**NB:** These formulae are intended as guidelines and must be tailored to each case's requirements by taking careful account of haemodynamic parameters

**PARKLANDS FORMULA**

**FIRST 24 HOURS FOLLOWING INJURY**

Replacement fluid at:

\[ 4 \text{ ml} \times \text{BW}(\text{kg}) \times \% \text{Burn} \]

During this initial 24 hrs CRYSTALLOID only is used e.g. Ringer's Lactate

- **HALF** of the requirement is given in the first 8 hours from time of burn
- the **REMAINING HALF** is given during the subsequent 16 hours
- total volume given should not exceed 10-12 litres
- requirements must be tailored to CVP and Urine Output which must be measured at least four hourly
  - CVP 5-10 mm H₂O
  - Urine 1-2 ml/kg/hr

**Plus**

Maintenance fluid at **2000 to 3000 ml / 24 hrs (30 ml / Kg BW)**

**SECOND 24 HOURS FOLLOWING INJURY**

Replacement fluid at **1 ml / kg BW / % Burn – colloid (FDP)**

Nasogastric losses must be replaced in addition to other losses within 12 hours

Maintenance fluid at **2000 to 3000 ml/24hrs (30 ml / Kg BW)**

NGT feeding as soon as possible (ideally within 48hrs)

Patients to be transferred to burns unit post 48 hrs
WALLACE RULE OF NINES
## EXTENT OF BURN IN CHILDREN

<table>
<thead>
<tr>
<th>AGE IN YEARS</th>
<th>0</th>
<th>1</th>
<th>5</th>
<th>10</th>
</tr>
</thead>
<tbody>
<tr>
<td>Head (A/D)</td>
<td>10</td>
<td>9</td>
<td>7</td>
<td>6</td>
</tr>
<tr>
<td>Thigh (B/E)</td>
<td>3</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Leg (C/F)</td>
<td>2</td>
<td>3</td>
<td>3</td>
<td>3</td>
</tr>
</tbody>
</table>
HEAD INJURIES

The Emergency Unit is responsible for the care of all polytrauma patients. Isolated Head Injuries are the responsibility of the relevant specialty; i.e. the Surgeons/Neurosurgeons

Management of Head Injuries:

1. 30º head up provided C-Spine has been cleared
2. Intubate if GCS 8 or less; oxygen 40-60%
3. Sedate with Dormicum® (midazolam) to prevent coughing and straining
4. If ICP raised on initial CT Brain
   • ventilate to maintain normocarbia (PaCO₂ 35-40 mmHg)
   • sedate/paralyse prn (anaesthetist or EU consultant)
   • repeat CT at 48 hours and then wake and wean if ICP decreased
5. Maintain MAP > 90mmHg (use inotrope infusion if necessary)
6. Check Hb – avoid anaemia
7. Monitor blood glucose (avoid hyper/hypoglycaemia)
8. Epanutin loading and maintenance dose in presence of an epileptogenic focus
   • SAH
   • Bleed (intra-cerebral, sub- or extra-dural)
   • Witnessed seizure
     Loading dose: 15mg/kg IV slowly with cardiac monitoring
     Maintenance: 300mg/day IV or PO
     Duration: 7 days

Futile Care

• GCS < 5 despite full resuscitation
• No correctable lesion
• GSW Head across the midline

CT SCANNING OF BRAIN

Patient is stable

Indications are as follows:

A patient transferred to the CT suite after initial stabilisation must be attended by a doctor from the Emergency Unit staff at all times
CT scan is arranged with the Radiologist
Are any of the following present?
- GCS < 13 at any point since the injury
- GCS 13 or 14 at 2 hours after the injury
- Focal neurological deficit
- Suspected open or depressed skull fracture
- Any sign of basal skull fracture (haemotympanum, 'panda' eyes, cerebrospinal fluid otorrhoea, Battle's sign)
- Post-traumatic seizure
- > 1 vomiting episode (clinical judgement on cause of vomiting and need for imaging should be used in children aged ≤ 12 years).

Any Loss of consciousness or amnesia since the incident

Are any of the following present?
- Age ≥ 65 years
- Coagulopathy (history of bleeding, clotting disorder, current treatment with warfarin)

Are any of the following present?
- Dangerous mechanism of injury (a pedestrian struck by a motor vehicle, an occupant ejected from a motor vehicle or a fall from a height of greater than 1 metre or 5 stairs). A lower threshold for height of falls should be used when dealing with infants and young children (i.e. < 5 years).
- Amnesia of greater than 30 minutes for events before impact (the assessment of amnesia will not be possible in pre-verbal children and is unlikely to be possible in any child aged < 5 years of age).

Request CT imaging of the head immediately – imaging to be carried out within 1 hour of the request

Ref: NICE Guidelines UK 2003
REFERRAL OF PATIENTS TO IALH

A. CRITERIA FOR URGENT CONSULTATION
- ALL with Coma Score 5-10
- GCS 11-14 with a) Skull fracture & or/ b) Focal neurological signs
- ALL with a fixed dilated pupil
- ANY deterioration in level of consciousness – even 1 level on GCS
- GUNSHOT HEAD must have minimum GCS 10/15

B. FOR CONSULTATION DURING WORKING HOURS
- GCS 11-14 > 48 hours + No fractures + No focal signs
- GCS 15 BUT with a focal sign
- GCS 15 BUT with a Stab Head or deeply in-driven bone fragments

C. RESUSCITATE FIRST, RE-EVALUATE, THEN CONSULTATION
- GCS 3 or 4 from the time of injury
- Shocked or hypoxic patients

MANAGEMENT OF HEAD INJURED PATIENTS IN COMA OR WITH POSSIBLE MULTIPLE INJURIES

1. Assess for respiratory insufficiency, for shock, and for internal injuries, especially after a high velocity injury e.g. A road accident
2. Perform a) Chest x-ray b) blood gas estimation c) Cervical spine x-ray d) other relevant investigations
3. Appropriate treatment may include:
   - Intubate (e.g. If airway obstructed or threatened)
   - Respiratory support
   - Commence IV infusion (2000ml/24h Dextrose Saline)
   - Mannitol, only after consultation with neurosurgeon
   - Application of cervical collar or cervical traction
   - Immobilization of fractures, treatment of internal injuries
4. If accepted for transfer, the patient should be accompanied by personnel able to insert or re-position endotracheal tube, and to initiate or maintain ventilation.

CRITERIA FOR SKULL X-RAY AFTER RECENT INJURY

1. Loss of consciousness or amnesia at any time.
2. Neurological symptoms or signs
3. Cerebrospinal fluid or blood from the nose or ear
4. Suspected penetrating injury
5. Scalp bruising or swelling
6. Difficulty in assessing the patient (i.e. Alcohol intoxication, Epilepsy, children)

CRITERIA FOR ADMISSION TO HOSPITAL

1. Confusion or any other depression of level of consciousness at the time of examination.
2. Skull fracture
3. Neurological symptoms or signs
4. Difficulty in assessing the patient e.g. Alcohol, epilepsy
5. Other medical conditions – e.g. Haemophilia
6. Posttraumatic amnesia or a brief period of loss of consciousness with full recovery is not necessarily an indication for admission
X-RAY OF Spine Injuries

Cervical Spine
1. Trauma patients who:
   - Are awake and alert
   - Have not ingested alcohol or drugs
   - Have no mental status changes
   - Have no Neck Pain or Tenderness to palpation or voluntary movement (flex/extend/45° rotation) – refer to Canadian C-spine rules and NEXUS
   - Have no distracting, painful injury
   - And have no neurological deficits
   - NO significant mechanism of injury
   May be considered to have a stable cervical spine and need no X-Rays of their cervical spine
2. All other trauma patients should have the following cervical spine X-Rays
   - Lateral (occiput to T1)
   - AP
   - Open Mouth Peg view (not possible in intubated resus patients)
   - Swimmers (if Lateral inadequate)
   Axial CT scan with sagittal reconstruction should be obtained for any questionable area of injury
3. If the X-Rays are normal but the patient complains of significant neck pain, an Orthopaedic consultation should be arranged and they may take the patient for Flexion and Extension views
4. If the patient has a neurologic deficit that may be referable to a cervical spine injury they should have an Immediate Orthopaedic consultation and consideration for a MRI of the Cervical spine
5. Any abnormalities discovered on any of the X-rays require an Immediate Orthopaedic consultation
6. “Open Mouth” view must be done to clear the peg, with the cervical collar off. The head must be stabilised and the neck protected throughout (i.e attending Dr to accompany patient).

Thoracic and Lumbar spine

Suspect thoracic or lumbar spinal injuries under the following circumstances. A FULL spinal survey must be carried out
   - Close proximity injury with decreased level of consciousness
   - Inability to assess the patient
   - The presence of any other vertebral fracture
   - The presence of any pelvic fracture
   - Evidence of any vertebral compression
     - Fall from height
     - Axial compression
     - Fracture of calcaneus or talus
BLUNT CARDIAC INJURY

Myocardial injury is a histological diagnosis; therefore, our job is to identify which patients are at risk of morbidity or mortality from cardiac contusion.

Reference:
MAXILLO-FACIAL INJURIES

Facial X rays require an OPG and an OM 10 degree film only.

i) Mandibular injuries.
Fractures occur of the condyle, the coronoid, the ramus/ angle of the mandible, the body or the symphysis.
Symptoms - inability to bite teeth together correctly, pain,, numbness in the lip (mental nerve distribution).
X-rays - ideally an OPG. Also oblique and PA mandible.
Management – Condylar and undisplaced body #’s - no or minor problems with occlusion
- Next Max-fax clinic
- Analgesia (antibiotics only for where the mucosa is breached)
- Soft diet
- If displaced or associated with an open wound d/w Max-Fax team

For mandibular dislocations, exclude fracture and then re-locate under the guidance of the senior staff.

ii) Zygomatic fractures
Commonly due to assaults, sporting injuries and falls.
Symptoms
- Inferior orbital nerve
- Paraesthesia
- Epistaxis from the affected side
- Slight depression zygomatic arch
- Double vision
- Trismus.
Signs
- Step deformity zygomatic complex and orbital rim
- Peri-orbital bruising
- Sub-conjunctival haemorrhage
- Restriction in eye movement
- Enophthalmos/exophthalmos
- The mouth may be locked open or shut due to impingement upon the temporalis muscle

2 Remember to check visual acuity and ocular movements.
X-rays - occipito-mental at 10° and Sub-mento vertex for view of the zygomatic arch.
Management
If no visual impairment then refer to the next Max-Fax clinic. Arrange suitable analgesia. Antibiotics are not required unless there is an overlying soft tissue laceration or mucosal injury.
If there is any impairment of eye movement then refer to the Max-fax team.

iii) Le Fort fractures 1, 2 and 3.
These are complicated fractures of the middle third of the face and obviously
signify significant trauma. They should be managed along standard trauma guidelines of primary survey, resuscitation, secondary survey, stabilisation and referral for definitive care. Compromise of the airway and significant haemorrhage are important complications to consider and treat on a priority basis.

**Soft tissue injuries**
In situations where there is a significant amount of bruising to the face and soft tissue shadowing, but with no obvious fractures or other signs and symptoms, follow-up with the Max/facs on call
BITES

**Dog:** *Pasteurella multicaida* is the organism most commonly associated with dog bites. Thorough cleaning, irrigation & debridement are essential. As a general principle most dog bites should not be closed but left to heal by secondary intention. However there are many dog bites whose position demands closure on cosmetic grounds i.e. facial bites. If this is the case then these wounds require meticulous wound toilet, often under local anaesthesia and prophylactic antibiotics i.e. AUGMENTIN (Erythromycin if allergic to Pen.). Superficial dog bites simply need wound toilet, dressing and assessment of the Tetanus status. However if the wound is closed primarily, appears a penetrating wound or is sited on the hand or face then prophylactic AUGMENTIN is recommended.

<table>
<thead>
<tr>
<th>Grade</th>
<th>Description</th>
<th>Wound toilet</th>
<th>Dressing</th>
<th>Antibiotic</th>
<th>Review</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Superficial</td>
<td>Simple</td>
<td>None/Dry</td>
<td>None</td>
<td>Discharge</td>
</tr>
<tr>
<td>2</td>
<td>Puncture wound</td>
<td>Simple</td>
<td>Inadine</td>
<td>Augmentin</td>
<td>Prac. Nurse</td>
</tr>
<tr>
<td>3</td>
<td>Subcutaneous exposure</td>
<td>LA &amp; wound toilet Irrigate +++</td>
<td>Inadine</td>
<td>Augmentin</td>
<td>D/C</td>
</tr>
<tr>
<td>4</td>
<td>Complicated</td>
<td></td>
<td>Inadine</td>
<td>Augmentin</td>
<td>? Refer</td>
</tr>
</tbody>
</table>

**Human bites:** These wounds are often at greater risk of infection than dog bites due to the numbers and types of bacterial flora present in the human mouth. Beware wounds over the knuckles which many patients adamantly deny are punching injuries but technically are human bite injuries if the wound is caused by the victims teeth. A high index of suspicion must be maintained and the patients warned about the potential consequences. The wounds need thorough wound toilet and many over the knuckles require admission for exploration to exclude joint penetration. These wound are best left open and AUGMENTIN must be prescribed. See further guidance under punching injuries.

**Cat bites:** Even trivial superficial cat scratches have a high propensity to infection and tendon sheath infections are very common with penetrating injuries over the palmer aspects of the fingers. *Pasteurella multicaida* is often the culprit and is sensitive to amoxycillin therefore prescribe AUGMENTIN.

**Insect bites/stings:** Anaphylaxis is the worst case scenario in these situation and should be treated along the principles of the ABC of resuscitation. Chlorpheniramine 10 mg IV and Hydrocortisone 100 mg IV are recommended. Volume replacement and adrenaline may be required for anaphylaxis (Shock). Infected bites treat with Pen V.
RABIES

History of suspicious animal bite

Incidence of Rabies in area
Stray animal
Unprovoked attack
Change in animal behaviour
Vaccination status of animal unknown
Animal that cannot be traced after the attack

HIGH RISK

Wound care
Wounds to be debrided and cleaned
Avoid suturing

Antibiotics
Patients who present after 8 hours
Extensive wounds to face and extremities
Immunocompromised patients
Diabetics
- Augmentin or
- Cefuroxime and Metronidazole or
- Clindamycin and Ciprofloxacin or
- Doxycycline

Rabies Vaccination (immediate)
First dose administered immediately
at a different site to immunoglobulin.
Do NOT inject into buttocks as fat interferes with absorption

Route:
Adults: Intramuscular into deltoid
Children: Anterolateral thigh

Booster Vaccine administered on:
Day 3, 7, 14, 28

Rabies Immunoglobulin
Dosage: 20 I.U. / Kg body weight. Each 2 ml ampoule contains 300 I.U. Infiltrated into the depth in and around every wound if anatomically possible. The rest can be injected into the buttocks.

<table>
<thead>
<tr>
<th>Body weight (Kg)</th>
<th>Dose (I.U.)</th>
<th>Dose (ml)</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>100</td>
<td>0.7</td>
</tr>
<tr>
<td>10</td>
<td>200</td>
<td>1.3</td>
</tr>
<tr>
<td>15</td>
<td>300</td>
<td>2.0</td>
</tr>
<tr>
<td>20</td>
<td>400</td>
<td>2.7</td>
</tr>
<tr>
<td>25</td>
<td>500</td>
<td>3.3</td>
</tr>
<tr>
<td>30</td>
<td>600</td>
<td>4.0</td>
</tr>
<tr>
<td>40</td>
<td>800</td>
<td>5.3</td>
</tr>
<tr>
<td>50</td>
<td>1000</td>
<td>6.7</td>
</tr>
<tr>
<td>60</td>
<td>1200</td>
<td>8.0</td>
</tr>
<tr>
<td>70</td>
<td>1400</td>
<td>9.3</td>
</tr>
<tr>
<td>80</td>
<td>1600</td>
<td>10.7</td>
</tr>
<tr>
<td>90</td>
<td>1800</td>
<td>12.0</td>
</tr>
<tr>
<td>100</td>
<td>2000</td>
<td>13.3</td>
</tr>
</tbody>
</table>

Do not exceed maximum dose
## Risk Categories for Rabies Exposure

<table>
<thead>
<tr>
<th>RISK CATEGORY</th>
<th>TYPE OF EXPOSURE</th>
<th>ACTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Touching/feeding animal</td>
<td>No Action is Required</td>
</tr>
<tr>
<td></td>
<td>Licking intact skin</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Nibbling uncovered skin</td>
<td>Manage the wound</td>
</tr>
<tr>
<td></td>
<td>Superficial scratch without bleeding</td>
<td>Full course of rabies vaccine (<em>above</em>)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Do not give the Immunoglobulin</td>
</tr>
<tr>
<td>3</td>
<td>Bites/scratches penetrating skin and drawing blood</td>
<td>Manage the wound</td>
</tr>
<tr>
<td></td>
<td>Licking of mucous membranes</td>
<td>Full course of rabies vaccine*</td>
</tr>
<tr>
<td></td>
<td>Licking broken skin</td>
<td>Give rabies immunoglobulin</td>
</tr>
</tbody>
</table>
2. MEDICAL EMERGENCIES

CARDIOVASCULAR

1 Advanced Cardiac Life Support
2 Recognition and treatment of Arrhythmia’s.
3 Acute Cardiac Failure
4 Chest Pain Evaluation
5 Management of Myocardial Infarction and Angina
6 Hypertensive Emergencies
7 Thrombo-embolic disease

1 ADVANCED CARDIAC LIFE SUPPORT

The management of critically ill patients who have suffered a cardio-pulmonary arrest or are in a “peri-arrest” rhythm requires a systematic and logical approach to management. Like the trauma situation, a team of individuals with pre-designated tasks allows for a cohesive team approach leading to a well disciplined and organised resuscitation.
Basic Life Support (CPR 30:2)

- **Shout for Help**
- **Precordial Thump**
  - If witnessed/monitored
- **Assess Rhythm**
  - **VF / VT**
    - Defibrillate x 1
      - 150-200J biphasic
      - 360J monophasic
    - CPR 2 min (30:2)
  - **Non-VF / VT**
    - Immediately resume CPR 2 min (30:2)

During CPR Check for:
- Correct reversible causes
- Electrodes & Paddles
- Airway & ventilation
- IV access
- Adrenaline 1mg every 3 min
- Consider:
  - Amiodarone
  - Atropine (PEA<60)
  - Buffers
  - Pacing
  - Magnesium 8 mmol

Reversible causes (H’s and T’s)
- Hypoxia
- Hypovolaemia
- Hypo/Hyperkalaemia/Hypocalcaemia
- Hypothermia
- Tension pneumoth.
- Tamponade
- Toxic/therapeutic Rx
- Thromboembolism
TERMINATION OF CPR
There are a number of poor prognostic indicators that can assist in the decision to terminate CPR:
- Unwitnessed collapse
- No or inefficient bystander CPR
- Delay in ambulance arrival (> 8 min) with CPR but no response/output
- Rhythm other than VF
- Failure to respond with the 1st six shocks
- Event time longer than 30 minutes

Many other factors need to be taken into consideration such as the pre-morbid history, age, any special circumstances, temperature, drugs etc.
2 RECOGNITION AND TREATMENT OF ARRHYTHMIA’S.

All patients with palpitations & arrhythmia’s should be triaged to EU Majors (RU). Correct any electrolyte abnormalities. Check for any inappropriate medication use or drug abuse.

Adverse signs: 
Pallor, cold extremities, impaired consciousness, hypotension, chest pain and pulmonary oedema

Summary points:
Prompt treatment required according to the appropriate algorithm (Algorithm’s below)

• Bradycardia - Treat if symptomatic or rate consistently below 40 bpm (Atropine 0.5-1 mg every 10 min)
• Heart Block -
  - First degree and Mobitz 1 (Wenkebach) - exclude Inferior MI. No treatment usually necessary
  - Mobitz 2 - exclude infarct (usually anterior) - may progress to Complete heart block - observe
  - Complete AV Block - observe if associated with Inferior MI and haemodynamically stable
  - if unstable try Atropine then urgent pacing
  - if associated with Anterior MI then most will need pacing
• Atrial Fibrillation
  - Will only require treating if the rate is > 100 bpm or patient is unstable
  - Digoxin 500 microgram in 100 mls 5% Dextrose over 30 min
    - If there are ventricular arrhythmia’s in addition then consider IV Atenolol 2.5 mg (if the patient is haemodynamically stable)
  - Rates > 130 bpm or persistent haemodynamic instability consider DC shock cardioversion
• Ventricular extrasystole’s - Suppress with lignocaine if the patient is haemodynamically unstable.
• Multifocal VE’s or recurrent non-sustained salvo’s do not need Lignocaine automatically
• Tachycardia’s - see algorithm’s below
  Rates > 130 are likely to be pathological and not simply sinus tachycardia
  Rates 140 - 155 are commonly atrial flutter with 2:1 block
  Rates 160 - 220 are SVT or VT
• Anti-arrhythmic drugs act more slowly and less reliably than electrical cardioversion.

<table>
<thead>
<tr>
<th>DRUG DOSES FOR ARRHYTHMIA TREATMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Atenolol 2.5mg IVI then 50mg PO</td>
</tr>
<tr>
<td>Esmolol 40 mg over 1 min+ infusion at 4 mg per min</td>
</tr>
<tr>
<td>Verapamil 5-10 mg iv</td>
</tr>
<tr>
<td>Amiodarone 300 mg over 20-60 min then 900mg over 24 hours (37.5mg/hr)</td>
</tr>
<tr>
<td>Digoxin 500microg over 30 min x 2</td>
</tr>
<tr>
<td>Lignocaine bolus 1mg/kg repeat every 5 min (max 200mg)</td>
</tr>
<tr>
<td>Flecanide 150 mg</td>
</tr>
</tbody>
</table>
**Tachycardia algorithm**

ABC assessment; 02 ; IV Access  
ECG, BP, Sats  
Rhythm ECG strip; 12 lead ECG  
Treat reversible causes e.g. electrolytes, anaemia - FBC, U&E

---

**Is the patient unstable?**
- Chest pain  
- Heart failure  
- Reduced LOC  
- SBP < 90

---

**YES**  
"UNSTABLE"

**CARDIOVERSION synchronised DC SHOCK**  
x 3 attempts

Amiodarone 300mg IV over 10-20min  
Repeat synchronised DC shocks x 3  
Amiodarone 900mg/24hrs IVI

---

**NO**  
"STABLE"

**QRS**

**Narrow QRS (<0.12 sec)**

**Regular rhythm**
- Probable SVT:  
  - Vagal manoeuvres  
  - Adenosine IVI 6/12/12  
  - Contin. ECG monitoring

**Irregular rhythm**
- Probable AF:  
  - Rate control = B Blocker, CCB, Digoxin  
  - Rhythm control (<48hrs)=consider amiodarone IVI

---

**Regular rhythm**
- Probable re-entrant SVT

---

**Irregular rhythm**

**Possibilities:**
1. AF + BBB – treat as narrow complex
2. Polymorphic VT (Torsades de pointes) – MgSO4 2g over 10min

---

**Irregular GET HELP**

**Regular Ventricular Tachycardia**
- Amiodarone 300mg IV over 10-20min  
- Amiodarone 900mg/24hrs IVI

---

**Normal sinus rhythm restored?**
- YES

---

**Seek Expert Help!**
- A.Flutter  
- Rate control = B blocker
**Bradycardia Algorithm**

*(includes rates inappropriately slow for haemodynamic state)*

If appropriate, give oxygen, cannulate a vein, and record a 12-lead ECG.

**Adverse signs?**
- Systolic BP < 90 mmHg
- Heart rate < 40 beats min⁻¹
- Ventricular arrhythmias compromising BP
- Heart failure

**YES**

- **Atropine 500 mcg IV**

**Satisfactory response?**

- **YES**
- **NO**

**NO**

**Interim measures:**
- Atropine 500 mcg IV repeat to maximum of 3 mg
- Adrenaline 2-10 mcg min⁻¹
- Alternative drugs *
- CR
- Transcutaneous pacing

**Seek expert help**

**Arrange transvenous pacing**

**YES**

- Risk of asystole?
  - Recent asystole
  - Möbius II AV block
  - Complete heart block with broad QRS
  - Ventricular pause > 3s

**NO**

**Observe**

* Alternatives include:
  - Aminophylline
  - Isoprenaline
  - Dopamine
  - Glucagon (if beta-blocker or calcium-channel blocker overdose)
  - Glycopyrrolate can be used instead of atropine

Ref: Resuscitation Council UK 2006
Atrial Fibrillation/Flutter

**Stable/Unstable**

**Unstable signs:**
- Rate > 150 bpm
- Ongoing chest pain
- Critical perfusion (low BP)
- Cardiac failure
- Decreased level of consciousness

---

**NB!!**
1. CCF / LVF – Use diltiazem, digoxin or amiodarone (avoid other agents)
2. WPW - Use amiodarone, flecainide (avoid adenosine, B-Blockers, CCB, digoxin)

**Reference:**
1. AHA. *Handbook of Emergency Cardiac Care*; 2004:14-15
2. Atrial Fibrillation. NICE guidelines. 2006
POST RESUSCITATION CARE

PRIMARY SURVEY

AIRWAY & BREATHING
Assess the airway. Secure by intubation if unprotected, check endotracheal tube position, 100% O2
CXR to confirm tube position and exclude pneumothorax/ aspiration. Capnography and blood gas to assess ventilation.
Sats. monitor for oxygenation monitoring

CIRCULATION
Re-assess circulation; pulse, rhythm, rate, blood pressure. Arterial (or CVP) line inserted for BP monitoring or inotrope administration.

DYSFUNCTION CNS
Re-assess dysfunction; record GCS pupillary reaction. Lateralising motor signs.

EXPOSURE OF PATIENT
Hypothermia may be of benefit for reperfusion injury (30 C – 34 C) i.e. cold fluids and ice packs

Perform:
FBC, U & E, Blood sugar, Ca2+, BM Stix & ABG’s. ECG & Chest X-ray.

MEDICAL TREATMENT
Patients with an output, post ventricular defibrillation should be started on either an Amiodarone infusion 900mg/24hrs following the initial bolus of 300mg IV during VF/VT resuscitation (ALS 2005) or lignocaine infusion (if lignocaine was used during the resuscitation) at 4mgs per minute i.e. 1 ml per min for 60 min of the pre-prepared Lignocaine infusion (0.4% in 5% Glucose). Do not use lignocaine if amiodarone has already been used and visa versa.
3 ACUTE CARDIAC FAILURE

ACUTE LEFT VENTRICULAR FAILURE

### CLINICAL PRESENTATION

**HISTORY**
- Orthopnoea, PND, DIB on exertion or rest

**EXAMINATION**
- Acute distress & dyspnoeic; frothy sputum, cyanosis
- Cold & clammy (cold hands, thready pulse)
- Tachycardia / Gallop rhythm (S3)
- Pulmonary crackles at lung bases
- Hypertension may be present; Raised JVP

### WORK-UP/INVESTIGATIONS

- FBC, U&E, ABG, *BNP (<100pg/ml = LVF unlikely; >500pg/ml = LVF highly likely – not avail. currently)
- CXR – cardiomegaly, pulmonary vessel congestion with upper lobe diversion - BATS wing appearance, Kerly B lines
- Pulse oximetry
- ECG – LV hypertrophy, ST segment depression (ischaemia), ST elevation (AMI), tachyarrhythmias, Bradyarrhythmia
- Central line insertion (Senior ED/AHAesthetist)

- CVP > 18mmHG = cardiogenic; < 18mmHg = non cardiogenic

### MANAGEMENT

- **60-80% Oxygen** (24% in co-existent COPD)
- **Sit** patient upright

**Preload Reduction**
1. GTN – Spray/buccal tablets initially S/L, followed by infusion (50mg:50ml infusion titrated from 0.6mg/hr upward against clinical symptoms and blood pressure (BP> 90mmHG)
2. Furosemide – 40mg slow IV push, causes initial venodilation followed by delayed diuresis, slow IV administration
3. Morphine – initial 3mg bolus then titrated to effect if patient anxious, slight decrease in vascular resistance, decreases catecholamine release

**Afterload Reduction**
1. ACE inhibitors – effects felt 10 minutes after IV admin. (e.g. enalapril 1.25mg, captopril 25mg S/L). Avoid in renal failure (Creat.>300Umol/l) & renal artery stenosis

**Inotrope support** (Senior EMU Dr/AHAesthetist)
1. Dobutamine – predominant β-1 effects (inotrope with mild chronotrope effects and slight vasodilation); Avoid if SBP< 80mmHg. Infusion – 250mg:500ml N/S @ 42ml/hr titrated (equiv. to 5ug/kg/min in a 70kg person)

**Ventilation** (Senior ED/AHAesthetist/Physicain)
1. Non Invasive Ventilation – CPAP/BIPAP
2. Mechanical Ventilation

### References:

Ngwelezane Emergency Unit Guidelines 2007 38
4. **Chest Pain Evaluation**

- Assess A,B,C.
- There is a continuum between coronary ischaemia and infarction and they are not distinct entities – **Acute Coronary Syndrome**
- If there is any potential for a cardiac cause then progress to immediate assessment & ECG
- Types of Chest pain (20% AMI, 35% angina/unstable, 45% non-cardiac)
  - Cardiac type chest pain
    - Heavy central chest pain
    - Radiation to jaw or arms (sometimes both)
    - Upper abdominal pain
    - Back pain
    - Nausea
    - Sweating
    - Anxiety
  - Pluertic chest pain
    - Musculo-skeletal
    - Pneumothorax
    - Pulmonary embolus
    - Pleural inflammation / infection
    - Pericarditis
  - Atypical chest pain
    - Beware atypical presentation of cardiac pain especially in the elderly and diabetics

**ECG Changes:**
10% of AMI’s never develop significant ECG changes
Only 50% with a transmural AMI ever develop obvious ST segment elevation
Hyper-acute T waves are common in early AMI. They are asymmetric and develop into ST elevation.

**Troponin-T**
This is the standard marker that has now replaced Troponin-I and cardiac profile for the diagnosis of suspected acute myocardial infarction. Elevation of cTnT is highly specific for myocardial damage. The sensitivity is virtually 100% if samples are taken > 12 hours after the onset of symptoms. It is detectable in unstable angina and cardiac failure with sub clinical myocardial damage.

Interpretation of results:

- \(< 0.03 \mu g/l\) myocardial damage excluded
- \(0.03\text{–}0.1 \mu g/l\) minor myocardial damage
- \(\geq 0.1 \mu g/l\) consistent with MI

Do not routinely perform cTnT in EU unless symptoms have persisted for more than 8 hrs. The decision to thrombolyse should continue to be made on the clinical history, examination and ECG findings without waiting for the cTnT results.
5 CARDIAC TRIAGE PROTOCOL

Cardiac Chest Pain
- Heavy central chest pain
- Radiation to arm or jaw
- Nausea
- Sweating
- Palpitations
- High risk collapse

Immediate Orange Triage in Resus Simultaneous doctor, nurse & ECG assessment Request old notes

Cardiac cause

Yes

No

? Thrombolysis

? Transfer medical

Yes

No or doubt

Further Ix & Mx or assistance

Contraindications

Yes

No

THROMBOLYSE IN RU

ICU

Med Ward

Appropriate discharge

Other

Equivocal ECG Repeat in 10 min
Risk factors
- Family history
- Smoking
- Hypertension
- Hypercholesterolaemia
- Asians
- Diabetes
- Angina

Cardiac Chest pain
- Heavy central chest pain
- Radiation to jaw or arms
- Pallor
- Sweating
- Nausea
- Shortness of breath
- Lethargy

Beware:
- Making the diagnosis of dyspepsia
  - Belching is commonly seen with myocardial infarction
  - The elderly can present with ‘silent’ MI and abdominal pain
  - Be constantly vigilant for atypical presentations

Differential Diagnosis:
- Unstable angina, pericarditis, pneumonia, pleurisy, PE
dyspepsia, oesophagitis, musculo-skeletal, shingles, dissecting aneurysm

ECG signs:
- A normal ECG does not exclude an MI. Repeat it within 15 min.
  - Hyper acute T waves (tall, broad, peaked & elevated above the iso-electric line)
  - ST elevation is probably imminent, prepare for thrombolysis & repeat ECG

ECG indications for ED Thrombolysis:
- Onset of cardiac chest pain within 12 hours or
- On-going chest pain beyond 12 hours with:
  - ST elevation of > 1 mm in more than 2 limb leads
    (2 in aVL, aVF, or 2 in I, II, III)
  - OR ST elevation > 2 mm in more than 2 adjoining chest leads (V1-6)
  - OR ‘new’ LBBB & chest pain
  - OR RBBB chest pain ST elevation

ECG signs not requiring ED thrombolysis:
- T wave inversion (often very late)
- Q waves may be present initially but this is unusual
- Post. MI - Tall R waves in V1-3,
  - ST depression in Anterior leads
- If there is ST depression in the chest leads then
  - perform V8, V9 & V4R
- Subendocardial MI: ST depression, small R waves, T wave inversion (symmetrical)

Contraindications:
- Bleeding disorder
- Active peptic ulceration in the last 2 months
- TIA or CVA within six months
- Surgery or significant head trauma within 6 weeks
- Previous Streptokinase - anytime (Rx rt-PA)
- Prolonged CPR (10 min)
- Aortic dissection
- Pregnancy

Relative contraindications:
- Anticoagulation: do INR, if < 3 Thrombolyse
- Hypertension > 200/100 d/w Medics
- Hypotension Systolic BP < 100 Rx rt-PA
- Severe Hepatic dysfunction. Do INR & d/w Medics

Note: menstruation is not a contra-indication

Streptokinase regime:
- ASPIRIN 300 mg
- Resus with full cardiac monitoring & saturation
- For Inferior infarcts
  - 1.5 million units in 100 ml Saline over 60 min
  - Transfer to ICU after 15 min
- Allergic reactions:
  - Stop the infusion
  - Hydrocortisone 100 mg IV stat
  - Chlorpheniramine 10 mg IV stat
  - +/- Adrenaline (dilute slowly IV)
  - +/- Salbutamol
MANAGEMENT OF ACUTE CORONARY SYNDROME
(Unstable angina – NSTEMI – AMI)

*Patients with cardiac type chest pain require:*
- Immediate assessment in resus (oxygen & immediate ECG)
- QUICK clinical assessment & Decision regarding immediate thrombolysis (ST elevation MI)
- 300 mg Aspirin (if not already given by Ambulance or GP)
- IV Access & Bloods (FBC, U&E, ABG, Cardiac Enzymes)
- GTN sublingual then IVI infusion (50mg:50ml @ 1mg/hr titrated to BP and pain) if pain persists
- IV Morphine 3-5 mg *slowly* & metoclopromide 10 mg IV
- S/C heparin (clexane 1mg/kg) - unless thrombolysed with streptokinase
- Atenolol 50mg PO (see below for contra-indications)
- Copidrogrel 300mg stat (NSTEMI)
- Monitor x 24 hrs – continuous 3 lead ECG/BP/P/Sats, check TropT, Repeat ECG q6h, admit to ward if stable

6 HYPERTENSIVE EMERGENCIES

This is a rare presentation in the ED department and is best treated on consultation with the physician by oral anti-hypertensives as in-patients.

Causes of severe hypertension:
- Malignant hypertension with encephalopathy, acute renal failure or LVF
- Aortic dissection
- Subarachnoid haemorrhage
- Eclampsia

Investigations:
Blood pressure in both arms, U&E’s, Urinalysis, CXR, ECG

Management:
ABC’s of resuscitation, High flow oxygen & IV access
7 THROMBO-EMBOLIC DISEASE

(i) DVT

Risk factors: Malignancy, recent surgery, immobility, and pregnancy, OCP, HRT, cardiac failure, previous DVT

Clinical features: Highly variable but may include calf pain & swelling, erythema, oedema, venous dilatation

Differential diagnosis: muscle injury, cellulites, heart failure, and Bakers cyst

Clinical scoring (Score one point for each of the following but deduct 2 if an alternative diagnosis is more likely)
- Malignancy
- Immobilisation – bed bound greater than 3 days, surgery in past month
- Lower limb trauma / surgery / POP
- Tender femoral or popliteal veins
- Dilated collateral veins (not varicosities)
- Localised tenderness along deep vein system
- Entire leg swollen
- Calf swelling > 3 cm compared to unaffected leg
- Pitting oedema

Low probability if score 0
Intermediate probability = 1-2
High probability 3 or greater (D-dimer need not be done as ultrasound indicated)

Investigations: D-dimer (currently not available at Ngwelezane)

Note: D-dimers are unreliable in malignancy, infective states, pregnancy and age > 70 yrs.

Management:
- If scoring probability is low and D-Dimer < 275 – Discharge
- Otherwise give 1st dose low molecular weight Heparin & refer to medics.

(ii) Pulmonary Embolus

Have a high index of suspicion for PE in anybody with unexplained Tachycardia & dyspnoea

Predisposing factors:
Recent surgery or trauma, obesity, immobility, malignant disease, oral contraceptives, pregnancy, HRT, post-natal, nephrotic syndrome, DVT (minor risk factors include COC, Obesity, HRT, COPD

Clinical features:
The classic triad of Dyspnoea (73%), Pleuritic chest pain (66%) and haemoptysis (13%) only occurs in a third of patients. They may also exhibit a cough (30%), pleural rub, hypotension, tachycardia (20%), tachypnoea (70%)

Clinical scoring – WELLS Criteria:
- Clinical symptoms of a DVT 3
- No likely alternative diagnosis 3
- Heart rate > 100 1.5
- Immobilisation/surgery < 4/52 1.5
- Previous DVT/ PE 1.5
- Haemoptysis 1
- Malignancy 1

Low probability < 4 (D-dimer)
High probability 4 or greater (d-dimer not needed, patient needs V/Q scan)
(-ve D-dimer excludes PE. +ve D-dimer – admit and request Q scan/Angio CT)
Management:
• ABC’s of Resuscitation, High flow oxygen
• Low molecular weight heparin should be started as soon as the diagnosis is considered.
• IV access & Bloods (FBC, U&E, Clotting), D-dimer (put clinical score - request card)
• ECG  May be normal or tachycardia, ectopics, RBBB, RAD, S1 Q3 T3, p pulmonale
• CXR  May be normal, may show peripheral wedge opacification, effusions, oligemia)
• ABG’s  State FiO2 (may be normal or show low PO2/PCO2)
• Medical referral (perfusion scan, sc. Dalteparin)
• Unfractionated heparin should be initiated as a 5000iu bolus dose, then given by continuous infusion at the rate of 18iu/kg per hour. At Ngwelezane we have enoxaparin (Clexane) which is not licensed for use in pulmonary embolus but has been used at the dose of 1mg/kg 12 hourly for treatment.
• Doppler USS legs - ? DVT
• CT angiogram

Massive PE (*Alteplase not available currently):

<table>
<thead>
<tr>
<th>Assess clinical state</th>
<th>Cardiac arrest</th>
<th>Deteriorating</th>
<th>Condition seems stable</th>
</tr>
</thead>
<tbody>
<tr>
<td>(1) Resuscitation (CPR)</td>
<td>(2) 50 mg alteplase iv</td>
<td>(1) Contact consultant</td>
<td>(1) 80 units/kg heparin iv in event of deterioration</td>
</tr>
<tr>
<td>(3) Reassess at 30 min</td>
<td>(2) 50 mg alteplase iv</td>
<td>(2) Urgent echo or CTPA</td>
<td></td>
</tr>
<tr>
<td>Comments</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
1. Massive PE is highly likely if:
   • collapse/hypotension, and
   • unexplained hypoxia, and
   • engorged neck veins, and
   • right ventricular gallop (often)
2. In stable patients where massive PE has been confirmed, iv dose of alteplase is 100 mg in 90 min (i.e. accelerated myocardial infarction regimen).
3. Thrombolysis is followed by unfractionated heparin after 3 hours, preferably weight adjusted.
4. A few units have facilities for clot fragmentation via pulmonary artery catheter. Elsewhere, contraindications to thrombolysis should be ignored in life threatening PE.

References:
1. RLI medicine Guidelines 2005
2. BTS guidelines for management of PE. Thorax; 2003: 470-483
3. RESPIRATORY

ACUTE ASTHMA

Clinical features and assessment

- ABC assessment immediately – respiratory rate, pulse, blood pressure, ability to speak in full sentences, cyanosis, level of consciousness, level of fatigue.
- PEF rate – if best value is not known use a chart of predicted value based on patient’s age, sex and height.
- Oxygen saturation – aim for >92% with oxygen
- ABG – necessary if SaO2<92%
- Chest x-ray – not essential for moderate asthma attacks, look for signs of pneumonia, pneumothorax, pneumomedistinum.

(if possible try to record precipitating factors e.g. Infection, smoking, allergy, acid reflux. Also enquire about social circumstances, medication compliance, psychiatric illness, alcohol, drugs (asprin) social support.)

Classify severity of attack

1. Moderate exacerbation – increasing symptoms, PEF 50-75% of best predicted
2. Acute severe – PEF 33-50% normal, resp rate >25/min, pulse rate >110, inability to speak in full sentences
3. Life threatening – PEF<33% of best predicted, SaO2 <92%, PaO2 <8kPa, normal PaCO2, silent chest, cyanosis, poor respiratory effort, bradycardia, hypotension, exhaustion, confusion, coma
4. Near fatal – raised PaCO2

Management

1. Oxygen – via a face mask at the highest flow rate possible
2. Nebulised salbutamol 5mg (if not available use ipratropium 0.5mg / fenoterol 1.25mg combination) given via an oxygen driven nebuliser (out of hospital salbutamol may be given via spacer until a nebuliser is available – also in moderate exacerbations patients may be treated with salbutamol given via a spacer.)
3. In acute severe and life threatening asthma – give continuous nebulisation of salbutamol 5mg via an oxygen driven nebuliser.
4. Ipratropium bromide 0.5mg 4-6 hourly should be added for patients with acute severe and life threatening asthma or patients with moderate exacerbations who do not respond to salbutamol alone.
5. Systemic steroids should be given in all cases and continued for at least 5 days or until recovery e.g. Prednisolone 40mg daily. (intravenous steroids are only necessary if the patient is vomiting or unable to steroids by mouth for some other reason).
6. In patients who do not respond to repeated nebulisation give intravenous magnesium 2g i.v. over 20 minutes as a single dose.
7. Intravenous salbutamol can be considered in patients failing to respond to nebulisation – add 5mg salbutamol to 500mls of 5% dextrose run at 0.5 to 2 mls per minute via an IVAC pump or syringe driver.
8. Antibiotics should only be given if there is evidence of infection (history, examination – fever, sputum, CXR changes)
9. Intravenous theophylline has significant side effects and has not been shown to improve outcome in acute severe asthma.
Criteria for admission – severe attack or moderate exacerbation that does not respond to initial therapy. 
(patients maybe discharged from the emergency unit if their PEF is >75% of best predicted one hour after initial treatment if they are otherwise well) Do not discharge patients who have been previously admitted to ICU, who are on oral corticosteroids or who have presented with an asthma attack and been sent home in the previous 24 hours.

Ask for ICU review in any patient with:

Acute severe or life threatening asthma that does not respond to initial therapy i.e. PEF does not increase, worsening hypoxia, hypercapnia, reduced pH, exhaustion, confusion, drowsiness or coma.
Chronic Obstructive Pulmonary Disease (COPD).

Chronic obstructive lung disease (COPD) is defined as chronic airflow limitation that is not fully reversible (<15%). The term COPD includes the clinical entities of emphysema, chronic bronchitis with airflow limitation and small airways disease. Many factors can contribute to COPD such as occupational dust exposure, environmental exposures childhood respiratory infections and genetic predisposition but all the factors are of relatively minor importance compared to the over whelming contribution of SMOKING. COPD is an increasingly common disease and is likely to consume large amounts of health care resources in the coming years. Effective management can probably reduce this burden to some extent.

Management of acute exacerbations – usually manifesting as increased dyspnea – look for a cause – infection, pneumothorax, bronchospasm,

1. **History** – is the patient known to have COPD? Previous exacerbations, usual exercise capacity, smoking history, occupational history, ask if they have increased cough, increased sputum, fever, increased dyspnea
2. **Examination.** Document respiratory rate, also can patient speak in full sentences, phrases, single words, level of consciousness (reduced if has CO2 narcosis or exhausted), fever, signs of pneumonia, pneumothorax.
3. **Investigations** – CXR (infection / pneumothorax, heart failure), ECG (MI, arrythmia, signs or right heart strain), FBC (infection, polycythaemia), ABG (important to document degree of hypoxaemia, hypercapnia and pH), blood culture (if febrile), Sputum (in our setting never forget AFB), PEFR (maybe to ill but useful as a baseline).

**Treatment**

4. Give oxygen 28% - aim for sats >90% or PaO2> 8.0kPa (the dangers of loss of hypoxic drive are not as great as the danger of hypoxia)
5. Give nebulised fenoterol1.25mg / ipratropium bromide 0.5mg – 4-6 hourly (or salbutamol 5mg as often as required with ipratropium bromide 0.5mg 4 to 6 hourly)
6. Give prednisolone 40mg daily for 14 days then **stop!!** (give iv hydrocortisone 200mg if to ill to swallow)
7. If there is evidence of infection give antibiotics – oral amoxicillin 500mg 8 hrly p.o. or if signs of severe pneumonia – cefuroxime 1.5g 8hrly i.v.
8. Ask for physiotherapy to aid sputum expectoration
9. After the above treatments reassess patient clinically and repeat ABG - If no improvement or patient tiring, respiratory rate >30, pH <7.35, pCO2 rising – call ICU and ask for advise re invasive or non invasive ventilation (CPAP/BIPAP). The final decision on whether or not to ventilate the patient should be made in consultation with ICU staff, admitting staff, medical consultant on call and if possible patients family members.

(Differential diagnosis – need to exclude – pneumothorax, pulmonary embolus, myocardial infarction, heart failure, upper airways obstruction)

**Therapies of little or unproven benefit in stable COPD**
5. Supplemental oxygen – there is little evidence for benefit from this compared to LTOT
6. Antibiotic prophylaxis – no evidence for benefit and predispose to resistant infections
7. Theophyllines – shown to be ineffective in both stable and acute COPD states.
8. Long term oral corticosteroids – no evidence of benefit but lots of evidence of side effects.

<table>
<thead>
<tr>
<th>Gold stage</th>
<th>Severity</th>
<th>Symptoms</th>
<th>Spirometry</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>At risk</td>
<td>Chronic cough and sputum</td>
<td>Normal</td>
</tr>
<tr>
<td>I</td>
<td>Mild</td>
<td>+/- chronic cough / sputum</td>
<td>FEV1 &gt;80% predicted</td>
</tr>
<tr>
<td>II</td>
<td>Moderate</td>
<td>+/- chronic cough / sputum</td>
<td>FEV1 &gt;50% but &lt;80% pred</td>
</tr>
<tr>
<td>III</td>
<td>Severe</td>
<td>+/- chronic cough / sputum</td>
<td>FEV1 &gt;30% but &lt;50% pred</td>
</tr>
<tr>
<td>IV</td>
<td>Very severe</td>
<td>+/- chronic cough / sputum</td>
<td>FEV1 &lt;30% predicted or FEV1&lt;50% with respiratory or heart failure</td>
</tr>
</tbody>
</table>

(Stages I to IV also should have FEV1/FVC <0.7)
**PNEUMONIA**

The most common organisms causing pneumonia are *Streptococci pneumoniae* (much more common in HIV infected people), *Haemophilus influenza*, *Chlamydia pneumoniae* and *mycoplasma pneumoniae*. Also viruses may cause pneumonia. In patients with co-morbidities or in hospitalised patients consider *Klebsiella pneumoniae*, *Staphylococcus aureus*, coliforms and other hospital acquired organisms. The contribution of *Legionella pneumoniae* to pneumonia in South Africa remains unclear.

**Symptoms:** cough, fever, shortness of breath, chest pain, sputum, haemoptysis  
**Signs:** Tachypnoea, raised temperature, confusion, cyanosis, tachycardia, hypotension, signs of consolidation (reduced chest expansion, dull percussion note, increased vocal resonance, crackles)  
**Investigations:** chest x-ray, FBC, renal function, blood culture, sputum for MC&S and AFB, VCT, blood gas.

**Management:**

1. History ask about symptoms as listed above, also duration of illness, TB contacts, HIV status and CD4 count, ARV’s, co-morbidity such as diabetes, COPD, asthma, bronchiectasis, recent hospital admission. Ask about diarrhea, recent travel, age, smoking and occupational history.  
2. Examination – focus on level of consciousness, respiratory rate, heart rate, cyanosis, blood pressure.  
3. Take blood for FBC, U&E, blood culture. Take a sputum sample at admission ask for MC&S and AFB.  
4. Do oxygen saturation if it is <92% do a blood gas.  
5. Do a chest x-ray. Look for consolidation / lobar pneumonia, multilobar involvement, signs of TB 
6. At this point review the diagnosis. Does the story and initial investigations fit with bacterial pneumonia? Remember malaria – always do malaria rapid test if there is the slightest suspicion of malaria. Remember other diseases can present with breathlessness 
   a. Are there signs of heart failure?  
   b. Could the diagnosis be a pulmonary embolus?  
   c. Is the patient on ARV’s could they be breathless due to lactic acidosis?  
   d. Could this be TB? Remember TB can present acutely also a patient can have TB and pneumonia at the same time.  
   e. Could this be PCP?  
   f. Could the patient have influenza?  
7. If the diagnosis is felt to be pneumonia decide if the patient can go home i.e. has non severe pneumonia, use the BTS CURB-65 criteria. If the patient has more than one of the below factors they should be admitted – CURB-65 score  
   i. Confusion  
   ii. Urea>7.0 mmol/l  
   iii. Respiratory rate >30 per minute  
   iv. Blood pressure SBP<90mm/hg  
   v. Age >65  
   vi. Any co morbidity such as HIV, diabetes, recent hospital admission, chronic respiratory disease, other immunosupression  
   a. If the patient is to be discharged give amoxycillin 500mg 5 hrly for days, take sputum for AFB and ask the patient to return for the result. Tell the patient to return if they do not improve or get worse over the following 48 hrs.  
8. For patients who will be managed as inpatients give  
   a. Oxygen – 100% via a face mask, iv fluids, analgesia  
   b. Antibiotics – for community acquired pneumonia use cefuroxime 1.5g 8hrly for 5 days. **First dose to be given <4 hours after arrival.** For hospital acquired pneumonia ask advice from one of the medical consultants. (during an influenza epidemic consider adding flucloxacillin 1g hrly i.v.i. for days.)  
   c. In severely ill patients – request ICU to review (there are multiple criteria that reflect severity such as CURB-65 >=3, multilobar pneumonia, hypotension, tachycardia, tachypnoea, exhaustion, confusion, hypoxia, low or high white cell count, very low or very high temperature, low
serum sodium – but use common sense also if the patient is felt to be severely ill ask ICU to review with a view to respiratory support)

d. If the patient does not improve in 48hrs think could this be TB, PCP, influenza, atypical pneumonia? Ask advice from one of the medical consultants. Remember to get AFB’s and do VCT followed by a CD4 count if appropriate.

9. Arrange follow up for patients with a chest x-ray after 1 month – especially if there was a suspicion of an underlying lesion such as a cancer.
HAEMOPTYSIS

Massive haemoptysis defined as >500mls in the proceeding 24 hours is a medical emergency. The protocol below outlines the management of life threatening haemoptysis and the subsequent investigation of patients when stable or those that present with non massive haemoptysis.

- A-airway (protected), B-breathing (Oxygen), C-circulation (IV fluids).
- Urgent cross match. If haemoptysis is massive and continous call for surgical help as urgent rigid bronchoscopy may be required.
- Blood from the lungs is bright red and alkaline whereas with haematemesis blood is darker and acidic. Blood from the nasopharynx may be hard to distinguish from haemoptysis – if you think the blood is coming from the nasal passages manage as such and get ENT advice.
- Once the patient is stable:
  1. History – How long has haemoptysis been present, associated symptoms such as fever, night sweats, sputum, past lung infection, past or current TB infection, heart disease, lung cancer, HIV infection
  2. Examination – look for signs of respiratory disease, clubbing, hyperexpanded chest, signs of consolidation, signs of pulmonary oedema, pulmonary friction rub, cardiac examination for signs of valve disease, skin examination for Kaposi’s sarcoma and AV malformations. Look for signs of a DVT.
  3. Investigation – Chest x-ray – look for pneumonia, TB, mass lesion – lung cancer, cavitation – TB or old cavities that may have a fungal ball inside. FBC – look for low platelets, anaemia and raised white cell count. Clotting screen – if patient is taking anticoagulants or a bleeding diathesis is suspected. Aterial blood gas if oxygen saturation is below 93%. Renal function – if high urea may impair clotting. If present sputum should be sent for acid fast bacilli and microscopy and culture
  4. Further investigation should be based on initial findings – High resolution CT chest should be performed if a mass is seen, to confirm bronchiectasis and to evaluate possible interstitial lung disease. CT angiography can be used to look for pulmonary embolus. Bronchoscopy should be used to localise proximal sites of bleeding, biopsy accessible mass lesions and biopsy in suspected interstitial lung disease. Rigid bronchoscopy performed by a surgeon may be required in the case of massive haemoptysis.

Differential diagnosis –
Infection (TB, pneumonia, bronchitis, bronchiectasis, aspergilloma)
Infarction, (pulmonary embolus), pulmonary oedema, primary pulmonary hypertension, mitral stenosis, lung cancer, Kaposis sarcoma, vascular malformation, lung contusion, Wegners granulomatosis, Goodpastures syndrome, bleeding tendency, airway trauma, foreign body
METABOLIC

DIABETIC KETOACIDOSIS

DKA is a common complication of diabetes (75% of decompensation occurring in all age groups of diabetic patients), and patients frequently present to the ED. The care of patients with DKA requires frequent and intensive monitoring. The following points should be remembered when assessing and treating these patients.

1. Perform a thorough history and physical examination in search of a precipitating cause.

2. A patient may present with DKA with a near normal glucose. This is more common in patients who have taken insulin recently, have decreased food intake or impaired gluconeogenesis as can be seen in liver disease.

3. Consider other causes of anion gap metabolic acidosis (e.g. methanol, uraemia, paraldehyde, INH/iron toxicity, lactic acidosis, salicylates)

4. Initial therapy consists of intravenous fluid administration. It is prudent to wait for adequate volume replacement and serum potassium levels before starting insulin or potassium replacement therapy.

5. Frequent monitoring of glucose and electrolytes should guide further treatment.

6. Caution should be used in fluid administration in patients with cardiovascular and renal disease.

7. If abdominal pain does not resolve with initial treatment, consider evaluating for intra-abdominal pathology.

8. Treatment of rare complications such as cerebral edema requires further studies before the development of standards of care.

9. NIDDM in shock – consider Hyperosmolar Non-Ketotic (HONK) Acidosis and require aggressive fluid administration. Ketones are not detected, osmolality > 330mosmol/l

a) Supportive Treatment
A/B/C’s of Resuscitation Secure the airway. Give high flow oxygen.
IV access & Bloods (FBC, U&E, BM Stix & Serum BS, ABG’s (venous gas can be done), Blood cultures.
Consider insertion of a nasogastric tube and urinary catheter if the patient is obtunded.

b) Fluid resuscitation.
1. Infuse IV N/Saline at a rate commensurate with the state of hydration i.e. 1000 ml over the 60 min.
2. Then repeat. If patient is elderly, has associated cardiovascular compromise or intravenous access proves difficult then early insertion of a CVP line should be considered.
3. If the plasma Na > 155 mmol/l then use 0.45% Saline. Low Na is usually as a result of “psuedohyponatraemia” and may not need adjustment (“every 5 (glucose) above 5 add 1.5 (Na+)” to correct)
4. Change to 5% dextrose when the blood glucose is < 15 mmol/l

a) Insulin Therapy
A standard insulin regimen consists of regular insulin intravenous drip at 0.1
U/kg per hour. Insulin should not be initiated until the blood pressure is stabilized with fluid administration. (6 units/hour Human Actrapid or Humulin S via a syringe pump made up to a concentration of 50 units in 50 ml i.e. one unit per ml). If a syringe pump is not immediately available give 20 units IM (as long as BM Stix/blood sugar is >17).

b) Potassium Therapy

Potassium is usually not required until after 2-3 litres of rehydration

Insulin therapy should be delayed until the potassium level is at least 3.3 mEq/L. Hypokalemic patients should not receive insulin unless potassium has been administered (at a rate less than 20mmol/hour), as the insulin-mediated movement of potassium into the intracellular compartment will worsen the hypokalemia. Body potassium stores can be extremely depleted. The initial serum potassium may be artificially elevated.

e) Treatment of the Underlying Cause. Perform an infection screen (CXR, Blood cultures, MSU).

Useful formulas:
Anion Gap = (Na + K) – (Cl + HCO3)
Serum Osmolality = 2(Na +K) + Glucose + Urea

References:
1. RLI Medicine Guidelines

HYPOGLYCAEMIA

Hypoglycaemia is often related to poor diabetic control, but may be related to a number of other pathologies (e.g. infection, seizures, adrenal failure etc.)

Signs and symptoms (two main groups)

a) Those due to the effects of counter-regulatory hormones (e.g. glucagon, adrenaline, cortisol, growth hormone) include sweating, tachycardia, hunger and other adrenergic symptoms. These are common when blood sugar falls rapidly.

b) This second group include headache, confusion, coma, seizures and focal neurological findings. These tend to be related to a gradual decline in blood sugar.

Treatment options

a) Sugary drinks and carbohydrate foods, glucagon (Glucagen™) 1 mg IM, dextrose bolus (25-50%) IV or infusion (10%) 50% DEXTROSE MUST NOT BE USED IN CHILDREN. A 25% SOLUTION CAN BE MADE UP BY ADDING 25 MLS OF 50% DEXTROSE TO 25 MLS OF NORMAL SALINE.
**LACTIC ACIDOSIS**

Management of Lactic Acidosis Secondary to Antiretroviral Therapy  
(Based on the guidelines of the Southern African HIV Clinicians Society)

Symptomatic hyperlactataemia or lactic acidosis suspected

- **Risk factors**
  - On D4T or DDI
  - Overweight
  - On ARV’s >2/12
  - Female
  - Peripheral neuropathy

- **Suspicious symptoms and signs**
  - Unintentional weight loss
  - Anorexia
  - Abdominal pain
  - Nausea and vomiting
  - Dyspnoea, tachypnoea with no respiratory cause
  - Unexplained tachycardia

- **Exclude other causes of acidosis**
  - Sepsis, severe anaemia, renal failure, liver failure, pancreatitis, cardiac failure, severe dehydration, thiamine deficiency, diabetic ketoacidosis, other drugs e.g. metformin

**Check lactate**

- **Lactate <2.5**
  - Hyperlactataemia excluded look for other causes of illness

- **Mild**
  - Lactate 2.5-5
  - Minimal symptoms and bicarb >20

  - Switch to D4T to AZT.
  - Repeat lactate in 3 days then weekly until normal

  - Stop ARV’s if
    1. lactate can’t be monitored
    2. NRTI other than D4T responsible
    3. Symptoms severe
    4. Symptoms worsen or lactate continues to rise after switch

- **Moderately severe**
  - Lactate 5-10
  - and/or bicarb 15-20

  - Stop ARV’s and admit patient
  - Give IV fluids to maintain hydration
  - Other supportive therapy as indicated
  - Investigate for sepsis, opportunistic infections and pancreatitis
  - Take blood cultures, check U&E, LFT, amylase, bicarb. Do blood gases if possible.
  - In acutely ill patients start iv. ceftriaxone

  - When lactate has normalised restart ARV’s according to national guidelines.

  - Never use D4T or DDI again.

- **Severe**
  - Lactate >10
  - and/or bicarb <15

  - Stop ARV’s and admit patient
  - Give IV fluids to maintain hydration
  - Other supportive therapy as indicated
  - Investigate for sepsis, opportunistic infections and pancreatitis
  - Take blood cultures, check U&E, LFT, amylase, bicarb. Do blood gases if possible.
  - In acutely ill patients start iv. ceftriaxone

  - When lactate has normalised restart ARV’s according to national guidelines.

  - Never use D4T or DDI again.
INFECTIONS

SEPTIC SHOCK – GOAL DIRECTED THERAPY

Septic shock criteria
1. SBP ≤ 90 mmHg
2. T ≥ 38°C or ≤ 36°C
3. HR > 90bpm
4. RR > 20resp/m
5. WCC > 12 000/mm³ or < 4 000/mm³

EARLY GOAL DIRECTED THERAPY

- CVP = central venous pressure; MAP = mean arterial pressure; ScvO2 = central venous oxygen saturation
- Inotropes = dobutamine
- Vasopressors = adrenaline/nor-adrenaline/phenylephrine/dopamine
References:

MENINGITIS

Clinical Features:
Headache, fever, neck stiffness, photophobia, Kernigs & Brudzinski’s sign
Systemic symptoms, fever, malaise, nausea, vomiting, decreasing GCS

The consequences of bacterial meningitis especially Meningococcal meningitis and/or Meningococcal Septicaemia is so severe that a very low threshold for diagnosis must be maintained.
A small number of individuals present with non-classical symptoms and may atypically have a pro-dromal flu-like illness.

IF YOU SERIOUSLY SUSPECT IT THEN TREAT IT.
RX BENZYLПENICILLIN 1.2g IV AND 2g CEFOTAXIME STAT

If you suspect Meningitis and the patient is drowsy the treatment is antibiotics and not Lumbar puncture! Exclude signs of raised intracranial pressure then do an LP. Admit to the R.U. major area. Immunocompromised patients may have other causes for their signs and symptoms such as cryptococcal meningitis, toxoplasmosis, TB meningitis, encephalitis etc.

Only very close contacts i.e. immediate family need prophylaxis.

PROPHYLAXIS MENINGOCOCCAL MENINGITIS:
RIFAMPICIN Adult 600 mg bd. for 4 doses, Children 1-12 10 mg/Kg bd. for 4 doses, < 1 yr. 5 mg/Kg bd. x 4
CIPROFLOXACIN 500 mg single dose is an alternative for adults.
BONE AND JOINT INFECTION

Septic Arthritis

*Aetiology:*
- Direct penetrating infection
- Haematogenous spread
- Extension from osteomyelitis

*Clinical features:*

**Children**
Beware children presenting with a history of trauma. Parents often assign the initiation of the unexplained symptoms to an episode of minor trauma.
- +/- Prodromal skin or URTI
- non-specific limp
- red, hot & swollen joint which is painful to move *(HIGHLY VARIABLE)*
- Systemic upset, lethargy, malaise, fever, vomiting, confusion etc.

**Adults**
- Hot, tender, swollen & painful joint
- +/- Pyrexia

*Investigations:*  
- Temperature
- X-ray (may be normal initially but joint effusion may be evident)
- Needle aspiration & urgent MC&S
- +/- FBC, ESR, Blood Cultures

*Differential diagnosis:*
- Osteomyelitis
- Acute traumatic effusion / haemarthrosis
- Transient Synovitis (‘Irritable joint’)
- Gout or pseudogout

*Management:*
- Analgesia
- Splintage
- Await microscopy results for the optimal antibiotic
- Orthopaedic referral for Joint irrigation & antibiotics
MALARIA

It is important to consider the diagnosis in any febrile patient, also in patients with jaundice, headache, diarrhoea and confusion. As malaria is seasonal in South Africa adult patients do not have partial immunity and tend to get very sick relatively quickly. This is especially to case with pregnant women. This guideline assumes the patient has *Plasmodium falciparum* for other malaria species contact Dr Martin Dedicoat for treatment guidelines.

**Symptoms**
Malaria usually presents with fever, headache, malaise and myalgia. The patient may also complain of a cough, diarrhoea.

**Signs**
There may be none or fever, anaemia, jaundice, splenomegaly, confusion, convulsion, coma.

**Management**

1. Suspicious – malaria test ASAP and follow-up result personally. If positive institute treatment stat.
2. Ask a travel history on all patients but patients still present with malaria having never travelled outside Uthungulu!!
3. Malaria smear is negative but strong suspicion - repeat. (patients with malaria usually have anaemia and thrombocytopenia)

The remainder of the protocol assumes you have a patient with a positive malaria smear.

1. Take a history and examine the patient, check FBC, U&E, glucose, oxygen saturation (if O2 saturation <94% or respiratory rate >20 do a blood gas to look for hypoxia and acidosis.) Chest xray if breathless, blood culture (gram –ve sepsis common in malaria), do fundoscopy for retinal haemorrhages.
2. If the patient has a reduced level of consciousness consider a lumbar puncture, and/or CT.
3. Complicated/severe malaria should be admitted and treated with quinine – if the patient is severely ill use intravenous quinine - quinine IV 12.g stat (in complicated malaria) followed by 600mg q8h (IV or PO)
4. Assuming the patient has uncomplicated malaria and good social support treat with oral co-artem (see dosage sheet) and allow home
5. Intravenous quinine is dangerous and should be given via an IVAC. The patient should be monitored carefully for hypoglycaemia – swap to oral quinine as soon as the patient improves
6. Patients with severe malaria often need urinary catheter, CVP line, O2 sats monitoring and should therefore be managed in a high dependency area if possible.
7. Severely ill patients should also receive ceftriaxone 2g daily i.v.i. to cover gram negative sepsis.
8. Treatment should be given for a full course – see sheet on drugs. *Indicators of severe malaria:*

   - *cerebral malaria* (confusion, impaired consciousness, coma)
   - *Severe anaemia* (Hb<5g/dl)
   - *Renal failure, Hyperparasitaemia, Pulmonary oedema, Hypoglycaemia, Hypotension, Bleeding / DIC, Convulsions, Acidosis, Haemoglobinuria, Jaundice,*
   - *Malaria in pregnancy should be considered as complicated.*
OTHER CONDITIONS

UPPER GASTROINTESTINAL BLEEDING

Causes of upper GI bleeding (bleeding proximal to the ligament of Treitz.) – Peptic ulcer (gastric or duodenal), Mallory Weiss tear, varices, mucosal erosions secondary to NSAIDS, alcohol related gastritis, Kaposis sarcoma, bleeding diathesis, neoplasms of the stomach or oesophagus. APPENDIX E – Upper GIT Bleed admission protocol (Rockall Score) and forms.

Rockall Score:
If ≤ 2 admit to ward; if >2 → increased risk - Admit to EMU, if > 8 → very high risk - Monitor closely (for all 5)

Management.
1. Assess the patient – ABC – resuscitate as necessary- put in two large bore cannulas, restore circulating volume with crystalloid, take urgent FBC, clotting profile, CXM – 4 to 6 units initially for a patient with active bleeding who is unstable, U&E, LFT. Transfuse if Hb low and still bleeding. A central line may be needed to guide fluid replacement and a urinary catheter should be used to monitor urine output in a shocked patient. Call for urgent help from the surgical team for any patient who is haemodynamically unstable or thought to be actively bleeding – these patients must not leave RU until stable.
2. Caution – the initial Hb and haematocrit may be higher than expected due to dehydration and haemoconcentration. Remember pulse and blood pressure may not change until a significant blood loss has occurred. Give fluids and blood carefully in the elderly as their cardiovascular system may not be able to cope with huge volumes.
3. When the patient is stable take a history – establish if the patient really has an upper GI bleed, ask about blood in vomit, coffee grounds, blood in stool either malaena or haematochezia (which signifies a severe upper GI bleed but also occurs in lower GI bleeds). Ask about alcohol, NSAIDS, anticoagulants, history of dyspepsia, weight loss. Assess co-morbidities as these impact on outcome – cardiac failure, advanced age, liver disease, respiratory disease – all patients with co-morbidities will need careful monitoring.
4. Examine – look for signs of chronic liver disease (Jaundice, ascitis, oedema)
5. Make sure you see the clotting profile and correct if necessary.
6. Decide if the bleed may be due to varices or other cause.
7. Patients who are haemodynamically unstable need urgent endoscopy when adequately resuscitated. Also patients with co-morbidities including the elderly should have an urgent endoscope as they may become unstable. It is your responsibility the resuscitate the patient and deliver them to the endoscopist in as stable a condition as possible do not call the surgical team then leave the patient ensure the fluids and blood you have ordered are given even if you have the give them yourself.
8. Patients who are stable may have an elective endoscopy usually within 24 hours of admission.
9. Variceal bleed – may need Sengstaken – Blakemore tube. Varicies will be injected at endoscopy, give propranolol to reduce portal pressure, ask advice on the use of other agents. Always arrange follow up arrange for investigation of the cause of liver disease if not clear.
10. Peptic ulcer – will be injected at endoscopy if still bleeding. HP eradication therapy should be given for peptic ulcer disease – give omeprazole 20mg daily, amoxicillin 1g 12 hourly and metronidazole 400mg 12 hourly all for one week. Patients should be called back to get their biopsy results. Other treatments will depend on the cause of bleeding. Advise on the use of NSAIDS, if unavoidable give with mucosal protective agents.
ACUTE RENAL FAILURE

1. CLINICAL
   - History/examination
   - Vitals
   - Urine dipstix

2. INVESTIGATIONS
   - Bloods – FBC, U&E/Ca/Mg/P, LFT, INR, ESR, Cholesterol, HIV, Hepatitis
   - Urine MCS
   - ECG, CXR, USS kidneys

3. TREATMENT
   - Hydrate IV fluids (CVP 10-15mmHg)
   - Antihypertensives (If CVP low and K+ high – Avoid lasix + ACEI)
   - Sliding Scale insulin if required
   - Correct electrolytes
   - Stop offending/nephrotoxic drugs
   - Antibiotics if infection

4. MONITORING
   - BP/P/Sats
   - CVP – caution overloading patient
   - Strict input vs output recording

*Discuss patient with Dr Thusi (daytime) and on-call physician at night*
3. TOXICOLOGY and POISONING

1. Introduction

An episode of acute poisoning is a common presentation to UK Emergency departments (ED). The physiological effects of the poison may have a rapid onset, and the clinical course can quickly deteriorate and improve. The majority of patients will have taken a non life threatening dose and will only require supportive care and a psychosocial assessment, the in-hospital mortality being less than 0.5%[1]. However there is the potential for significant morbidity and mortality to occur. It is important to perform a full risk assessment of all poisoned patients. This will enable you to predict the likely clinical course and to identify important interventions that are time critical (e.g. antidotes). A useful review detailing how to manage common toxicological problems presenting to the ED was published recently in the Postgraduate Medical Journal[2].

2. Clinical approach to the poisoned patient

Initial assessment/resuscitation

Airway, Breathing, Circulation and Disability

(airway protection, adequate ventilation, establishment of IV access, and circulatory support)

Risk assessment

Risk is determined by both the lethality of the hazard (poison exposed to) and the dose. As the dose increases there is a greater the likelihood of target organs being adversely affected.

Take into account the following variables

- Agent(s)
- Dose(s)
- Time since ingestion
- Current clinical features
- Patient (any factors that would increase the hazard of the poison)

NB - History

Despite prejudices from some clinicians evidence demonstrates that the history obtained from a poisoned patient is usually reliable. In the confused or unconscious patient you will need to obtain collateral history from family, paramedic staff. Count missing tablets from medication packets. Obtain past medical history as they may have taken similar overdoses previously. Physical examination may be useful in helping you identify one of the “toxodromes”, and screening tests most importantly a
12 lead ECG and serum paracetamol level may provide further information.

**Clinical treatment**
- Supportive care (oxygen, fluids, warming, Pabrinex® in alcohol abuse, benzodiazepines in agitation etc.)
- Decontamination (e.g. charcoal, washing off skin contaminants)
- Appropriate investigations
- Enhanced Elimination
- Antidotes
- Likely place of disposition/referral, e.g. discharge after psychosocial evaluation, general medical ward or the ICU.

**Decontamination**
Activated charcoal (AC) is reduces drug absorption by binding the drug (adsorption) in the gastrointestinal tract. The recommended dose is 50g (1g/Kg in children). It should normally only be administered **within one hour** of a potentially lethal overdose, unless a drug which decreases gastric emptying has been taken (e.g. tricyclic antidepressants). The acronym CHARCOAL can aid in remembering substances not bound effectively by charcoal.

- C = corrosives
- H = heavy metals
- A = alcohols, glycols
- R = cyanide, chlorides
- O = organophosphates
- A = Acid/alkali/aliphatics (petroleum)
- L = lithium

Complications of AC include vomiting in around 5% of cases and in unconscious patients a careful risk/benefit analysis should be done prior to administration via a large bore NG tube.

**There is no role for gastric lavage in the routine care in the management of the poisoned patient.** Ipecac traditionally used to induce vomiting in children is not used in current day practice.
Whole bowel irrigation using polyethylene glycol (2 l/hr in adults 500 ml/hr in preschool children) is used on occasion to reduce the amount of drug reduced from the GI tract. The main indication for its use is for drugs which are not absorbed by AC which include lithium and iron overdose, enteric and sustained release calcium channel blockers.

**Enhanced elimination**
Multiple dose activated charcoal is one technique to the improve elimination of drugs that undergo enterohepatic or enteroenteric circulation. 50g (1g/Kg in children) is administered 4 hourly, with a cathartic such as sorbitol with the first dose given to reduce the risk of obstruction. There are reported case reports of tablet and charcoal concretions which have caused bowel perforations. Urinary alkalisation has been used to increase elimination in severe salicylate poisoning without indications for haemodialysis. Sodium bicarbonate solution is administered with potassium chloride supplementation added to prevent hypokalaemia. Haemodialysis is indicated in only a small number of life threatening poisonings, including salicylate, lithium, and theophylline poisonings.

**Appropriate investigations**

- **Vital signs**: Pulse, BP, temperature, SaO₂, BM and an ECG.
- **Baseline blood tests**: FBC, U&E's, ALT, baseline PT, and venous blood gas measurement (aspirin overdose).
- **Specific tests**: Paracetamol and salicylate level in deliberate self harm. For specific overdoses it is worth measuring drug levels, examples include paracetamol, salicylates, iron, and theophyllines. There are anecdotal reports of patients returning with liver failure 48 hours following the first presentation having initially denied...
ingesting paracetamol.

For medico-legal reasons it may sometimes be appropriate to send a toxicological screening sample. We do have qualitative urine testing strips in the department which test for amphetamines/cocaine/MDMA/opiates/TCA. These are only to be used when one does not know what the patient has taken and they have unstable vital signs or need specific medical treatment.

Antidotes
Antidotes are only available for a small number of drugs. See specific agents below.

3. Common toxidromes

Some patients ingest unknown substances or poisons. A syndrome of clinical signs and symptoms (toxidromes) can give the clinician a clue to the agent taken. The table below describes some of the common toxidromes that may present to Emergency departments.
<table>
<thead>
<tr>
<th>TOXIDROME</th>
<th>FEATURES</th>
<th>DRUGS/TOXINS</th>
<th>DRUG TREATMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Anticholinergics</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Hot as a hare, dry as a bone, red as a beet, mad as a hatter</strong></td>
<td>Mydriasis, Blurred vision, Fever, Dry skin, Flushing, Ileus, Urinary retention, Tachycardia, Hypertension, Psychosis, Coma, Seizures, Myoclonus</td>
<td>Antihistamines, Atropine, Baclofen, Benztropine, Tricyclic antidepressants, Phenothiazines, Propantheline, Scopolamine</td>
<td>Physostigmine (for life-threatening events, do not use in tricyclic antidepressant overdose because of potential worsening of conduction disturbances)</td>
</tr>
<tr>
<td><strong>Cholinergics</strong></td>
<td>Salivation, Lacrimation, Urination, Diarrhea, GI and muscle cramps, Emesis, Wheezing, Diaphoresis, Bronchorrhea, Bradycardia, Miosis</td>
<td>Carbamate, Organophosphates, Physostigmine, Pilocarpine</td>
<td>Atropine – repeated doses or an infusion may be required, Pralidoxime for organophosphates</td>
</tr>
<tr>
<td><strong>&quot;SLUDGE&quot;</strong></td>
<td></td>
<td></td>
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</tr>
<tr>
<td><strong>Adrenergic stimulants</strong></td>
<td>Hypertension, Tachycardia, Mydriasis, Diaphoresis, Dry mucus membranes</td>
<td>Amphetamines, Cocaine, Ephedrine, Phencyclidine, Pseudoephedrine</td>
<td>Benzodiazepines, Fluids for dehydration and rhabdomyolysis</td>
</tr>
<tr>
<td><strong>Sedative or hypnotic</strong></td>
<td>Stupor and coma, Confusion, Slurred speech, Apnea</td>
<td>Anticonvulsants, Antipsychotics, Barbiturates, Benzodiazepine, Ethanol, Meprobamate, Opiates</td>
<td>Naloxone for opiates, Flumazenil for benzodiazepine, Urinary alkalinization for phenobarbital, Pabrinex for alcohol, Procyclidine/Biperiden for tardive dyskinesia</td>
</tr>
<tr>
<td><strong>Antipsychotics</strong></td>
<td>Rigiditi/tremor, Opisthotonos, Trismus, Hyperreflexia, Choreaethesiosis</td>
<td>Haloperidol, Phenytoinines, Risperidone, Olanzapine</td>
<td>Diphenhydramine, Benztprine, Procyclidine, Biperiden</td>
</tr>
<tr>
<td><strong>Hallucinogens</strong></td>
<td>Hallucinations, Psychosis, Panic, Fever, Mydriasis, Hyperthermia, Synaesthesia</td>
<td>Amphetamines, Cannabinoids, Cocaine, Lysergic acid diethylamide, Physostigmine (may present with miosis)</td>
<td>Benzodiazepines for cocaine and amphetamine agitation or seizures</td>
</tr>
<tr>
<td><strong>Narcotics</strong></td>
<td>Altered mental status, Slow shallow breaths, Miosis, Bradycardia, Hypotension, Hyperthermia, Decreased bowel sounds</td>
<td>Dextromethorphan, Opiates, Pentazocine, Propoxyphene</td>
<td>Naloxone</td>
</tr>
</tbody>
</table>
4. Substance Abuse

**ECSTACY (3,4 methylenedioxyamphetamine MDMA)**

**Type of product**
Semi-synthetic hallucinogenic amphetamine.

**Dose**
30-300mg.

**Toxicity**
Serotonin, dopamine and catecholamine release.
Severe toxic features are usually idiosyncratic and unrelated to dose ingested or previous duration of exposure. Early deaths are usually due to cardiac arrhythmias and late ones post 24 hours from neuroleptic malignant syndrome (NMS).

**Drug kinetics**
Half-life 7.6 hours, the average duration of action is 4-48 hours, depending on the dose ingested (30-300 mg.)

**Clinical Features**
Onset within one hour; duration between 4-48 hours

**Mild**
- anxiety, agitation, hypertonicity, muscle pain, trismus, dilated pupils, blurred vision, sweating, dry mouth, hypertension, tachycardia, ataxia, nystagmus, tremor, chest pain, pyrexia

**Moderate**
- hypotension, hyperreflexia, tachycardia, hyperventilation

**Severe**
- delirium, coma, SVT & VT, hypertonicity & hyperreflexia, hyperpyrexia, rhabdomyolysis, metabolic acidosis, ARF, DIC, ARDS, multiorgan dysfunction syndrome (MODS).

**Management**
- ABCD and support if necessary
- Consider activated charcoal if ingestion < 1 hr
- Fluids
  - Diazepam to control anxiety/agitation/seizures
  - AVOID β-Blockers for tachycardia – unopposed alpha stimulation
- IV GTN if hypertension persistent
- Hyperpyrexia
  - active cooling with fluids at 4 degrees centigrade, ice packs in the axilla and groin (this would be uncomfortable and the patient will require sedation. If rectal temp. > 39 C (? Malignant hyperthermia). Confirm with renal function and CPK. Rx dantrolene 1mg/Kg IV over 10 min. Repeat if no response every 15 minutes up to a max. of 10mg/Kg in 24 hrs.
  - Consider intubation & ventilation in severe cases

**Monitoring**
- Monitor renal function, hepatic function, clotting, ABG’s & CPK
- 12 lead ECG
- ABG’s - correct metabolic acidosis unresponsive to fluids with bicarbonate as a matter of urgency

**LYSERGIC ACID DIETHYLAMIDE (LSD)**

**Type of product**
(‘tabs’) – hallucinogen

**Toxicity**
Low acute toxicity

**Clinical Features**
- Confusion, agitation, visual hallucinations, dilated pupils, mild hypertension, mild pyrexia
- Patient may taste colours & smell sounds

In overdose
- coma, respiratory arrest, metabolic acidosis, platelet dysfunction with bleeding tendency

Patients usually recover within 48 hrs but psychotic episodes may last up to 4 days.

‘Flashback’ episodes may occur many years later when the patient will recall a ‘bad’ trip

**Management**
- Reassurance
- Sedation initially with diazepam
- If psychotic then options include buccal olanzapine 10mg or parenteral haloperidol
- General supportive measures

**OPIATES**

**Type of product**
Exogenous endorphins

**Clinical Features**
Euphoria, drowsiness, pinpoint pupil, respiratory depression/arrest

**Management**
- Naloxone administered intravenously starting with a 200 microgram bolus (0.01mg/kg for children)
- Further 100-200 microgram boluses titrating against response

**REPEAT DOSES MAY BE REQUIRED**
- Consider Naloxone infusion if repeated boluses are required.
  - 2/3 rd. of the dose required for bolus reversal of unconsciousness per hour
  - i.e. 1.2mg bolus required then infuse 0.8 mg per hour e.g. 4 mg in 500 ml N/saline at 100 ml/hr

The aim of treatment should be to have the patient responsive to voice with RR > 10bpm. Full reversal may precipitate an acute opiate withdrawal syndrome. Apart from the problematic symptoms, it may lead to the patient becoming aggressive towards staff members and leave them to leaving the department prematurely. The half life of opiates is longer than the half life of naloxone. The patient would then be at risk of respiratory depression in the community. The only role for IM naloxone would be inability to obtain IV access. There is no indication to give both IV/IM doses to prolong half life of effect.

Beware Methadone overdose where the half-life of Methadone is prolonged and the metabolism is unpredictable leading to an uncertain and highly variable clinical course[3].

**AMPHETAMINE** (speed)

**Type of product**
-Sympathomimetic

**Toxicity**
- Fatal dose 10mg for a child, 100 mg for an adult

**Clinical features**
- Excitement, restlessness, rapid speech, dilated pupils, tachycardia, and hallucinations
- Hyperreflexia & hypertonia
  - Ectopics, SVT & VT
  - Hypokalaemia

**Management**
- Observe for 4 hours if asymptomatic
- Sedate with diazepam
- If cardiac output OK do not treat tachycardia
- Control convulsions with lorazepam initially, if uncontrolled may require an RSI.

**Monitor**
- Beware Hypokalaemia, consider potassium replacement
- Ventricular arrhythmias, correct reversible factors such as acidosis, metabolic abnormalities and hypoxia. Electrical cardioversion of ventricular arrhythmias in the poisoned patient may result in asystole. Pulseless VT/VF should be treated along standard ALS protocols.
**COCAINE**

**Type of product**
Drug of abuse, still used as a local anaesthetic

**Clinical features**
Sympathetic symptoms including euphoria, agitation, delirium, hypertension
Can cause cocaine induced chest pain (6% incidence of MI if chest pain)

**Management**

*Agitation/convulsions*
- Diazepam/lorazepam IV
*If chest pain*
- Oxygen
- Aspirin
- GTN
- ECG changes usually resolve within 12 hrs
- TOXBASE suggests that if chest pain is not relieved by standard therapy, and ECG changes of MI, firstly consider angiography. Thrombolysis should be given only if angiography is not available or if there is a thrombosis and medical treatment has failed and there are no contraindications. Be aware of hypertension following cocaine.

*Acidosis*
- Collapsed patients often have a marked acidosis, which needs to be treated aggressively with fluids and sodium bicarbonate 8.4% 50 ml titrated against blood gases
- *Hyperthermia* should be treated by aggressive cooling

**AVOID THE USE OF β blockers** (leads to unopposed α-receptor stimulation and worsening hypertension)

**Crack cocaine**
- The smoke is inhaled and along with the local anaesthetic effect may cause airway burns
5. DRUG OVERDOSES and specific therapy

**PARACETAMOL OVERDOSE:**
Damage caused by conversion of Paracetamol to a toxic metabolite. This is normally inactivated by conjugation with reduced glutathione but this is depleted in serious overdose resulting in liver damage/failure and to a lesser extent kidney failure. The idea of treatment is to provide sulfhydryl groups to react with using N-acetyl cysteine. Toddlers and children do better than older patients with equivalent ingestion's.

**Risk assessment**
What is a serious overdose?

**Adult:**
150 mg/kg or ~>12g (24 tablets) OR Plasma level > 200mg/L at 4 hours post ingestion

**High risk individuals**
These include patients with alcoholic dependence syndrome, anorexia nervosa, the malnourished, cystic fibrosis and HIV patients. Also included are those on hepatic enzyme inducing drugs e.g. phenytoin, barbiturates, carbamazepine, rifampicin, primidone. Those considered particularly at risk if ingested > 7.5 g (adult) or > 100 mg/Kg (child)

**Child:**
<125mg/kg Not significant - allow home.
>150mg/kg Significant ingestion. Do levels
>250mg/kg Likely hepatic damage
>12g total Potentially fatal

*Remember Compound Analgesic's Contain Paracetamol e.g. - Co-Codamol / Co-Proxamol*

**Gastric decontamination**
No evidence of benefit from charcoal

**Antidote**

**Presenting 0-4 hours post ingestion.**
Do levels at 4 hours post ingestion. Treat with Parvolex only if over the treatment blood level.

**Presenting 4-8 hours**
Do levels immediately and await the results before deciding if Parvolex is indicated. (High-risk individuals should be treated at the lower threshold)

**Presenting 8-24 hours**
Treat immediately with Parvolex if it is a significant ingestion i.e.:
>12g in adult,  > 150mg/Kg in a child, > 7.5 g or 100 mg/Kg in a high-risk individual
Dose uncertain or interrupted ingestions over time.
Check paracetamol levels, PT & LFT's.

**Presenting > 24 hours**
Assess clinically (drowsiness, nausea, vomiting, liver pain/tenderness, and encephalopathy)
Do levels, INR, Creatinine, venous blood gas, and ALT.
Start N-acetyl-cysteine if any abnormal finding of high-risk individual & admit

**Dose of N-acetyl-cysteine**
150mg/kg in 200mls 5% dextrose over 20 min.
Followed by: 50mg/Kg in 500mls 5% Dextrose over 4 hours.
Followed by: 100mg/Kg in 1L 5% Dextrose over 16 hours.

If patient refuses an IV cannula consider giving oral methionine 2.5 gm (repeated at 4 hrs – see wall protocol)

**Staggered overdoses**
NPIS suggests that a dose of less than 150 mg/kg in 24 hours is unlikely to cause significant toxicity, with risk factors use a level of 75 mg/kg. For obese patients calculate toxic dose
using weight of 110 kg, rather than actual weight.
If INR, ALT and serum Cr are normal at 24 hours then N-acetylcysteine can be discontinued.

A paper published by Daley et al 2004, investigated the characteristics and outcome for patients who had been referred to a poison centre and had ingested greater than a “supratherapeutic” dose of paracetamol (4 g/24 hour). They suggested if the admission paracetamol level was more than 10 mg/L or ALT >50 IU/L then they should receive N-acetylcysteine to reduce the risk of hepatotoxicity[4].

**Enhanced elimination**
No interventions will improve clinical prognosis

**ASPIRIN/SALICYLATE**
Normally salicylate is conjugated with glycine to form salicyluric acid that is excreted in the urine. This system becomes saturated in overdose.

**Risk assessment**
120 mg/kg should be considered a severe overdose. 300 mg/kg potentially life threatening

**Evidence of toxicity:**
Tinnitus, nausea, vomiting, hyperventilation, sweating, vasodilatation, tachycardia, respiratory alkalosis, metabolic acidosis.

**Evidence of severe intoxication:** Those above plus confusion, delirium, hypotension, acidemia, seizures, cerebral oedema, non-cardiogenic pulmonary oedema, encephalopathy, renal failure, cardiac arrest.
Plasma level usually >700 mg/L

*Consciousness is not impaired unless there is severe intoxication or another drug has been ingested.

**Investigations**
-ABG’s
-Plasma salicylate levels should be taken at least 2 hours following ingestion in symptomatic patients and 4 hours in asymptomatic patients. Absorption is unpredictable. If there is suspected severe toxicity repeat levels 2 hours later
-U&E’s, INR/PT, and blood glucose

**Gut decontamination**
-Consider 50g activated charcoal if more than 120 mg/kg ingested within an hour of presentation

**Antidotes**
-There are no specific antidotes

**Enhanced elimination**
-Alkaline diuresis indicated if:
  Signs or symptoms of toxicity (see above)
  Salicylate concentration > 500 mg/l (3.6 mmol/l) in an adult
  > 350 mg/l (2.5 mmol/l) in a child
  If venous Bicarbonate is < 20 mmol/l

In alkaline diuresis it is rendering the urine alkaline that is of far greater benefit then forcing a diuresis.
Give 1.5l of 1.26% Bicarbonate plus 40 mmol K over 3 hours
Aim to keep urinary pH between 7.5-8.5

-Haemodialysis is the treatment of choice for severe poisoning and should be seriously considered if:
  CNS signs
  Severe acid-base disturbance
Renal failure
Cardiac failure
ARDS
Salicylate level > 700 mg/l (600 mg/l in children & the elderly)

**Tricyclic Antidepressants (TCAD’s)**

**Risk assessment**
An ingestion of greater than 10 mg/kg could produce serious symptoms and may be fatal. These drugs are “dirty” with multiple effects.

- **Anticholinergic**: blurred vision, dry mouth, sinus tachycardia, dry mucosa, dilated pupils and delirium.

- **Sodium channel effects**: cardiac toxicity - widening of the QRS complex. Right axis deviation occurs. A positive r wave in AvR is a marker of severe toxicity. Tachycardia

- **α-blockade**: sedation and hypotension via vasodilatation

It is important to note that these complications can arise over a short period of time and any patient suspected of taking TCAD’s must be closely observed.

**A/B/C’s of resuscitation**
ECG monitoring & 12 lead ECG
QRS complexes

- >0.10 s Increased risk of seizures
- >0.16 s Increased risk of malignant arrhythmias

IV access
U&E’s – look for low potassium
ABG’s – look for acidosis

**Gut decontamination**
Activated charcoal should be given, if > 4 mg/kg ingested within one hour, providing the airway is protected. The anticholinergic effects of TCAD reduce gut emptying and charcoal may be used beyond the hour limit.

**Antidote**
If arrhythmias or significant ECG abnormalities (QRS >0.16 s)
Give Bicarbonate: 50 ml 8.4%
-Aim for a pH 7.45 -7.5
-Avoid anti-arrhythmics

**Supportive care**
- **Hypotension**:
  -Give a bolus of iv fluids, bicarbonate and consider inotropes, glucagon, and noradrenaline
  -Convulsions:
  -IV Lorazepam
  -Phenytoin is contraindicated due to its effects on sodium channels, and risk of arrhythmias
  -Persistent seizures should be treated with intubation and ventilation
  -Cardiac Arrest: Prolonged resuscitation may be necessary

Monitoring: Patients with toxic signs should be monitored for at least 12 hours

**BENZODIAZEPINES**
A very common overdose, alcohol exaggerates the CNS depression. Main risks are of profound CNS depression with respiratory depression and the potential of aspiration if airway reflexes are lost.

**Initial treatment**
- Assess and secure the airway
- Assess the extent of CNS depression

**Antidote**
Flumazenil should only rarely be used in cases with airway problems, coma or hypotension (200 microgram repeated up to 1mg)

Fits have been reported as a complication of giving these patients flumazenil, it should not be given to patients with a possibility of chronic dependence, or epilepsy, in mixed overdose or as a “DIAGNOSTIC” test

**WARFARIN Reversal**

**INDICATION:**
- Intra-cranial haemorrhage in patients on anticoagulants
- Major haemorrhage in patients on anticoagulants
- Rat poison ingestion

1. Check INR
2. IV Vitamin K 5-10 mg stat
3. FFP 2 units IVI initially
4. Check INR 30 min later
5. Vitamin K 5 mg orally may be required if INR high

**References:**
6. POISONS

Iron

Risk assessment
Potentially lethal ingestion. No single method is satisfactory—clinical and laboratory features must be taken into account. Toxicity related to amount of elemental Iron ingested. Serious toxicity is unlikely if <60mg/kg ingested.

<table>
<thead>
<tr>
<th>Iron Salt</th>
<th>Usual dose</th>
<th>Elemental iron</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ferrous fumarate</td>
<td>200 mg</td>
<td>65 mg</td>
</tr>
<tr>
<td>Ferrous gluconate</td>
<td>300 mg</td>
<td>35 mg</td>
</tr>
<tr>
<td>Ferrous succinate</td>
<td>100 mg</td>
<td>35 mg</td>
</tr>
<tr>
<td>Ferrous sulphate</td>
<td>200 mg</td>
<td>60 mg</td>
</tr>
<tr>
<td>Ferrous sulphate (dried)</td>
<td>300 mg</td>
<td>65 mg</td>
</tr>
</tbody>
</table>

Assessment requires both
- Accurate estimation of ELEMENTAL Iron.
- A serum iron at about 4 hours after ingestion is the best measure of severity.
Levels taken more than 6 hours post-ingestion can seriously underestimate the amount of free iron due to its distribution throughout the body.
- < 3 mg/L (55 micromol/L) mild poisoning
- 3-5 mg/L (55-90 micromol/L) moderate poisoning
- > 5 mg/L (90 micromol/L) severe poisoning

Take an AXR if suspected overdose within 2 hours. If greater than two hours have elapsed, an x-ray is of no value.

Symptoms:
Vomiting, diarrhoea may become blood stained later leading to drowsiness, convulsions, metabolic acidosis and shock. Hepatocellular necrosis can occur and death can occur from circulatory failure.
There are late complications occurring 2-5 weeks after ingestion including gastric or pyloric strictures

Gastric decontamination
If tablets visible in the stomach (AXR) perform gastric lavage with the widest bore tube possible. If tablets are beyond the pylorus consider whole bowel irrigation. Activated charcoal is not effective.

Treatment
If shock or coma are present, start treatment with desferrioxamine stat.
Otherwise act upon the serum iron levels and discuss with Poisons Centre if symptomatic and there is moderate or severe poisoning.
Dose of desferrioxamine I/V: 15mg/kg/hour total dose should not exceed 80mg kg in 24 hours. This may be discontinued when clinical improvement allows.

Disposition
If greater than 20 mg/kg ingested the patient will require admission for observation.
**Carbon monoxide poisoning**

**Type of product**
Carbon monoxide (CO) is a tasteless, odourless, colourless and non-irritant gas.

**Occult carbon monoxide poisoning is easily missed because of a low index of suspicion and the variety of presenting symptoms. Consider CO poisoning in any unconscious patient where no other cause can be found.**

**Mechanism of toxicity**
CO binds to haemoglobin, to reduce the oxygen carrying capacity of the blood. Long term and permanent neurological and psychological sequelae commonly occur following non life threatening exposure. These result from direct cellular toxicity in the central nervous system. It is important therefore to dissociate the CO molecule from the haem complex in the red cell by giving high concentrations of oxygen.

**Clinical Presentation**
Patients are usually unaware that they have been exposed to CO. Symptoms of CO poisoning can easily be wrongly labelled as "flu", "viral illness" or "food poisoning". The presentation can therefore be extremely variable, have a HIGH INDEX OF SUSPICION.

**Symptoms & signs**
- CNS: Headache, confusion, agitation, depressed GCS, hyper-reflexia, hypertonia, cerebellar signs, papilloedema, convulsions
- GI Symptoms: Nausea and vomiting, haematemesis, melaena
- CVS symptoms: Arrhythmia's, AF, BBB, A-V block, prolonged Q-T, ST changes.

**Treatment**
In all patients you suspect of CO poisoning:
- a) Give 80% - 85% oxygen therapy (12-15 l/min) via a tight fitting non-rebreathing mask with reservoir
- b) Perform arterial blood gases and measure expiratory CO levels (CO Breathalyser in Resus)
- c) For conscious patients use the hand held monitor kept in Resus.
- d) For unconscious patients perform serum CO levels with other ABG's
- e) Perform CXR & ECG
- f) Consider hyperbaric oxygen therapy (though the evidence is controversial)

**Indications for referral**
Exposure to carbon monoxide plus any one of the following is an indication for hyperbaric oxygen therapy
- Unconscious at any time post-exposure.
- Neurological or neuropsychiatry signs or symptoms other than normal headache
- Carboxyhaemoglobin level more than 20% at any time
- Myocardial ischaemia, infarction or arrhythmia (clinical or ECG evident)
- Pregnancy
- Children with CO level > 10%, any unconsciousness, neurology or cerebral irritability

**Means of referral**
- Discuss ALL cases with the Emergency Department Consultant on-call.
**Corrosives**

**Acids:** Ingestion will usually cause blistering and ulceration of the oral and gastric mucosa. They flow along the greater curve and can cause perforations. Hoarseness stridor or dyspnoea are serious and indicate of airway involvement.

**Initial treatment:** Establish clear airway. Analgesia, If hydrofluoric acid give calcium tablets 10-20g orally and 10mg of calcium gluconate I/V. Do not attempt neutralisation or dilution. Need early endoscopy to assess damage. CXR to assess pulmonary damage.

**Alkalis:** They tend to damage the oesophagus rather then the stomach where they are neutralised. Oesophageal ulceration +/- perforation occurs and strictures are the long term complications.

**Initial treatment:** Secure airway. Analgesia. Will need an endoscopy to assess damage. Do not attempt neutralisation as this causes an exothermic reaction.

**Organophosphates**

Found in insecticides and absorbed through the skin or ingested orally. Organophosphates inhibit acetylcholinesterase increasing levels of acetylcholine at the nerve synapse. Symptoms can be divided into muscarinic and nicotinic.

**Muscarinic:** salivation, lacrimation, vomiting, diarrhoea and increased bronchial secretions

**Nicotinic:** muscle fasciculations and paralysis

Associated bradycardia

**Treatment:**
Wear gloves – remove clothes, decontaminate skin

**ABC** – ventilatory support may be required

**Rx:**
- Atropine 1mg stat then 0.05mg/kg every 15 min (full atropinisation occurs when pupils dilate, pulse rate increase, and dry mouth). Continuous infusion of 0.05mg/kg/hr may be required or 60mg in 200ml @ 5ml/hr titrated up
- Pralidoxime 30mg/kg over 15 min (not for use in carbamate poisoning)
7. Paediatric poisoning

There are two age peaks seen in paediatric poisoning. Between the ages of 1-5 years the poisoning tend to be accidental, and between 11-15 years intentional overdoses. The majority of overdoses can be managed with supportive care only, serious morbidity and mortality is low at less than 1%. All intentional overdoses should be referred to the paediatric team, to allow a psychosocial assessment.

Specific problems to paediatric poisoning

Certain poisons have the potential to cause severe toxicity even with amounts ingested as small as two tablets. Examples include MST, sulphonylureas, calcium channel blockers, and ecstasy.

There is some evidence children are more resistance to the hepatoxic effects of paracetamol (200mg/Kg ingestion). Currently the adult guidelines are followed; in cases of doubt following an accidental ingestion of paracetamol a 4 hour level should be requested.

Button batteries ingestion rarely cause systemic problems, however they can adhere to mucosa in the stomach and oesophagus and cause perforations. A plain chest and abdominal film should be requested. Batteries in the oesophagus should be referred for removal by endoscopy. If the battery is in the stomach a repeat abdominal film should be carried out within 24 hours. If the battery is still within the stomach, the patient needs to be referred for removal. If the button has passed beyond the pylorus, it is unlikely to cause further problems. The patient can be discharged to be advised to return if any abdominal pain or GI haemorrhage.

References:
MANAGEMENT OF PSYCHIATRIC PATIENTS

Psychotic patient

1) Exclude medical cause (e.g. hypoxia, head injury, meningitis, hypoglycaemia etc.) or delirium
2) History incl. drug use (e.g. cannabis)
3) IV access if possible (FBC, U&E, LFT, ESR, TFT, RPR, TPHA, VitB12/folate)
4) Sedate if necessary:
   a. Haloperidol (Serenace) 2.5mg if first presentation or not aggressive; 5-10mg if aggressive or repeated episodes
   b. Lorazepam (Ativan) 4 mg if patient requires sedation
5) Risperidone, Olanzapine and Clozapine - requires approval by consultant psychiatrist
6) Ensure MHCA forms are filled in correctly (1x form 04 + 2x form 05 + 1x form 01)

Aggressive patient

1) Ensure your safety - close to exit
2) Other staff available to assist (e.g. security)
3) Form 01 MHCA to be filled in ASAP if patient needs to be restrained and sedated
4) Treatment as above but haloperidol (10mg) may need to be given IMI with repeat 5mg dosing every 30 min until sedated.
5) Look for a medical cause if patient is delirious and treat
6) Discuss case with psychiatrist on call
SNAKE BITES

SYNDROMIC MANAGEMENT OF SNAKEBITES

Most snakes are not identifiable and snakebites are difficult to categorise into the classic neurotoxic, cytotoxic and haemotoxic categories. Syndromic management looks at clinical syndromes of envenomation, i.e.
1. Progressive Painful Swelling (PPS)
2. Progressive Weakness (PW)
3. Bleeding (B)

INITIAL APPROACH

1. Assess the bite site
2. Clearly mark the area of swelling
3. Check pulse/sensation of the distal extremities
4. Elevate the limb
5. Analgesia
6. FBC, U&E, Coag; IV fluids
7. Bites to the neck and face are high risk for complications
8. Venom in the eyes or mouth – irrigate with water and assess eyes for mucosal/corneal abrasions
9. Monitor x 6 hours; discharge if no clinical/biochemical deterioration/progression

1. PPS
Snakes = Puff adder, Spitting cobra, Stiletto snake, Night adder, Gaboon viper

Swelling bite site spreading proximally

> Painful adenopathy

> Blisters ± necrosis (do not debride before 5-7 days)

> Swelling to knee/elbow by 4 hrs - whole limb in 8 hrs
> ? Compartment syndrome – rare. Elevate limb x 1 hr
> Coagulation disorder
> Unexplained SOB

- No response to elevated limb in swelling/ developing compartment syndrome after 1 hr (or)
- Low / dropping platelet levels (< 50)

Treat coagulopathy if present (FDP)
Antivenom polyvalent* 50mg IVI
Mannitol 1g (500ml 20%)
Prepare for theatre

Re-assess at 1 hour

> Compartment pressure high (>30mmHg)
> No coagulopathy

> Open full length fasciotomy
2. PW
Snakes = Cobras e.g. rinkhals (tender bite site), Mamba (non tender bite site), Berg adder

Triad: pins/needles, sweating+++; salivation+++; (metallic state)

Monitor ABC hourly

Life-threatening envenomation
- Weakness and SOB
- Unable to swallow saliva
- Ptosis & dilated pupils
- Respiratory distress

A. Intubate if airway compromise
B. Ventilate if required
C. Fluids
D. Antivenom polyvalent * 80-100ml
E. ICU

3. BLEEDING
Snakes = Boomslang, Vine snake – specific haemotoxins; Puff adder and Gaboon viper – cyto + haemotoxic

Fang punctures do not stop bleeding
Headaches, fainting or convulsions

- Active systemic bleeding
- Blood placed in test tube does not clot after 20 min
- INR; PI/PTT deranged

- Heparin/FDPs etc not necessary
- Antivenom *
  (Boomslang monospecific 10-20ml for boomslang/vine snake; polyvalent 50ml for puff adder; polyvalent 200ml for gaboon viper)
ANTIVENOM ADMINISTRATION

( the risk of acuter systemic reaction to antivenom ranges from 23-56%)
1. Only for severe life or limb threatening envenomation
2. D/W Dr Wood (*7514) or Dr Nwachukwu (*7189)
3. Dr with airway skills to assist (senior EU Dr or anaesthetist)
4. Oxygen; 2x Large bore (>18 G) N/saline IVI
5. Monitor BP/Pulse/Sats
6. Resus trolley and defibrillator on hand
7. Hydrocortisone 200mg IV is controversial – delayed effect but may offset serum sickness; give at least 30min prior to antivenom admin.
8. Antihistamine (Phenergan) IV
9. S/c adrenaline 0.3-0.5mg prior to antivenom
10. Antivenom IV over 10 minutes (test dose not required)
11. Repeat doses (1-4 vials) may be required every 1-2 hours if symptoms persist; alternatively prophylactic doses (2 vials) at 6,12 and 18 hrs are also recommended in the literature

(A general guideline is 2-4 vials for minor envenomation symptoms; 5-9 vials for moderate symptoms and 10-15 vials for major envenomation symptoms)

Antivenom: South African Vaccine Producers - 011 - 386 6000

References:

ORTHOPOEDICS

SOFT TISSUE INJURY AND INFECTION

1  Back Pain
2  Strains and ligamentous injuries

1  Back pain

Low Back Pain

Diagnostic Triage

Simple backache

Nerve root pain

Serious pathology

Age 20-55
Lumbar sacral
Buttocks
Thigh

Unilateral leg pain
worse than backache
Radiate beyond knee
paraesthesia

Constant pain
Thoracic pain
1st presentation > 60
Hard neurology

No neurology
Patient ‘well’
Apyrexial

X-ray
not necessary

Carcinoma
HIV
Steroids
Systemically unwell

X-ray not necessary

Treat as for
Simple backache

Cauda equina syndrome
Sphincter/gait disturbance
Saddle anaesthesia

1/- Paracetamol
2/- Paracetamol + NSAID
3/- Tylex
? Diazepam

See GP

X-ray lumbar spine
FBC, ESR

No bed rest
Stay as active as possible
Reassure
"nothing serious"

If fails to resolve in 4/52 see GP

Urgent
Orthopaedic
referral
2 Strains, ligamentous injuries & Musculo-tendinous injury

General comments.
Soft tissue injuries constitute one of the commonest and yet most underestimated problems seen in the Emergency Medicine Department. Accurate documentation of the mechanism, examination and correct diagnosis is essential. The over-simplified "strap and rest" approach is inappropriate.

In order to attain the correct diagnosis, ask the following questions:

a) The History
- What was the EXACT mechanism ?
- Was there immediate loss of function ? (e.g. unable to weight bear in knee or ankle injury)
- Was there immediate swelling ?
- Was there anything atypical in the history ? (e.g. " like I was kicked in the back of the ankle ? ruptured TA)
- Any previous such injury or chronic instability of joint ?.

b) The Examination
(i) LOOK.
- Any obvious joint effusion.
- Any soft tissue swelling.
- Any bruising.
- Ability to weight bear.
(ii) FEEL
- Signs of crepitus
- Bony tenderness
- Ligamentous tenderness
- Joint line tenderness
- Joint stability
(iii) MOVE
- Active movement
- Passive movement

GOOD DOCUMENTATION OF HISTORY AND EXAMINATION IS ESSENTIAL.

c) Investigations
Make sure to order x-rays specific to the area in question.
Adopt a systematic approach to examining the x-ray.

Once a diagnosis is reached, the general principles to be applied are :
- Rest, ice, compression, elevation (R.I.C.E.).
- Advice on self-physiotherapy (very important).
- A realistic perception of the recovery time (2-3 weeks in most injuries, as opposed to a few days).
- Consideration of formal physiotherapy input.
- No physical sports for ? how long
- Follow-up arrangements either with the GP (vast majority) or in the
ED Review Clinic
N.B. Non-steroidals have a relative contra-indication in a patient with LARGE muscle haematoma's.

Compression supports available include tubigrip, cohesive strapping and rigid supports such as a Futuro splint (for the wrist) or plaster of Paris.

REGIONAL INJURIES

1. Ankle/foot
Most injuries involving the ankle affect the lateral ligamentous complex. The anterior tibio-fibular ligament (ATFL) will tear first, followed by the calcaneo-fibular ligament and finally the posterior tibio-fibular ligament. Most ankle sprains affect only the ATFL. Examination of the ankle should include:

- Proximal & distal fibula
- Lateral malleolus
- ATFL
- 5th MT base
- Navicular
- Medial malleolus (specify any medial tenderness or not)
- Calcaneum
- Tendo-achilles

Indications for requesting an x-ray are as follows: (Ottawa Ankle Rules)
In exceptional circumstances when there is inability to weight bear and gross swelling/discomfort but with no fracture on X-ray it is appropriate to apply a below knee back-slab NWB with crutches and see in review clinic in 1/52.
Moderate sprains with difficulty weight bearing will need tubigrip, NSAID’s, physio and crutches.

**Beware tendo-achilles ruptures** if the pain is on the postero-lateral aspect of the ankle only and there is **no history** of inversion. Always examine the 5th metatarsal in inversion injuries and x-ray the foot if it is painful (fractures run at right angles to the shaft of the 5th metatarsal and epiphyses run parallel). Always examine the fibular shaft as fractures here are easy to miss. Avulsion fractures of the medial or lateral malleolus infer significant ligamentous injury and will require physiotherapy as well as being given a prognostic time scale of 4-8 weeks. Consider plantar fasciitis in patients presenting with a spontaneous onset of heel pain, especially in obese individuals.

**2. The knee**

90% of the diagnoses can be gained from the history. Twisting mechanisms will suggest meniscal injury. Valgus/varus strains will cause collateral ligament injury. Anterior cruciate ligament (ACL) rupture will occur with AP deceleration mechanisms. Mixed forces will cause a combination of injuries. (75% with an acute haemarthrosis will have an ACL rupture)
Self-physiotherapy (especially quadriceps exercises) is an essential component in the rehabilitation of patients with knee injuries.

Criteria for X-ray
- Age 55 yr. or over
- Isolated bony tenderness of the patella
- Tenderness at head of fibular.
- Inability to flex to 90 degrees
- Inability to bear weight both immediately and in the department (Stiell et al. JAMA 1997; 278.)

If unable to weight bear then X-ray the knee prior to testing the cruciate, collateral ligaments and straight leg raising. If there is a collateral ligament rupture then there may be no effusion because the capsule has also ruptured! If there is a tense painful effusion aspirate it with a sterile pack.

All patients with truly locked knees; complete (Grade 3) ligament injuries or tense haemarthrosis should be referred to Orthopaedics
Patients with a history of a twisting and the possibility of meniscal injury should be referred to Fracture Clinic
All patients must be given advice on quadriceps exercises and given tubigrip/cohesive support.
Patients with a likelihood of significant knee injury not needing an orthopaedic opinion should be referred to the Physiotherapist and can be referred back to the GP for follow-up.

3. The Hip
Beware children with vague hip and/or knee pain (? referred pain), possibly related to trauma. A careful history and examination with radiology (AP + lateral) if necessary (especially if the history spans a number of weeks) will help you to avoid falling into such traps. Always record the body temperature.

Remember septic arthritis (< 5 years), Perthes' (5-10 years), slipped upper femoral epiphyses (10-14 years). Transient synovitis of the hip is a diagnosis of exclusion, which you should discuss with the Senior ED staff.
All elderly patients having had a fall with hip pain must have an x-ray to exclude a fractured neck of femur.

4. The Elbow
Patients who have full extension on examination need not be X rayed, but the elbow rested in a Broad arm sling and REVIEWED at 7 days.
Patients with no bony injury on X ray who have a significant haemarthrosis (positive fat pad sign) should be referred to Fracture Clinic (20% occult fracture rate).

5. The Wrist
Tenosynovitis should be considered in minor trauma, especially with a repetitive component. Clinical presentation consists of a swollen, hot,
tender area on the dorso-lateral aspect of the wrist/forearm. The presence of crepitus implies a hyper-acute presentation. In these hyper-acute cases, treatment consists of local steroid injection, physiotherapy, non-steroidals and tubigrip/Futuro splint support. Only if severe and needing POP immobilisation should they be reviewed in the clinic in two weeks. Chronic cases with minimal signs, if any, should be treated with tubigrip, non-steroidals and GP follow-up.

6. The Shoulder

If the x-ray of the shoulder reveals no bony injury or dislocation, consider the following:

i) AC joint injury. Point tenderness over the AC joint should suggest damage. Grade 1 injuries have no radiological abnormality (on weight-bearing views) and infer a sprain to the AC ligament. Grade 2 injuries will show a subluxation at the AC joint on weight-bearing views and are consistent with a rupture of the AC ligament. Grade 3 injuries will show marked displacement of the end of the clavicle and infer major disruption of the coracoclavicular ligaments as well.

Management:-
Grade 1 injuries - broad arm sling, analgesia, early mobilisation, GP follow-up 1/52
Grade 2 injuries - broad arm sling, analgesia, physiotherapy referral and Fracture Clinic appointment 3/52
Grade 3 injuries - broad arm sling, analgesia, physiotherapy and Fracture Clinic appointment in 1/52

ii) Rotator cuff injury is a commonly missed diagnosis. Consider it always in those patients in whom you have excluded bony injury, dislocation and AC injury. A high-riding humeral head on the AP x-ray will confirm the diagnosis in the minority of cases. All but the mild ones should have physiotherapy and referred to their GP for follow up and GP referral to Orthopaedics if necessary.

iii) Stiff shoulder syndrome

If the above conditions are mis-managed an intractable stiff shoulder will almost certainly result. Be aware of the need to advise on simple early mobilisation exercises. Where a stiff shoulder is established, referral to the physiotherapists and Review Clinic follow-up is appropriate.

iv) Tendonitis

Patients presenting with acute pain and a history of minimal/no trauma may have supraspinatus/biceps tendonitis. X-ray may reveal calcification. Discuss treatment with non-steroidals/steroid injection + physiotherapy, review in EU clinic if necessary.
Dislocated shoulder algorithm

Suspicion of dislocated shoulder
Yellow Triage

Assess:
- Pain score
- Axillary nerve function
- Distal circulation

IV access & Opiate analgesia (Aim at < 30 min)

Consider if all of the following:
- Previous recent dislocations (< 2 yrs)
- Age < 50
- Simple fall or manoeuvre
- Clinically convincing diagnosis

Yes

No

Any doubt

Fast-track x-ray

Clinical dislocation

Radiological dislocation

Manipulative reduction (<90 min)
- Salient PMH
- Consent
- EU theatre/resus
- ECG/Sat/NIBP
- Oxygen/Suction
- 2nd Senior Dr. in Dept.
- Sedation*
- Flumazenil (available)

Options:
- Ext rotation/traction
- Spaso
- Milch
- Traction/counter-traction
- Kocher (caution)
- Document the technique used

Successful

Recover & Check Xray
Polysling, # clinic
(Aim at discharge < 120 min)

Unsuccessful

Refer for admission
No further re-sedation or attempt in EU

* SEDATION = midazolam, propofol (SENIOR Dr only). * ANALGESIA =Always give analgesia (opiates)
Minor Orthopaedic Trauma/Fractures

1 Neck Sprain/Whiplash
Defined as an extension/flexion injury following a M.V.A (shunting injury). Record the details of the accident, whether the patient had any warning of the injury e.g. in car mirror, whether there was a head rest and seat belt fitted and lastly any pre-existing cervical spine pathology. Document any cervical spine tenderness, the range of movement and a neurological examination of the upper limbs. The onset of symptoms is often delayed and they may increase in severity over 24 hours.

Indication for X-ray
The Canadian cervical spine rules have been validated, and are a useful guide to the need for an x-ray following neck trauma. If you follow the flow diagram below, if there are no high risk factors, and the presence of one or more low risk factors, then you can make a safe assessment of lateral rotation. If this is greater than 45 degrees in both directions you do not need to perform an x-ray.

Management:
- NSAID's
- Whiplash instruction card
- Warn them that it will get worse before it gets better.
• Cervical collars of little or no benefit. Encourage the patient to gently mobilise.
• Physiotherapy for those with restriction in the range of movement or marked hesitancy.

**General Principles for the management of acute peripheral bone or joint injury**

• Treat the patient not the X-ray
• If the patient is in distress then give adequate analgesia BEFORE X-ray
• This may include IV access and IV opiates (These must be given for such things as tibial shaft fractures or shoulder dislocations)
• Consider some form of splintage BEFORE X-ray

### 2. Acute Shoulder / Humerus Injuries

- **Clavicle fracture**  
  Beware skin compromise  
  # ORTHO clinic in 1/52

- **Scapular #**  
  Specific X-ray views. Beware chest injury  
  # ORTHO clinic in 1/52

- **AC joint**  
  AC joint Stress views  
  # ORTHO clinic in 1/52

- **SC joint**  
  Beware posterior dislocation  
  Refer to Ortho immediately

- **Shoulder dislocation**  
  (SEE SECTION SEDATIVE MANIPULATIONS & SHOULDER DISLOCATION)

- **Greater tuberosity #**  
  Polysling  
  # ORTHO clinic

- **Surgical neck of Humerus**  
  Beware circumflex nerve injury  
  Polysling  
  # ORTHO clinic

  If associated with dislocation refer to Ortho

- **Humeral shaft**  
  Beware Radial nerve injury/undisplaced  
  U-slab & BAS # clinic

### 3. Elbow Injuries

- **Supracondylar Humerus**  
  Displaced or complicated by neuro-vascular injury  
  TCI  
  IV access & opiates prior to X-ray, admit TO ORTHO
  Undisplaced  
  Back slab/ C&C  
  # ORTHO clinic

- **Pulled elbow**  
  If good history witnessed by an adult then an X-ray is not indicated. Manipulate after discussion with a senior.
• Condylar fractures
  Undisplaced
  C&C (+/- POP) & # ORTHO clinic
  Displaced
  Beware medial epicondyle in the joint
  TCI - ADMIT ORTHOPAEDICS

• Capitellar fractures
  Ortho to see

• Coronoid fractures
  Ortho to see

• Olecranon fractures
  Undisplaced
  POP Back slab in 100 degrees of flexion & # clinic

• Radial head fracture
  Comminuted (>1/3 fragmented)
  Ortho to see
  Undisplaced
  C&C & # clinic

• Radial neck fracture
  > 20 degree angulation Ortho to see
  <20 C&C & # ORTHO clinic

• Elbow dislocation
  Manipulation under sedation in Resus
  Exclude neuro-vascular injury & Check X-ray
  POP Backslab & # clinic

• Radial head dislocation
  Exclude distal ulna fracture
  Ortho to see

4 Forearm & Wrist & Hand injuries

• Shaft of radius alone
  X-ray to include the elbow and wrist
  If angulated > 10 degree
  Ortho to see
  Undisplaced - above elbow POP # clinic

• Distal 1/3 radial shaft
  “Colles type” fracture
  Children admit for MUA
  Adults -Biers block/MU sedation # clinic

  For simple torus or single cortex buckle fractures in Children
  Futura splint & discharge

• Radiological Scaphoid fracture
  Scaphoid back slab (include thumb) # clinic

• Clinical Scaphoid fracture
  Futura splint or scaphoid back slab (include thumb if painful)
  # clinic 10/7
5 Pelvis & hip injuries

Trauma patients should have the stability of the pelvis assessed and a pelvic X-ray as part of the primary survey. Exsanguinating haemorrhage can occur as a result of a displaced pelvic fracture. Seek senior advice immediately.

Fractured Neck or femur
- Investigate & treat any medical reason for fall
- Analgesia & Fast-track to Ortho

Pubic rami fracture
- Management dependant on discomfort & mobility
- d/w Orthopaedics

Finger fractures See section on hand injuries
FRACTURED NECK OF FEMUR PATHWAY

Yellow Triage

Fast-track process

Nursing assessment

Pressure area care

Inform Doctor

Clinical assessment
Any medical cause for collapse
IV access & bloods
Opiate analgesia
+/- ECG (if indicated)
Routine ECG
CXR

If Clinically obvious

Fast-track to X-ray

See films immediately on returning to the department

Patient direct to the ward – d/w/ ORTHO

Standards to be achieved
Yellow Triage
Time priority
Pressure area care
Analgesia within 10 min
Opiate analgesia
Referral within 45 min
6. Knee Injury

Haemarthrosis, tense effusion or a good history of a twisting knee injury:
Follow the Ottawa Knee rules
Consider immediate orthopaedic refer or # clinic mane’
Knee splint / Wool & crepe
Crutches (NWB)
Analgesia
Locked knees should be referred to the on-call Orthopaedic team.
Ligamentous instability - Knee splint or Cylinder POP & # ORTHO clinic
Painful knee without haemarthrosis or twisting injury that is difficult to assess - See in Review clinic after more than 5/7

7. Ankle and Foot Injury

If not included below then discuss with Orthopaedics
See Soft Tissue Injuries follow Ottawa ankle and foot rules above

<table>
<thead>
<tr>
<th>Fractures</th>
<th>Classification (Fig. 1.2.5)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Undisplaced lateral malleolar fractures (exclude talar shift)</td>
<td>Comment on any medial tenderness POP Back slab NWB # ORTHO clinic</td>
</tr>
<tr>
<td>Undisplaced bimalleolar fractures (exclude talar shift)</td>
<td>d/w Orthopaedics</td>
</tr>
<tr>
<td>Displacement, angulation or talar shift</td>
<td>Refer to Orthopaedics</td>
</tr>
<tr>
<td>Talar dome fractures</td>
<td>d/w Orthopaedics</td>
</tr>
<tr>
<td>Calcaneal fractures</td>
<td>refer to Ortho</td>
</tr>
<tr>
<td>Hind foot dislocations (mid-tarsal or tarso-metatarsal)</td>
<td>refer to Ortho</td>
</tr>
<tr>
<td>Metatarsal fractures</td>
<td>POP Back slab NWB # ORTHO clinic</td>
</tr>
<tr>
<td>Toe Phalangeal fractures</td>
<td>Manipulate, neighbour strap # ORTHO clinic</td>
</tr>
<tr>
<td>Displaced</td>
<td></td>
</tr>
<tr>
<td>Undisplaced</td>
<td>Neighbour strap. No follow up</td>
</tr>
</tbody>
</table>
- **Weber B** - at level of syndesmosis (usually ext. rotation with foot pronated, occ. abduction, Fig.1.2.7)
- **Weber C** - above level of syndesmosis (ext. rotation with foot supinated, occ. abduction, Fig.1.2.8)

**Fig. 1.2.1: Weber A**  **Fig. 1.2.2: Weber B**  **Fig. 1.2.3: Weber C**

**Other Factors**
1. Talar shift (Fig. 1.2.9 & 1.2.10)
   - implies Weber B or C and in C implies diastasis of syndesmosis.

**Fig. 1.2.4: Joint Space**
2. Disruption of weight-bearing surface by fracture (Fig. 1.2.10)
   - adduction fracture where medial malleolus is pushed off, with fracture line starting on weight-bearing aspect.
   - large posterior malleolar fragment (approximately one third on lateral view).

**Fig. 1.2.5: Disruptions of Weight-bearing Surface**

**Treatment**
As a general rule all ankle fractures should be admitted. The only fractures that can be treated as an outpatient, are the completely stable fractures, where only one part of the ligamento-osseous ring is disrupted. These are uni-malleolar fractures of the lateral malleolus, either Weber A or Weber B with no clinical or radiographic evidence of medial collateral ligament damage. However, even these cases should often be admitted because of the logistics of applying a decent POP and finding and using crutches (most patients are female and grossly overweight).

Outpatient Treatment with:
- half-leg POP with walking heel; crutches or walking stick; elevate at home for 48 hours; POP check; review in outpatients within 1 week.

All other fractures (i.e. ankle injuries with 2 parts of the fibro-osseous complex disrupted) should be admitted for:
- elevation
- analgesia
- back-slab.

All displaced fractures require reduction by:
- manipulation and external splintage in POP or open reduction and internal fixation

8. FEMUR - Shaft Fractures

Usually caused by an MVA and so frequently assoc. with other injuries, both near and distant from the femur. Knee ligament injuries are not infrequent (eg. ACL laxity) and this problem may only become manifest when the patient has recovered from his femur fracture and is attempting to get back to sports. Much more serious is the hip dislocation assoc. with a shaft fracture and all femoral shaft fractures (from MVAs), must have a pelvis and CXR.

Initial management consists of:
1. excluding other injuries by appropriate clinical assessment, X-rays and regular observations.
2. assessment of the limb itself, for neuro-vascular deficit and skin wounds.
3. IV Access and fluids
4. Analgesia – morphine stat followed by Femoral Nerve Block (Senior EU Dr only)
5. consider blood transfusion, almost always appropriate if there are other significant injuries, but frequently not necessary if the femoral fracture is an isolated injury.
6. apply skin traction at an initial weight of approx. 10% of body weight. Skeletal traction is really unnecessary.
MAJOR ORTHOPAEDIC TRAUMA

Massive Lower Limb Trauma

1. Open Fractures

Classified by the Gustillo/Anderson classification:
Grade I - puncture wound <1cm
Grade II - skin wound 1-10cm
Grade III - larger wounds
   IIIa - extensive lacerations or flaps but with adequate coverage of the bone/fracture.
   IIIb - extensive soft tissue loss with periosteal stripping and exposed bone/fracture.
   IIIc - fractures with arterial damage requiring repair.

An open or compound fracture formerly carried a high mortality and for such injuries as an open tibia 150 years ago, death from infection e.g. gas gangrene, could only be avoided by urgent amputation. Today, such things are rare (but not unknown) because open fractures are routinely sent straight through to theatre for debridement. Antibiotics, tetanus toxoid and improved orthopaedic technology have also helped improve results, but the major influence on the course of management is the initial debridement.

Gunshot fractures are open fractures and should in theory all be "layed open" with a debridement. However, the majority of these fractures do not require this major procedure and can be treated as closed injuries and internally fixed if necessary. If the entry or exit wound is bigger than 1cm diameter, then the limb should be treated as any other open fracture and a debridement done.

Severity of Fracture
Increasing severity is caused by increasing energy transfer into bone and soft tissues. Simple falls are low energy injuries and usually for fractures to occur in a large bone, require the bone to be weak in the first place (e.g. osteoporosis in the elderly). MVAs are high energy injuries ($\frac{1}{2} MV^2$).

Severity is related to:
1. Extent of displacement
2. Extent of comminution
3. Extent of soft tissue injury

![Increasing Fracture Severity relates to time to union](image)

**Fig.1.15.1: Increasing Fracture - Severity relates to Time to Union viz.**

- Minor (none of above parameters) 10 weeks
- Moderate (one of above parameters) 15 weeks
- Major (all above parameters) 23 weeks
Also if an arbitrary time of 20 weeks is chosen as time to delayed union, 2% of minor but 60% of major fractures will have "delayed union".

**Initial Assessment of Open Fracture (eg tibia)**

Assessment of patient
- usually high energy injury (MVA) and so frequently assoc. with other more serious but less obvious injuries eg chest, abdomen.
- note mechanism of injury and time since injury.

Assessment of limb
- distal pulse (but may be absent because of hypotension or limb swelling),
- sensation and movement (active and passive to exclude compartment syndrome)

Assessment of wound
1. grade 1-3
2. degree of contamination

**Initial Management in Emergency Unit**

1. IV Fluids
2. Analgesia (Morphine IV)
3. Wound exposure, ADEQUATE WOUND WASHOUT/TOILET with sterile water
4. Cover wound with dry dressing and leave covered.
5. Splint limb (traction or backslab)
   - Grades I and II - Cloxacillin and Penicillin.
   - Grade III - Penicillin & Amikacin.
7. Methylprednisolone 1g stat ; 1 g at 12 hrs
8. Tetanus Toxoid (and Tetanus Immunoglobulin if severely contaminated)
9. Consider ordering blood
10. Arrange urgent theatre, consent – theatre within 2 hrs after arrival.

?? AMPUTATION

It is in III b and IIIc injuries that amputation should be considered. In a recent review, 29% of IIIb fractures had deep infection and 17% had a secondary amputation; IIIc had 100% complications and 78% amputation, many of these done as a secondary procedure. The realities are that in our region a real IIIc open fracture will rarely get to a vascular surgeon within 6 hours and so will require amputation. Fortunately, real IIIc open fractures are very uncommon, but major vessel injury is fairly common in a bad open tibia fracture. However only one of the 3 vessels needs to be patent to maintain viability in an open tibia fracture and so most “vascular injury” open fractures are not a IIIc, since the limb will survive without vascular repair.

**Indications For Amputation in the Lower Limb**

New techniques in the management of massive lower limb trauma have made limb salvage possible in the majority of cases. External fixators, free flap transfer, new antibiotics etc will usually push the surgeon to salvage the limb rather than amputate. However, long drawn out attempts at salvage and reconstruction can destroy a patient physically, psychologically, socially and financially and leave him with a limb which is frequently worse than a prosthesis.

The severe open tibial fracture is the commonest situation where amputation is considered/performed, but severe foot injures present similar problems and are quite common at Ngwelezana.
Scoring Systems
A number of attempts have been made in recent years to produce an "objective" scoring system to aid decisions regarding salvage or amputation. The Mangled Extremity Severity Score (MESS) seems to be as good as any and better than most.

M.E.S.S. Variables
A. Skeletal/Soft Tissue Injury
   - low energy (stab, simple #, civilian GSW) 1
   - medium energy (open or multiple #s) 2
   - high energy (high energy GSW, crush injury) 3
   - very high energy (above + gross soft tissue avulsion) 4

B. Limb Ischaemia
   - reduced/absent pulse but viable 1
   - pulseless, paraesthesia 2
   - cool, paralysed, insensate 3
   (all scores double for ischaemia >6 hours)

C. Shock
   - systolic BP always > 90mm Hg 0
   - transient hypotension 1
   - persistent hypotension 2

D. Age
   - < 30 years 0
   - 30 - 50 years 1
   - > 50 years 2

(MESS scores of 7 and over usually indicate amputation as the best option).

Other Indications
Also, most authorities would give the following as absolute indications for amputation:
1. Complete amputation (there is no indication for re-plantation of the lower limb).
2. Irreparable sciatic or posterior tibial nerve injury assoc with a IIIc fracture.
3. Ischaemia time more than 6-8 hours.
4. Assoc. life threatening injuries with prolonged shock, DIC or ARDS.

Indications for Amputation in the Upper Limb
In the upper limb, digital amputation is the main concern. The thumb provides about half of the hands function and it’s loss has a devastating effect. Do not amputate or shorten a thumb, without getting a senior, second opinion - most can be preserved and reconstructed. The fairly common almost complete amputation of the thumb due to a bush knife assault, nearly always survives, despite the thumb dangling on a piece of dorsal skin, usually with only the extensor tendon intact. This is because the main blood supply to the thumb, arteria princes, is carried in this intact dorsal skin.

Fingers contain 5 important structures:
- Skin; Extensor tendon; Flexor tendons; Neurovascular bundles;
- Bone and joints.
(If 3 of these structures are badly damaged, consider amputation and if 4 are badly damaged, amputation is almost certainly the better treatment).

Levels of Amputation in the Hand/Finger

Terminal phalanx
- amputations of the tip of a digit will heal well by conservative Rx, provided the bone is not sticking out. There is a lot to commend conservative Rx since healing times and return to work are similar to fancy flaps and SSGs and the end result is generally better since
sensate skin is pulled over the stump by the healing process with scar shrinkage. As long as the amputation tip is clean it, can be dressed and the patient sent home with the dressing retained, undisturbed for 7 –10 days.
- as the amputation approaches the base of the terminal phalanx, then removal of the small remaining stump of bone back to the DIP joint is often sensible, allowing loose close of the skin.

Middle & Proximal phalanx

Once the level of the stump gets towards the base of the middle phalanx the remaining stump is generally useless and gets in the way. I will usually try and persuade most women and many men, to then consider a cosmetic ray amputation, down at the base of the metacarpal. This gives a slim 3 fingered hand in which the absent finger is not noticed - did you know that “Micky Mouse” has only 3 fingers?
APPENDICES

APPENDIX A - RESUSCITATION TEAM

NGWELEZANE WILL FOLLOW A TRAUMA TEAM SYSTEMS APPROACH

Management of the trauma patient is a multi-disciplinary exercise.
As soon as the Trauma Team has performed the initial primary and secondary survey and identified the injuries, the appropriate specialties must be contacted by the Team Leader and a definitive management plan formulated.

The patient with multiple trauma needs to be managed in a logical and structured fashion by a team of doctors and nurses.

i) Call the TRAUMA TEAM. Only ATLS accredited doctors may lead the trauma team.

ii) Each team member will be assigned a specific task according to the ABCD principle

TEAM ASSIGNMENTS

The Nurse Team Leader will ensure that all duty staff (6th CALL, Emergency Doctor 1 and 2, consultant if on site) are notified of the Admission ASAP. This must be done without delay.
The Medical Team Leader must:

a) Ensure prioritisation of care by the various specialties in the Resus Room.
b) It is particularly important that when the patient has serious injuries such as:
   • Unstable pelvic fracture with hypotension
   • Likely haemorrhagic shock from intra-abdominal / retro-peritoneal injury
   • Shock from penetrating thoracic injury

SENIOR SURGICAL INVOLVEMENT IS SOUGHT IMMEDIATELY.

Task allocation will be as follows:

- **Team Leader:** Most senior ED doctor/6th call – ATLS accredited; level of at least medical officer
- **Doctor 1:** A.T.L.S. ® trained – Medical officer level
- **Doctor 2:** Intern/comm. Serv

(where resources are limited only one doctor may be available to assist team leader)

- **Nurse Team Leader:** Most Senior Nurse present
- **Sister 1:** Most Junior Nurse present / Paramedic/Med student
- **Sister 2:** Runner. As allocated by Nurse Team Leader

All aspects of the resuscitation will be controlled by the Team Leader, who will usually be the senior Emergency Team doctor. The Consultant will only intervene if protocols are either not being followed, or in consultation with the Registrar, if there is to be a departure from the protocols.

Universal precautions against HIV transmission are to be scrupulously observed at all times, i.e. use of goggles, gloves and masks and minimizing of body fluid spillage.

Universal Precautions include but are not limited to:

a. Goggles of mask with visor.
b. Surgical mask
c. Surgical gloves
d. Plastic apron
e. Arm protectors (if indicated e.g. Thoracotomy / major spills)

**NB Each individual will be held totally responsible for the disposal of his/her sharps.**

Every Resus. patient being transferred to the C.T. or Angiography suite must be accompanied by the Doctor 1 (or a designated intern), who must ensure that the equipment required for managing the patient (and for dealing with possible cardiopulmonary resuscitation) is available.

**ONLY the Duty Consultant or 6th call can step down a resuscitation**

*The National Trauma Bank Data Collection forms must be completed on ALL Resuscitation patients.*

**Resus Team Duties:**

**DOCTORS**

1. **Team Leader**
   - The Team Leader is responsible for the smooth running of a resuscitation. He/she should not be directly involved in “hands-on” patient care.
   1. Ensure resuscitation team is properly gowned and protected.
   2. Listen to hand over
   3. Ensure Nurse Team Leader is documenting hand over
   4. Check on task allocation
   5. Control traffic and noise levels
   6. Direct resuscitation
   7. Confirm to the Nurse Team Leader when the Cervical Spine has been cleared.

   The Team Leader should only get involved in an individual procedure if the task is not being completed appropriately, and there is no-one more suitable to delegate.

2. **Doctor 1 (A&B)**
   1. Assist with transfer from ambulance stretcher
   2. Listen to hand over
   3. Greet patient
   4. Undo collar (c-spine stabilised) and check:
      - Airway/Breathing - Face, Airway, Neck veins, Trachea, Any penetrating injuries, Chest exam.
   5. Secure Airway and Breathing
   6. Second IV line
   7. At log-roll (both ways) - Remove spine board, Examine back, Rectal exam and thermometer
   8. Re-evaluate ABCs
   9. Secondary survey
   10. At the end of the resuscitation checks, annotates and signs (when correct) the medical documentation.
   11. Completes any research documentation (Trauma Bank, Research, etc)

   **NB All findings to be called out to Team Leaders in clear (and audible) fashion**

3. **Doctor 2 (C)**
   1. Assist with patient transfer from ambulance stretcher
   2. Listen to hand over
   3. Check colour, capillary return and pulse
   4. Stop any external haemorrhaging
   5. Manual BP
   6. First IV line – Large bore at least 14G ; bloods, BHCG and Xmatch
7. Second IV line (unless completed by Doctor 1)
8. Assist with log-roll
9. Blood gas (Primary survey including log-roll completed)
10. Assist Nurse 2 – Monitoring, OGT or NGT, Urine Catheter
11. Central line

NB All findings to be called out to Team Leaders in clear (and audible) fashion

(If only 2 doctors available then one does A&B – team leader; the other does C)

**NURSING**

1. Nurse Team Leader
   1. Task allocate
   2. Protective clothing
   3. X-Ray aprons (check that appropriate aprons are worn)
   4. Monitor resuscitation with Doctor Team Leader
      Noise level
      Medical findings
      Traffic control
      Charting and recording of findings including fluids
      Patient observations
   5. Document clearing of cervical spine
   6. Document blood samples taken and time of sample.
   7. Supervise all cleaning of X-Ray aprons at end of resuscitation

Should any member of the team not be in control of their task then the Nurse Team Leader must assist, either by delegating the responsibility to someone else or temporarily assisting herself

2. Sister 1
   1. Assist transfer of the patient from stretcher to trolley
   2. Hold Head
   3. Maintain Head control until log-roll completed
   4. Head control until head and shoulders have been taped to the bed
   5. Assist with drugs as required once neck control complete
   6. Keep patient informed as to what is happening
   7. Constantly monitor Airway and Breathing

NB: If C-Spine control is not required, then will be allocated to assist Sister 2 by Nurse Team Leader

**Sister 2**

1. Assist with transfer from stretcher to trolley
2. Attach patient to Oxygen or Ventilator
3. Attach Pulse Oximeter probe
4. Assist with Intubation if necessary
5. Undress patient (cut off clothes if necessary)
6. Attach ECG electrodes
7. Cover patient with a sheet
8. Assist with any circulation needs
9. Assist with log-roll
11. Set up and apply Bair Hugger
12. Set up trolleys for invasive/diagnostic procedures
13. Assist with any other tasks as allocated
Radiographer

1. Ensure protective clothing is worn
2. The following Initial X-Rays ONLY are permitted (in order of priority)
   - Chest
   - Pelvis
   - Cervical spine
3. Call “5,4,3,2,1,” when exposing.
4. Return initial X-Rays before commencing secondary survey films
5. “Open Mouth” views for odontoid peg must be done with the cervical collar removed, and the neck fully stabilised
APPENDIX B - ANAESTHETIC TECHNIQUES

1 Indications for intubation and ventilation
2 Rapid sequence induction
3 Difficult Airway algorithm
4 Induction/sedative drugs
5 Sedation
6 Biers Block

1 INDICATIONS FOR INTUBATION AND VENTILATION
Aim: Improve oxygenation (PaO₂) and ventilation (PaCO₂), protect airway

Airway
- Airway compromise/unable to maintain
- GCS < 8
- Severe maxillofacial injury with potential swelling and airway obstruction
- Inhalation burn
- Allergic reaction/angiodema affecting airway

Breathing
- Acute respiratory failure
- Apnoea
- Severe respiratory distress
- PaO₂ < 60mmHg on oxygen 100%, no response to treatment
- Flail chest with respiratory compromise
- Compromised ventilation with PaO₂ > 60mmHg despite treatment

Circulation
- Cardiac arrest
- Shock/haemodynamic instability (SBP < 75mmHg) despite treatment

Disability/CNS
- GCS <8
- CNS depression secondary to drugs or head injury
- Head injury/ Intra-cranial haemorrhage with agitation requiring CT scan

2 EMERGENCY INTUBATION – RAPID SEQUENCE INTUBATION
- Assess the airway early.
- Anticipate a difficult airway/intubation – call for help, extra equipment
- Ensure correct indication for intubation.
- Follow the following steps:
  - All monitors on patient – pulse oximetry, capnograph, BP, ECG
  - Pre-oxygenate 100% oxygen for 3-5 min (bag/mask)
  - IV access mandatory
  - Induction agent (correct dose) bolus stat
  - Muscle relaxant (scoline/rocuronium) bolus stat
  - Cricoid pressure (Sellick manoeuvre)
  - Intubate with correct size ETT
  - Check correct placement (ETT visualized through cords, auscultation chest, capnograph)
  - Check breathing and tube depth
  - Stabilise ETT with Tape/ribbon
- Initiate intermediate to long term sedation ± muscle relaxants

References:
3 DIFFICULT AIRWAY ALGORYTHMN

Indication for intubation appropriate?

Consider the following before proceeding

- **Difficult airway**
- **Difficult ventilation**
- **Poor Pt. co-operation**

### INTUBATION ATTEMPT

**Initial intubation attempt failed**

- **MASK VENTILATE**
  - (maintain cricoid pressure)
  - Insert airway
  - 100%

**Second attempt**

- Correct head position (jaw thrust in C-spine injury)
- Change blade, use introducer, bougie, cricoid pressure adjusted
- Smaller size ETT, NEVER USE SCOLINE TWICE

**UNSUCCESSFUL**

**CALL FOR HELP!!**

- **MASK VENTILATE**
  - (maintain cricoid pressure)
  - insert airway
  - 100% oxygen

**SUCCESSFUL**

**UNSUCCESSFUL**

- Alternative approach:
  - Continue with mask and cricoid pressure
  - Wake up patient + logroll
  - Laryngeal mask + cricoid pressure

- **EMERGENCY**
  - SURGICAL AIRWAY
  - (needle/surgical cricothyroidotomy)

Bilateral breath sounds
Absence of air listening over stomach
Capnography confirmation
CXRAY
### 4 INDUCTION AND SEDATION DRUGS IN EMERGENCIES

**Important considerations:**
1. Use the correct dose (mg/kg)
2. Match appropriate the drug to the medical condition
3. Administer the drug correctly, i.e. drugs behave differently when the rate of administration is altered. Rapid bolus infusion (ideal for intubation, i.e. aim to “flatten patient”) can cause rapid apnoea and BP may drop suddenly (most agents, see table below). Be prepared for these effects. Slow drug titration to patient response (ideal for conscious sedation) is more gentle on blood pressure fluctuations and reduces the risk of apnoea. Thus, the sedative versus intubation requirements of a drug are different with regards to dose and rate of administration.

<table>
<thead>
<tr>
<th>Drug</th>
<th>Ave. Dose (70kg)</th>
<th>Timing</th>
<th>Advantages</th>
<th>Caution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Etomidate (Hypnomidate®) 10ml amp @ 2mg/ml = 20mg</td>
<td>0.2-0.3mg/kg (20mg/1amp)</td>
<td>Onset – 20 sec. DOA – 10 min Brief episode of dystonia may occur</td>
<td>Ideal in trauma – rel. cardiostable with min. BP fluctuations Good choice in shocked patients Can be used without muscle relaxants</td>
<td>Pain on injection Dystonic jerks Nausea, vomiting Avoid in intra-ocular trauma Adrenal suppression</td>
</tr>
<tr>
<td>Propofol (Diprivan®) 20ml amp @ 10mg/ml = 200mg</td>
<td>2mg/kg (150mg)</td>
<td>Onset – 40-60 sec. DOA – 10 min. Min. hangover effects on waking</td>
<td>Smooth induction and waking. Drug of choice in non shocked patients Only to be used by MO with ICU or anaesthetics experience Can be used without muscle relaxants</td>
<td>Dramatic BP drop (Avoid in shock) Sudden apnoea Unexpected bradycardia (atropine responsive) Pain on injection</td>
</tr>
<tr>
<td>Midazolam (Dormicum®) 3ml amp @ 5mg/ml = 15mg</td>
<td>Intubation – 0.2-0.3mg/kg (15-20mg) Sedation – 0.1mg/kg (5-10mg titrated)</td>
<td>Slower onset 3-5 min. DOA 60-120 min.</td>
<td>Ideal sedating agent with anticonvulsant, amnesia and anxiolytic properties. Can be combined with fentanyl for short procedures.</td>
<td>Slow onset time Prolonged sedation BP drop at high, rapid doses and apnoea (esp. with morphine) Does not give good airway anaesthesia for intubation. Caution two strengths available 5mg/5ml and 15mg/3ml</td>
</tr>
</tbody>
</table>
5 PROTOCOL FOR SEDATIVE MANIPULATIONS

Sedation is used in the Emergency Unit to facilitate manipulative reductions of fractures & dislocations. It is not without its dangers, which must never be underestimated.

Problems arise when:
- High doses of sedatives are used in combination with opiate analgesics
- Hypoxia from other injuries is exacerbated by the sedated state
- The elderly are particularly sensitive to sedation and need lower / slower doses

Protocol for the use of sedation:
- Can the procedure be performed under Entonox, LA or Regional anaesthesia?
- Take a full history and examination including medications and allergies
- Obtain informed consent
- Make sure the patient understands the need for the procedure

Choice of drugs
- Prefer to use drugs with rapid onset and short duration
- Avoid pethidine and valium as both have a slow onset and long duration. (inadequate sedation 5 minutes after injection and too much sedation 1 hour after injection! Patient cannot go home for >6 hours)
- Midazolam and fentanyl are a good choice.
- Midazolam onset time 3-5 mins, duration 60-90mins.
- Fentanyl onset time 3-5 mins, duration 30 mins
- With fentanyl and midazolam, monitoring with pulse oximetry to continue for about 1 hour or until patient awake. Patient may go home in 1-2 hours.
- Low dose propofol may be used only by doctors with anaesthetic experience.
- Low dose ketamine is a good safe choice but can cause emergence hallucinations.

- All sedation’s must be performed in EU Theatre or the Resuscitation Room
- Sedation and airway management to be done by the Senior EU doctor or an anaesthetist !!!
- Establish monitoring with Pulse Oximetry, ECG leads, and capnography (if available)
- (Supplementary Oxygen)
- They should have received adequate analgesia (fentanyl or morphine) some time before.
- Have Flumazenil and Naloxone available
- Use midazolam 1mg/ml
- Give the patient small boluses until adequate sedation is achieved i.e. 2+2+1+1+1 mg i.e titrate!titrate! slowly
- Perform the manipulative reduction
- Now is the time of greatest of risk, the patient is sedated with most of the pain abolished
- Watch them for potential airway compromise, keep oxygen and monitoring in place
- They must remain supervised in the Resus room until awake
- These patient must then be escorted by a nurse for their check X-rays.
- If the X-ray is satisfactory then they should be sent to the ward if admission is indicated
- If they are going home they must have recovered sufficiently - fully aware & alert
- Adequate transport home and appropriate supervision must be assured.
- The patient must not drive a car for 24 hours.
- The patient must have adequate analgesia to take home with them and follow up arranged.
6. Intravenous Regional Anaesthesia (IVRA) (Bier Block)

This double tourniquet is to be used for i.v. regional anaesthesia only. The cuffs must not be used with other tourniquets and the screw connections must not be removed.

Preparation

- Obtain i.v. access in the limb to be anaesthetised (for the IVRA) and on the other side (for administration of drugs).
- Draw up drugs for the IVRA and emergency drugs.
- Connect monitors to patient and have resuscitation facilities available.
- Select the appropriate cuff size. We have three double cuffs:
  - Paediatric arm cuff
  - Standard arm cuff
  - Standard leg cuff that can also be used for large arms.
- Place the cuff on the limb over a thin layer of padding, with the red cuff distal and the blue cuff proximal. Secure the connections well.

Contraindications

- Upper limb peripheral vascular disease or sickle cell disease
- Allergy to local anaesthetics
- Uncooperative patient e.g. drunk
- Patients under 14 years old
- Hypertensive patients (SBP > 200)

Cuff inflation

- Exsanguinate the limb with the Esmarch bandage unless doing a fracture manipulation – simple elevation the limb to be anaesthetised for 1 minute is adequate
- Turn the black selection knob to “proximal”
- Set the desired pressure with the black pressure adjustment knob. You have to press the silver safety cover down to turn this knob. Confirm the pressure on the dial.
- Start the timer. (first press the timer and reset buttons to bring it to 0:00)
- **Cuff pressures needed:**
  - Arm = systolic BP + 100-150mmHg (maximum 300)
  - Leg = systolic BP + 200-250mmHg (maximum 400)
- Inject the local anaesthetic solution in the arm to be anaesthetised
- Remove the Butterfly/cannula on the procedure limb and tamponade the injection site for at least 1 minute
- After about 15 minutes or when the patient complains of pain under the tourniquet:
  - Turn the black selection knob to “distal”
  - You should see the distal dial pressure rising to the same as the proximal one.
  - Press the blue “deflate” button to release the proximal tourniquet.
  - Now the area under the distal cuff is anaesthetised so the patient will tolerate the cuff for much longer.
- Check the cuff pressures regularly and record them on the monitoring sheet with BP and pulse. Sudden deflation is dangerous.
- If the compressed air fails, the manual inflation bulb can be used to maintain the pressure but the black “pressure” knob will not automatically maintain the selected pressure any more.

Drugs

- **Use Lignocaine 0.5% only.** (prilocaine is safer but not available here)
  - Use the i.v. lignocaine 100mg/5ml ampoules + 15ml water = 20ml 0.5% lignocaine
- **Do not ever use adrenaline or bupivacaine.**
- Do not use the vials that contain preservative.
• Arm: use 0.5ml/kg (30-40ml for adult)
• Leg (above knee tourniquet): use 1ml/kg 60-80ml for adult

Deflation of tourniquet
• Wait minimum of 20 minutes after injection of lignocaine
• Turn the pressure regulator to zero and press the red deflate button briefly to deflate.
• Observe for signs of lignocaine toxicity and reinflate the tourniquet if any occur.
  Intermittent release for 5-10 seconds and then reinflation to allow a slow systemic
  release of the lignocaine may be safer.

Useful tips
• Use a peripheral vein (on the dorsum of the hand not at the elbow) to inject the
  lignocaine. You get better spread of the lignocaine distally if you do not have to go
  back past too many venous valves.
• The arm will be numb within one to two minutes if your block is working well. If not,
  check the cuff pressure and give more volume of lignocaine.
• Once the block is working, remove the cannula to clean and drape the hand. For
  manipulations there is no need to clean or drape
APPENDIX C - NGWELEZANA BLOOD TRANSFUSION POLICY

POLICY NO. 80 OF 2006

Use of Blood Products

Rationale

Blood transfusion may be life saving but it is very expensive and is associated with risks to the patient (eg. transmission of infection, blood group incompatibility, etc). The use of blood needs to be rationalized and blood should only be given when clearly indicated. To ensure that the usage of blood is cost effective, safe and efficient.

Policy

Before any blood products are administered, it must be discussed with the relevant consultants per department except, patients acutely bleeding eg. trauma patients, GI bleeding. These patients can be transfused without prior consultation.

Procedure

- Before prescribing blood products, each medical practitioner must discuss the case with the consultant.
- Medical practitioners must ensure that the date, time and the name of that particular consultant with whom the case was discussed, is annotated in the patients file. The name of the consultant must also be noted on the blood transfusion form (form which remains with the blood bank).
- For RU patients the usage of blood must be discussed accordingly, i.e medical patients must be discussed with the medical consultant and surgical patients with the surgical consultant.
- All ICU patients must be discussed with Dr Popa (male).

Emergency crossmatch

- The emergency crossmatch has extra risk for the patient and extra cost. It should be used in a genuine emergency where, the waiting period of two hours for a full crossmatch, is impossible.
- Medical practitioners should order only one or two units on emergency crossmatch and the rest on standard.

COMPILED BY:

..............................
DR I POPA

APPROVED BY:

......................................
CHIEF EXECUTIVE OFFICER

PERI-OPERATIVE BLOOD TRANSFUSION

Rationale:
Blood transfusion may be life saving but it is expensive and is associated with risks to the patient (eg transmission of infection, blood group incompatibility, etc). The use of blood needs to be rationalised and blood products should only be given when clearly indicated.

Policy and procedure:

Acceptable Hb for surgery
Blood should not be given only because a patient is “for GA”. There should always be another good reason for transfusion. The acceptable Hb for surgery and anaesthesia is not a constant amount for all patients. It is somewhere between 6 and 10g/dl. The following should have a Hb >10:
- Patients who have significant cardiac or respiratory disease
- Patients for major surgery where significant intra-op or post-op bleeding is expected
- Patients with large wounds, burns or sepsis where the Hb is expected to continue to drop.

In other patients, an Hb as low as 6 is acceptable for minor surgery (minimal bleeding expected.) There is a grey area between 6 and 10, and the patient needs to be individualised depending on the general health status and the type of surgery planned.
If you are in doubt about the acceptable Hb for a particular patient, please discuss it with the consultant in charge of the case, the anaesthetic consultant or the anaesthetist who will be doing that list. Do not just order blood without a good indication.

Trauma patients
Chronic anaemia is tolerated better than acute blood loss. The volume replacement is more urgent than red cell replacement. A trauma patient for emergency surgery needs volume replacement with clear fluid (Modified Ringers Lactate) at about 3000ml crystalloid for each 1000ml blood lost. If more than 20% blood volume (1000ml in an adult) is lost acutely, you should consider red cell transfusion.
If only one unit is needed, then do not give any blood. If two or more units are needed, give the required amount. Each unit will raise the Hb by 1-1.5g/dl.
If there is ongoing bleeding, more blood will be needed. The rate of transfusion depends on the rate of bleeding.

Paediatric patients
In children who need transfusion, give 10-15ml packed cells per kg. Do not order paediatric units for theatre use. Order one adult unit and measure the blood you need. Discard the rest if it is not needed. (A paediatric unit is only 85ml, and about 25ml is lost in the giving set so you have 60ml for the patient. That is usually too little. You then need to order a second paed unit at greater cost and you expose the baby to the risk of a second donor)

Elective surgery
Patients for elective surgery should have the Hb checked at least the day before and the doctor must see the result. If blood is needed (see “acceptable Hb for surgery”), it should be ordered the day before, on a standard crossmatch. The emergency crossmatch is not intended for elective surgery (just because the doctor did not look at the result in advance). If the Hb is >6 but significant intra-operative bleeding is anticipated, the blood can be transfused in theatre or postop. It is not necessary to delay surgery for pre-op transfusion. Please do not send unopened units of blood to theatre with the patient. Either start the transfusion or leave the blood in blood bank. Inform the anaesthetist how many units are available in blood bank and the anaesthetist will send for the blood when it is needed.
If the Hb is > 10 it is not necessary to order blood except for a few specific types of surgery where major bleeding is expected (eg. thoracotomy, prostatectomy, vascular surgery, large skin graft)
Emergency crossmatch
The emergency crossmatch has extra risk for the patient and extra cost. It should only be used in a genuine emergency where you cannot wait two hours for a full crossmatch. If blood is ordered on emergency crossmatch it should be given to the patient within less than two hours (or else a standard crossmatch would have been better). Hospital policy is that in an emergency, you should order only one or two units on emergency crossmatch and the rest on standard. It usually takes two hours to give the first two units and by then the standard crossmatch is ready. Emergency crossmatch is not to be used for convenience when the Hb was not checked in advance before elective surgery.

If blood is not needed
Occasionally blood is crossmatched and then not needed. (eg. bleeding less severe than originally thought, patient dies, etc). Try to avoid this by not ordering blood that is not needed. If it happens, leave the blood in blood bank and inform the blood bank. Once blood has been issued it will be wasted.
Do not collect blood that you are not planning to transfuse immediately. Do not send patients to theatre with bags of unopened blood in the bed.

Platelets
Platelet transfusion is needed when there is bleeding and thrombocytopaenia (< 50 000). Do not give platelets for thrombocytopaenia if there is no bleeding.
The dose is one pooled unit for an adult (equivalent to 5 units in the previous packaging). Platelet orders must be countersigned by a specialist, registrar, PMO or 6th call doctor)

FDP Bioplasma
The main indication for FDP is the replacement of clotting factors and other plasma proteins. It is not to be used as a volume expander because there are much cheaper alternatives. FDP is not to be given “prophylactically” after a certain number of units of red cells. It should only be given if there is bleeding.
Do not order more than 5 units of FDP for “ward stock” at a time. Blood bank is always open and there is no reason why any ward (including theatre, ICU and RU) needs to stockpile vast quantities of FDP. (5 units costs R1710.00!). (Exception: burns unit may continue to use FDP for volume resuscitation and may order 10 units for “ward stock”.)

Cost of blood products
Prices correct April 2002:

<table>
<thead>
<tr>
<th>Product</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>Red cell concentrate</td>
<td>581.78</td>
</tr>
<tr>
<td>Paediatric RCC</td>
<td>429.57</td>
</tr>
<tr>
<td>Crossmatch (if blood is not issued)</td>
<td>258.87</td>
</tr>
<tr>
<td>Platelets (pooled 5 units for adult)</td>
<td>2960.90</td>
</tr>
<tr>
<td>Emergency crossmatch (extra levy for each unit on emerg.)</td>
<td>61.41</td>
</tr>
<tr>
<td>FDP Bioplasma – 200ml</td>
<td>438.90</td>
</tr>
<tr>
<td>Type and screen</td>
<td>145.95</td>
</tr>
<tr>
<td>After hours service (per case)</td>
<td>130.80</td>
</tr>
</tbody>
</table>

The diagnosis and reason for transfusion must be written on the crossmatch request form or the order will not be processed.

Dr DH Barrett
Principal Anaesthesiologist, Ngwelezana Hospital
MASSIVE TRANSFUSION

Definition
Massive transfusion is arbitrarily defined as:

- the replacement of a patient's total blood volume in less than 24 hours, or
- the acute administration of more than half the patient's estimated blood volume per hour.

One blood volume transfusion (10 units in adult male) replaces 70-75% of patient's original blood volume; a two-volume transfusion replaces 90% of the patient's original blood volume.

Identification of patients requiring massive transfusion
Early prediction of patients likely to require massive transfusion is critical to prepare the blood bank and other resources (e.g. autotransfusion).

Patients considered likely to require large volumes of fluid and blood should be included in this protocol as soon as one of the following is evident:

a) Hypotension: BP 80/- in an adult, 60/- in a child under the age of 12; or a BP between 80-90 that does not respond to a rapid infusion of 30 ml/kg Ringers Lactate (2L for a 70kg patient)
b) Major obvious blood loss: e.g. > 700ml immediately out through a chest tube, multiple long bone and/or pelvic fractures, heavily blood-soaked clothes and bed, etc.
c) The patient has received 3 units and will obviously require additional transfusion.

Communication with Blood Bank
Routine procedures should be followed until it becomes obvious that massive transfusion is likely. The blood bank should be informed as soon as possible that a major trauma requiring massive transfusion is arriving or in the building.

Accurate, rapid administration of blood and blood products
Profound hypotension should be treated speedily with fluids as in the intravenous fluids protocol. Blood administration in the Trauma Unit should follow Unit policy:

a) O-negative (or if unavailable, O-positive) blood is stored in the Blood Bank Refrigerator. 4 Units to be held in EU majors (RU).
b) O-negative blood should be transfused only if the patient is in need of immediate transfusion. If O-negative blood is not available, the refrigerator may be stocked with O-positive blood. Care must be taken when giving O-positive blood to women of childbearing potential (Rhesus incompatibility).
c) Type-specific blood should be used if blood is not required for 15 minutes, and fully crossmatched blood should be used if an hour delay is safe.
d) All policies regarding identification of patients' specimens (double-checking of specimen labels and papers against identi-band) must be rigidly followed despite the pressure of time.

Laboratory Samples
At the start of resuscitation, mandatory blood samples should be taken together with
coagulation studies and repeated in continuing management at least every 4 hours. In the event the PT and PTT cannot be obtained in a timely fashion, FFP may be administered for correction of microvascular bleeding in patients transfused with more than one blood volume (10 units in adult).

**Components**

Component replacement should occur only in the presence of active bleeding or if interventional procedures are to be undertaken.

Platelet concentrates (1 pack/10kg) are given if platelet count falls below 50.

Fresh frozen plasma (12ml/kg) is administered if PT or PTT are running higher than 1.5 times control levels.

Cryoprecipitate (1-1.5 packs/10kg) is given for Fibrinogen levels < 0.8g/l.

For massive uncontrolled traumatic haemorrhage, maintenance of full haemostatic ability is usually unrealistic. The priority is for definitive surgical arrest of haemorrhage from major vessels. Combinations of stored whole blood, packed cells, colloids & crystalloids are given to maintain blood volume or pressure at adequate levels and haemoglobin ≥7g/dl or haematocrit at 0.25. Conserve limited supplies of fresh blood, plasma or platelets until the bleeding is controlled. When blood loss has lessened (0.2 l/hour) and major vessels have been controlled, it becomes worthwhile correcting haemostasis.

**Hypocalcaemia**

Those at most risk include those receiving more than 3 units of blood rapidly. A blood sample should be sent for calcium measurement. If calcium needs to be replaced, 5-10 ml calcium gluconate should be given slowly i/v.

**Potassium**

Although hyperkalemia is often discussed in treatment with massive transfusion, it is rarely observed clinically.

In fact, as many patients have hypokalemia as have hyperkalemia. Close monitoring of potassium levels and immediate appropriate therapy is warranted.

**Acid-Base imbalance**

Patients who undergo massive transfusion are at risk for development of an acid-base imbalance. Stored blood has a pH level of 6.6 to 7.0. Stored blood becomes more acidic with time; especially blood stored more than 3 weeks. Acidosis is likely to develop in patients with severe refractory shock because of inadequate resuscitation and the inability to reinstate tissue perfusion. Normally, in the adequately resuscitated patient, citrate and lactate can be rapidly processed into bicarbonate resulting in an alkalotic state, which is the more common acid-base imbalance in transfusion therapy.

**Temperature**

Hypothermia is a potential risk with massive transfusion. When giving large quantities of fluid rapidly, the blood should be given through a blood warmer.
Massive Transfusion Protocol

PATIENTS AT RISK

HYPOTENSION

BP <80 mmHg in adult
BP between 80-90mmHg unresponsive to 2 litre crystalloid bolus
BP <60 mmHg in child<12 yrs

MAJOR OBVIOUS BLOOD LOSS

NB. Unstable pelvic #
Massive haemothorax

IMMEDIATE TRANSFUSION REQUIRED

GIVE RED LABEL BLOOD

O –ve blood, or if not available O +ve blood
(Red Label blood)

Only transfuse when need is IMMEDIATE

Take care transfusing O+ve blood to women of child-bearing age

Red Label (emergency) blood should be given as soon as available

SOME DELAY ACCEPTABLE

• 15 minute delay:
  Ask blood bank for:
  TYPE SPECIFIC BLOOD

• 60 minute delay:
  Ask blood bank for:
  CROSS-MATCHED BLOOD

IN THEATRE & ED

• Alert blood bank that ‘massive transfusion’ is in progress.

  Bair Hugger is mandatory
  Cover patients head
  ALL fluids to be warmed
  Warm saline should be used to irrigate the abdomen, specifically to raise core temperature

  Patients undergoing massive transfusion (> 6 units) should have 1 or more units of fresh frozen plasma per 6 unit transfusion

  Platelets should be given if there is a massive transfusion requirement and there is ‘oozy’ bleeding

  Calcium should not be given as a routine
Blood Transfusion

1. Start RBC transfusion based on nature of injury and haemodynamic instability
2. Start FDP, based upon presence of clinical coagulopathy and transfusion of >3 units of PRBC’s with anticipated transfusion of more PRBC’s.
3. Aim for PT <16 seconds
4. Aim for fibrinogen >100 mg/dl
5. Aim for Hct >20 and <30%
   NB. Lab parameters lag behind clinical events…do not wait for lab values.

1. Stop PRBC transfusion based upon haemodynamic stability, control of blood loss and Hct in the 20-30% range
2. Stop platelet transfusion when patient is not “oozing” and platelet counts >50,000 mm$^3$
3. Stop FDP transfusion when patient is not “oozing” and PT <16 seconds
4. Stop cryoprecipitate transfusion when patient is not “oozing” and fibrinogen >100 mg/dl
   NB. Remember to use external warming blanket and warmed fluids for all patients

Autotransfusion

Indications
- > 6 Unit blood loss
- > 2 Unit blood transfusion requirement
- All chest losses
- Abdominal losses following discussion with Duty Consultant

Chest Drain
400 ml. Normal Saline + 1000 u Heparin per bottle OR cell saver equipment
APPENDIX D

PAIN CONTROL (TRAUMA)

1 Analgesia in Adults
2 Paediatric pain relief

ALGESIA IN ADULTS

Pain management in the Emergency Department has been extensively investigated and often found to be sub-optimal. There are a variety of opiates, non-steroidal drugs, local anaesthetic blocks, limb splints and psychological support therapy techniques available to you in this dept. The withholding of opiates from patients with acute abdominal pain because they mask pain has been proven to be a complete myth. If anything, true peritonism is unmasked.

W.H.O. has recommended a 3 step analgesic ladder:
1. Paracetamol ± Non-steroidal anti-inflammatory (NSAIDS) agents
2. Oral Opioids e.g. codeine combinations (e.g. Dolorol Forte®), Tramadol
3. High potency opioids e.g. Morphine I.V.

Added to this are Local Anaesthesia and nerve blocks using lignocaine and bupivacaine.

Oral analgesia.
The triage nurse may have already prescribed paracetamol or codeine/paracetamol (e.g. Dolorol Forte) to patients but check that this has been done. At the very least, every patient's pain should be assessed, a pain score obtained and the patient offered simple oral analgesia.

Non steroidal therapy
Diclofenac, ibuprofen, indomethacin are available. Diclofenac IMI is generally discouraged (risk of necrotising faciitis). If the patient is in severe pain he should be given intravenous opiates. Indomethacin and diclofenac may be given Per Rectum.

THE USE OF NON STEROIDALS IN ELDERLY PATIENTS ESPECIALLY IF DEHYDRATED IS TO BE DISCOURAGED. A PROPORTION WILL DEVELOP MARKED RENAL IMPAIRMENT IF GIVEN NSAIDS.

IV Opiates – Morphine is the mainstay potent IV analgesic in Emergencies. Please make sure that these drugs are diluted in saline up to 15 ml prior to IV use. Therefore 15 mg of morphine in 15 mls (1mg/ml). Initial dose 3-5mg in adults with severe pain. Titrate the dose given to the patients requirements. Give small aliquots IV, wait five minutes and re-assess. Beware respiratory depression.

We would recommend to you that in general:
- Patients in severe pain secondary to trauma should have opiates IV at the end of the primary survey
- Patients with marked deformity/dislocation of a bone or joint should have opiates IV before X-ray.
- Any patient who is in severe pain and is likely to be admitted to hospital should have opiates IV.

Local Anaesthetic Block Techniques.
There are several blocks, which can be learnt easily and used in the ED dept. Some will be taught on the introductory course. They include femoral blocks (# shaft of femur), radial, ulnar, median and digital blocks. If you would like to use one of these techniques ask the senior staff to help you.
PROTOCOL FOR SUBCUTANEOUS PCA using Baxter “Wristwatch”

**PUMP**: Baxter disposable ‘wristwatch’
Reservoir – 60ml

**MEDICATION**: Morphine 2mg/ml + Maxolon (metachlopramide) 0.5mg/ml
Mixture 120mg morphine (8 or 12ml +
30mg metoclopramide 6ml +
46 or 42ml saline = 60ml solution

**PUMP SETTINGS**: Preset in factory
Infusion - nil
Bolus – 0.5ml/1mg (given by pressing PCA button)
Lock out - 6 minute (maximum dose 5ml/hr)
Or 15 minute (maximum dose 2ml/hr)

**MONITORING**: 2 hourly for 6 hours then 4 hourly if stable
- Pain intensity: Nil, mild, moderate, severe.
- Respiratory rate
- Blood pressure, pulse.
- Sedation 0-awake, 1- drowsy, 2-asleep, wakes easily, 3- asleep, hard to awake

**RESPONSE TO MONITORING & PAIN**

**Moderate/severe pain**
- Check all connections from syringe to butterfly in shoulder. Reconnect any disconnections and give a bolus.
- Check reservoir – attach new reservoir if necessary and give bolus.
- Persistent pain despite above – DO NOT GIVE intramuscular morphine / pethidine. Contact Anaesthetics or ICU doctor

**Respiratory rate Less than 10 per minute**

**Sedation score 3- hard to wake**
- Stop infusion
- Give Naloxone (narcan) 0.4mg (1amp) IVI stat.
- Repeat Naloxone at 3-5minute intervals until patient wakes.
- Contact Anaesthetics or ICU doctor

**Blood Pressure less than 90mmHg systolic**
- Stop infusion

2. **PAEDIATRIC PAIN RELIEF**
Children can be very difficult to assess in terms of their analgesic requirements. Partly as a result of this, there is a greater tendency for them not to receive any form of pain relief. Other factors include the hesitancy of junior doctors in attempting to site IV cannulae in young children. However, adherence to some basic principles and common-sense will result in a child receiving prompt and effective analgesia. Do not wait for a definitive diagnosis before giving analgesia therefore give analgesia before X-ray.

Basic Principles - Try to gain the child's confidence. Do not pounce into the room and pick up the injured limb. Introduce yourself some distance from the child and begin to talk to the parents and take a history. Children notice such interactions and are more likely to co-operate with a stranger who appears to be friendly with mum. Start examination by a gentle approach to the non-affected limb first. Try to get the child to move the limb voluntarily whilst


Distracting them. Explain things to children in a simple manner. Try not to lie to the child - it will result in problems for you in the short term and potentially for the child in the long term. Explain that a particular procedure (digital nerve block, siting of IV cannula etc) and the necessity for it. Explain that "it will 'sting' for half a minute" but things will be much better afterwards. Be patient in getting the appropriate staff to help you. Toys, activities and other distraction techniques can be used as cognitive strategies for the children whilst they undergo painful procedures (e.g. insertion of IV cannulae or suturing). Children can be successfully distracted from, and prepared better for, any procedure. It takes a little time, care, imagination and a little patience for all concerned. The outcome will be that children will be less frightened and distressed, will cope better and be more co-operative.

All children with obvious long bone fractures or significant burns requiring admission to hospital should receive IV opiates. If you are unhappy to site cannulae in children ask for assistance but remember practice makes perfect. Alternatively the intra-nasal route can be used, as this is quick and efficient. Remember however that an IV cannula may still be required for resuscitation purposes. If possible all children must be weighed for accurate dosage calculation. If it is not possible to weigh the child then weight can be estimated by: (Age + 4) x 2 = the weight in kilograms

MILD PAIN (e.g. undisplaced greenstick fracture)
Paracetamol - <3 months: 10 mg/kg, >3 months: 10-15 mg/kg PO/PR 4 to 6 hourly (max. 4 doses in 24 hrs)
NB round dose down to lower end of range for younger ages.
Second line treatment - ibuprofen (not recommended for children under 1 year or under 10 kg, care in asthmatics) dose: 5mg/kg 6 to 8 hourly after food (20mg/kg daily)

MODERATE / SEVERE PAIN (e.g. burns not requiring IV resuscitation)
Intranasal morphine: 0.2 mg/Kg; Valoron drops PO per wt

SEVERE PAIN (e.g. children with major trauma)
The gold standard is IV opiates
NB opiates can be used even in young infants, providing great care is taken in calculating the dose which should be checked with a second qualified staff member.
IV morphine 1-3 months: 0.025mg/Kg, 3-6 months: 0.05mg/Kg, 6-12 months: 0.1mg/Kg, 1-12 years: 0.1-0.2mg/Kg administered slowly over 10 minutes in a dilute solution (e.g. 1mg/ml) and titrated against response; monitor respiration, SaO2 & ECG; if analgesia is inadequate and no sign of respiratory depression (check mental state and rate & depth of respiration), a further dose may be given after not less than 5-10 minutes.

Nerve block e.g. digital block, femoral nerve block. (maximum safe dose of lignocaine 3mg/kg not to be repeated more than every 4 hours, maximum dose of bupivacaine 2mg/Kg)
Splintage provides good analgesic support, e.g. Thomas splints and POP back slabs before X-ray.
Entonox as an interim measure, e.g. while achieving IV access, performing a nerve block, or moving a fractured limb to splint or X-ray.
APPENDIX E - SPECIAL DIAGNOSTIC INVESTIGATIONS

1. DIAGNOSTIC PERITONEAL LAVAGE (DPL)

Prerequisite:
The placement of an indwelling Foley catheter to ensure empty bladder and NG tube to decompress stomach

Indications:
1. Blunt or penetrating abdominal trauma, or suspicion thereof, in any obtunded or comatose patient
2. Evidence of injury above and below the diaphragm
3. Penetrating injury below the 4th intercostal space

Absolute Contraindication:
1. Obvious requirement for Laparotomy

Relative Contraindications:
1. Pregnancy
2. Previous Laparotomy
3. Fracture pelvis (use supra-umbilical incision)

In stable patients only, Consider Ultrasound or CT

N.B. If during the procedure the patient becomes unstable, the investigation must be terminated immediately, and the patient returned to RESUS. The Registrar and Consultant must be notified.

OPEN TECHNIQUE DPL
Indicated:
• in the situations outlined above
• where a suspicion of diaphragmatic injury exists
• (and in which case meticulous haemostatic technique is essential)
• where the possibility of peritoneal penetration in a case of penetrating injury exists but is uncertain on physical examination.
• for reasons of safety in obese patients

CLOSED TECHNIQUE DPL
Indicated for cases of blunt injury as described above. It is contra-indicated in penetrating injury.

CELL COUNT ON FLUID SAMPLE
After instillation and recovery of 1000mL of pre-warmed Ringers Lactate, 2 x samples are decanted from the bag into specimen jars:
- 1 is sent for RBC and WBC count
- 1 is kept and tested by Urine dipstix. It is then labelled and kept until a confirmed result is obtained. It should be taped to the i.v. drip line.

INTERPRETATION OF RESULTS:
The following are considered positive:

Blunt injury:
- RCC > 100 000/mm³ (=20ml Blood)
- WCC > 500/mm³

Penetrating injury:
- RCC > 10 000/mm³ (=2ml Blood)
- WCC > 50/mm³
2. ULTRASOUND
F.A.S.T ultrasound scan when available is a first line, rapid, non invasive diagnostic tool for blunt abdominal trauma. If positive findings – immediate surgical intervention. Sensitivity operator dependant.

3. CT SCANNING OF ABDOMEN
   Used only when
   - CT would be required for other indications
   - DPL is contra-indicated
   - Patient is stable

   Indications are as follows:

   A patient transferred to the CT suite after initial stabilisation must be attended by a doctor from the Trauma Unit staff at all times
   - CT scan is arranged with the Radiologist
Are any of the following present?
- GCS < 13 at any point since the injury
- GCS 13 or 14 at 2 hours after the injury
- Focal neurological deficit
- Suspected open or depressed skull fracture
- Any sign of basal skull fracture (haemotympanum, ‘panda’ eyes, cerebrospinal fluid otorrhoea, Battle’s sign)
- Post-traumatic seizure
- > 1 vomiting episode (clinical judgement on cause of vomiting and need for imaging should be used in children aged ≤ 12 years).

Any Loss of consciousness or amnesia since the incident

Are any of the following present?
- Age ≥ 65 years
- Coagulopathy (history of bleeding, clotting disorder, current treatment with warfarin)

Request CT imaging of the head immediately – imaging to be carried out within 1 hour of the request

Request CT imaging of the head immediately – imaging to be carried out within 8 hours of the injury, or immediately if patient presents > 8 hrs post-injury

Ref: NICE Guidelines UK 2003
4. EXCRETORY UROGRAPHY AND CYSTOGRAPHY

Indicated for all cases of frank haematuria or other evidence or suspicion of urinary tract injury

Evaluation of Haematuria:
Blunt Trauma:

- Investigation is ONLY indicated with MACROSCOPIC haematuria in blunt trauma after the prior exclusion of urethra rupture (clinically, i.e. no pelvic trauma, or radiologically): investigation is a retrograde urethrogram, which is done if unable to pass catheter or find a high-riding prostate.
- First review the pelvic X-Ray: if a major fracture is present and the patient is MALE then request a CT-abdomen with contrast and CT-cystogram concurrently, providing a retrograde urethrogram was normal in cases with pelvis fracture
- In the female proceed straight to cystogram after exclusion of menstruation with a midstream urine specimen.

Penetrating trauma:
- All haematuria from 1+ to macroscopic required investigation and the specific investigation to be guided by the site of injury
- Trace blood only may be reviewed after ONE hour: if still trace or positive then get IVP, unless unlikely to have UT injury by location of wound

Prerequisites for these studies are good pre-hydration and a urine catheter in situ for the IVP. Also U&E if time permits.

N.B. Blunt Injury: Haematuria on Dipstix is not relevant unless backed by clinical findings
Penetrating injury: Haematuria is highly relevant.

Prerequisites for IV contrast administration:
- Adequate volume repletion/hydration
- Haemodynamic stability
- Exclusion as far as possible of Iodide allergy on available history
- Availability of anti-anaphylactic drugs

i) Technique: Excretory Urography
- Take pre-contrast film
- Administer Contrast : Warmed Urografin - give 2ml bolus and wait 90 sec, if no reaction then give rest quickly (100 ml over 2 minutes)
- Films - take one cross kidney film stat then one post micturition at 20 min

ii) Technique: Cystography
- The study is carried out in the Resuscitation Area.
- Assure placement of Foley catheter
- Take pre-contrast film (whole pelvis)
- Instill 250 ml. contrast (Urografin) via catheter plus
- Instill a further 250 ml. water.
- Clamp Foley
- Take films: Anteroposterior Lateral
- Unclamp Foley
- Take films: Postmicturition

iii) Technique: Urethrography.
This is NOT an emergency investigation. Do not do it in RESUS.
Place a suprapubic catheter when the bladder is full.
Do a later micturating cystogram when the patient is stable.
5. ARTERIOGRAPHY

i) ARCH AORTOGRAM

URGENT ARCH AORTOGRAPHY is indicated where evidence or suspicion of traumatic rupture of the aorta (TRA) exists:

a. Blunt chest injury in context of high-speed deceleration, lateral collision or ejection, as indicated by history from personnel at scene of accident
b. Presence of "classical signs" of TRA on CXR
   i. Obscuring of aortic knuckle
   ii. Deviation of NG tube (Make sure an NG tube has been passed before the erect CXR!)
   iii. Depression of Left main bronchus
   iv. Apical pleural "cap"
   v. Left haemothorax or upper rib or clavicular fracture
   vi. Presence of "pseudocoarctation"

This study must be arranged without delay by the consultant in consultation with the duty Radiologist

NB: CT SCAN IS NOT ACCEPTABLE UNLESS
- Spiral CT Scanning is used
- The scan is with contrast
- Specific approval of the Duty Consultant
  In trans-mediastinal Gunshot wounds, CT can be used in the stable patient

ii) PERIPHERAL ANGIOGRAPHY

PERIPHERAL ARTERIOGRAPHY is either formal (in angiography suite - arranged with duty radiologist) or done as an emergency in theatre

Formal angiography requires:
- Stable patient
- Emergency arteriography is not required
- Specific approval of the duty consultant
6. UPPER GI BLEED ADMISSION FORM

Patient ____________________________ Date __________________
Hosp nr __________________________
Age _____ M / F
Referral: Surgeon / GP / Clinic / Hospital __________________

Presenting complaint:
________________________________________________________________________
________________________________________________________________________

Amount

Melena / Not Known PUD / Liver disease / Bleeding abnormality
Smoking / Not Previous Upper GI bleed / Not
Dyspepsia / Not Alcohol / Not
NSAIDS / corticosteroids / anticoagulants / none

Medical Problems Medications
1. ____________________________ 1. ____________________________
2. ____________________________ 2. ____________________________
3. ____________________________ 3. ____________________________
4. ____________________________ 4. ____________________________

Past Surgery Allergies ________________
1. ____________________________
2. ____________________________
3. ____________________________ RVD: Reactive / Non-reactive / Unknown

EXAMINATION

General impression _________________________________________________
Pale / Jaundice / Dehydrated / Oropharynx - blood
BP _____/_____/ Pulse _________ Temperature _________ Resp rate _________
CVS _____________________________ Resp _____________________________
Abdomen: hepatomegaly / splenomegaly / caput medusa / ascites / other chronic liver
disease / Tenderness epigastric
PR melena / not
Other ______________________________________________________________

BLOODS

FBC Hb_______ WBC_______ Pl_______
INR
UE Na_____K_____ Cl_____ Urea_____Creat_____
LFT Prot____ Alb____ Bili____ ALP____ ALT____ GGT____
<table>
<thead>
<tr>
<th>Rockall score</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (years)</td>
<td>&lt; 60</td>
<td>61 - 79</td>
<td>&gt; 80</td>
<td>-</td>
</tr>
<tr>
<td>Vitals</td>
<td>Normal</td>
<td>P &gt; 100</td>
<td>P &gt; 100</td>
<td>Systole &lt; 100</td>
</tr>
<tr>
<td>Comorbidities</td>
<td>No major</td>
<td>-</td>
<td>CCF</td>
<td>IHD Any major comorbidity</td>
</tr>
<tr>
<td>G-scope:</td>
<td>Mallory-Weiss No lesion No SRH</td>
<td>All other diagnoses</td>
<td>Malignancy of upper GIT</td>
<td>-</td>
</tr>
<tr>
<td>Diagnoses</td>
<td>Major SRH</td>
<td>None Dark spot sign</td>
<td>Blood in upper GIT Adherent clot Visible / spurting vessel</td>
<td>-</td>
</tr>
</tbody>
</table>

If ≤2 admit to ward; if >2 → increased risk - Admit to EMU, if > 8 → very high risk - Monitor closely (for all 5)

**Suggestions:**
- CVP if Rockall score 2 or more
- Transfuse to Hb of 10
- Zantac IV, (?IV PPI for Rockall score of 2 or more)
- O2 mask

If oesophageal varises add Ocreotide (100 ug IV stat then 50 ug iv / h)

**Summary:**

_____________________________________________________________________________________________
_____________________________________________________________________________________________

**Plan:**

_____________________________________________________________________________________________
_____________________________________________________________________________________________
_____________________________________________________________________________________________
_____________________________________________________________________________________________
_____________________________________________________________________________________________

Ngwelezane Emergency Unit Guidelines 2007
## APPENDIX F
### TRAUMA SCORES

#### GLASGOW COMA SCALE

<table>
<thead>
<tr>
<th>Eyes</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Open Spontaneously</td>
<td>4</td>
</tr>
<tr>
<td>Open to Voice</td>
<td>3</td>
</tr>
<tr>
<td>Open to Painful Stimulus</td>
<td>2</td>
</tr>
<tr>
<td>None</td>
<td>1</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Verbal</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Orientated</td>
<td>5</td>
</tr>
<tr>
<td>Confused</td>
<td>4</td>
</tr>
<tr>
<td>Inappropriate Words</td>
<td>3</td>
</tr>
<tr>
<td>Incomprehensible Words</td>
<td>2</td>
</tr>
<tr>
<td>None</td>
<td>1</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Motor</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Obeys Commands</td>
<td>6</td>
</tr>
<tr>
<td>Localises Pain</td>
<td>5</td>
</tr>
<tr>
<td>Withdraws from Painful Stimulus</td>
<td>4</td>
</tr>
<tr>
<td>Flexion to Painful Stimulus</td>
<td>3</td>
</tr>
<tr>
<td>Extension to Painful Stimulus</td>
<td>2</td>
</tr>
<tr>
<td>None</td>
<td>1</td>
</tr>
</tbody>
</table>

#### REVISED TRAUMA SCORE

<table>
<thead>
<tr>
<th>Glasgow Coma Score</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>13-15</td>
<td>4</td>
</tr>
<tr>
<td>9-12</td>
<td>3</td>
</tr>
<tr>
<td>6-8</td>
<td>2</td>
</tr>
<tr>
<td>4-5</td>
<td>1</td>
</tr>
<tr>
<td>3</td>
<td>0</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Blood Pressure</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>&gt;90</td>
<td>4</td>
</tr>
<tr>
<td>76-89</td>
<td>3</td>
</tr>
<tr>
<td>50-75</td>
<td>2</td>
</tr>
<tr>
<td>1-49</td>
<td>1</td>
</tr>
<tr>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Respiratory Rate</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>10-29</td>
<td>4</td>
</tr>
<tr>
<td>&gt;29</td>
<td>3</td>
</tr>
<tr>
<td>6-9</td>
<td>2</td>
</tr>
<tr>
<td>1-5</td>
<td>1</td>
</tr>
</tbody>
</table>
APPENDIX G - TRIAGE

The aim of triage in the Emergency Unit is-

- To streamline the delivery of time critical treatment for patients with life-threatening conditions
- To ensure that all people requiring emergency care are appropriately categorized according to their clinical condition
- To improve patient flow
- To improve patient satisfaction
- To decrease the patients overall length of stay
- To facilitate streaming of less urgent patients
- To be user friendly for all levels of health care professionals

The triage provider, once trained in triage, can be a medical officer, registered nurse, staff nurse or nurse auxiliary.

Appropriate triage involves using a score based on the patients vital signs, their mobility, mechanism of injury and clinical/physical findings. The Score is then used to categorise patients into urgency for management. TEWS = Trauma Early Warning Score

The Cape Triage Score (CTS) has been validated and has been implemented in the Western Cape. Permission has been granted from the Cape Triage Group for use of this system at Ngwelezana hospital and drainage areas.

TRIAGE TOOL

The TEWS calculator

The CTS consists of 2 parts: the TEWS (part 1) and the symptom list (part 2). The symptom list follows after the TEWS. The provider needs to calculate the TEWS before moving on to the symptom list. The first part (or the TEWS) is shown in table 3 (adult version).

<table>
<thead>
<tr>
<th></th>
<th>3</th>
<th>2</th>
<th>1</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mobility</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>RR</td>
<td>less than 9</td>
<td>9-14</td>
<td>15-20</td>
<td>Stretcher/ Immobile</td>
<td>more than 29</td>
<td>more than 129</td>
<td></td>
</tr>
<tr>
<td>HR</td>
<td>less than 41</td>
<td>41-50</td>
<td>101-110</td>
<td>111-129</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SBP</td>
<td>less than 71</td>
<td>71-80</td>
<td>81-100</td>
<td>more than 129</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Temp</td>
<td>less than 35</td>
<td>39-38.4</td>
<td>38.5 or more</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AVPU</td>
<td>Alert</td>
<td>Reacts to Voice</td>
<td>Reacts to Pain</td>
<td>Unresponsive</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Trauma</td>
<td>No</td>
<td>Yes</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

over 12 years / taller than 150cm

TEWS (Trauma Early Warning Score) CALCULATOR
In order to generate a total score, the provider has to observe the basic vital signs of the patient. Each vital sign monitors a different physiological system:

- **Blood pressure** and **Heart rate** monitor the **cardiovascular** system (heart and blood flow). You as the provider are interested in the **systolic** value only. That is the **top** value of the blood pressure (BP=120/80, systolic BP or SBP=120)
- **Respiratory rate** monitors the **respiratory** system (lungs)
- **Temperature** monitors the **thermoregulatory** system (infections, hypothermia)
- **AVPU** monitors the **central nervous system** (brain)
- **Mobility** monitors the **musculoskeletal** system (bones and muscles)
- **Trauma** refers to the presence of **ANY** injury (bump, bruise, cut etc)

By comparing the observed basic vitals of the patient with a parameter on the TEWS calculator (horizontally) a score can be read off (vertically). These scores are added together which gives the provider a total TEWS. See **example 1**.

**Example 1:**

<table>
<thead>
<tr>
<th>Patient in wheelchair</th>
<th>With help scores</th>
<th>1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Respiratory rate = 18</td>
<td>15-20 scores</td>
<td>1</td>
</tr>
<tr>
<td>Heart rate = 118</td>
<td>111-129 scores</td>
<td>2</td>
</tr>
<tr>
<td>Blood pressure = 208/112</td>
<td>&gt;200 scores</td>
<td>2</td>
</tr>
<tr>
<td>Temperature = 36.5</td>
<td>35-36.5 scores</td>
<td>0</td>
</tr>
<tr>
<td>Patient Alert</td>
<td>Alert scores</td>
<td>0</td>
</tr>
<tr>
<td>No Trauma</td>
<td>Scores</td>
<td>0</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td>6</td>
</tr>
</tbody>
</table>

**FYI: Calculating the respiratory rate**

Count the amount of breaths taken by the patient over 30 seconds and multiply by 2.

The second part or the symptom list is shown in **table 4**. This is the part that generates the actual triage colour (red, orange, yellow, green, blue) which will determine severity level and essentially also when the patient will be attended to. As with the TEWS, there are separate versions of this for infants, children and adults. The adult version is shown.

The TEWS score will only identify and classify a patient into an appropriate triage code if the physiology of the patient is altered from normal. The TEWS will be effective for most of the cases presenting to the triage provider.

There are however some **symptoms** that requires **special attention**. It has been found that physiology alone does not pick up and classify patients with these symptoms safely and effectively. These symptoms therefore serve as a **safety net** for those patients with severe enough pathology to be seen more urgently, but who’s physiology did not respond to the insult and therefore did not generate an urgency appropriate TEWS. They are reclassified after the TEWS has been calculated. This process is explained in the next section.
### Symptom list

<table>
<thead>
<tr>
<th>Colour</th>
<th>RED</th>
<th>ORANGE</th>
<th>YELLOW</th>
<th>GREEN</th>
<th>BLUE</th>
</tr>
</thead>
<tbody>
<tr>
<td>TEWS</td>
<td>7 or more</td>
<td>5-6</td>
<td>3-4</td>
<td>0-2</td>
<td>DEAD</td>
</tr>
<tr>
<td>Target time to treat</td>
<td>Immediate</td>
<td>less than 10 mins</td>
<td>less than 60 mins</td>
<td>less than 240 mins</td>
<td></td>
</tr>
<tr>
<td>Mechanism of injury</td>
<td>High energy transfer</td>
<td>Haemorrhage - uncontrolled</td>
<td>Haemorrhage - controlled</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Seizure - current</td>
<td>Seizure - post ictal</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Presentation</td>
<td>Focal neurology - acute</td>
<td>Level of consciousness reduced</td>
<td>Psychosis / Aggression</td>
<td>Threatened limb</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Dislocation - other joint</td>
<td>Dislocation - finger or toe</td>
<td>ALL</td>
<td>DEATH</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Fracture - compound</td>
<td>Fracture - closed</td>
<td>OTHER PATIENTS</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Burn – face / inhalation</td>
<td>Burn over 20%</td>
<td>Burn - electrical</td>
<td>Burn - circumferential</td>
<td>Burn - chemical</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Burns - other</td>
<td></td>
<td></td>
<td>Poisoning / Overdose</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Abdominal pain</td>
<td></td>
</tr>
<tr>
<td>Hypoglycaemia – glucose less than 3</td>
<td>Diabetic - glucose over 11 &amp; ketonuria</td>
<td>Diabetic - glucose over 17 (no ketonuria)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Vomiting - fresh blood</td>
<td>Vomiting - persistent</td>
<td></td>
<td>Pregnancy &amp; abdominal trauma or pain</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Pregnancy &amp; trauma</td>
<td>Pregnancy &amp; PV bleed</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pain</td>
<td>Severe</td>
<td>Moderate</td>
<td>Mild</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Senior Healthcare Professional's Discretion**
3: STEPWISE APPROACH TO THE USE OF THE CTS

Figure 1 shows how simple it is to calculate the triage code for a patient by simply following the stepwise approach. This approach allows the triage provider to code patients both effectively and safely in the minimum time period. Triage providers should always use this approach unless directed otherwise by a senior health care professional.

**Figure 1. The stepwise approach for triage providing**

**Step 1: The vitals**

The first step is to perform the observations required by the TEWS.

1. The triage provider can use a mechanical blood pressure/ heart rate analyser (Dynanap) or a manual blood pressure cuff to perform the first two vital signs.

2. The respiratory rate needs to be calculated by counting the patient’s breaths for 15 seconds and then multiplying by four.

3. The temperature is measured using either an electronic or mercury thermometer (preferably a low-reading thermometer).

4. AVPU is observed by talking (verbal stimulus) to the patient, or by producing a painful stimulus if no response is observed by talking. If there is no response to either verbal or pain stimuli the patient is labelled as unresponsive.

5. Mobility is observed by noting the mode in which the patient has to be mobilised

6. Trauma is present if there is ANY injury to the patient.
Step 2: The history

The history concerns the main presenting complaint. This information can be gained by questioning the patient (or escort if the patient is unable to give a history) or by reading a referral letter. The triage provider should always ask the patient what their emergency is. This question will assist the provider in finding the core of the presenting complaint. It will also point out non-emergencies. This decision should however not be taken until the whole stepwise approach has been completed.

FYI:
Always ask the question: What is your emergency?

The history along with the vitals now has to be documented.

Step 3: The TEWS calculator

Look at example 1 again:

- Patient in wheelchair
- Respiratory rate = 18
- Heart rate = 118
- Blood pressure = 208/112
- Temperature = 36.5
- Patient Alert
- No Trauma

<table>
<thead>
<tr>
<th>Score</th>
<th>3</th>
<th>2</th>
<th>1</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mobility</td>
<td>Walking</td>
<td>With help</td>
<td>Stretcher</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Patient in wheelchair. The patient is not walking on his/her own or on a stretcher. He/she is assisted (wheelchair in this case but could just as well be a crutch, cane, walking aid or even assisted by another person). We will therefore score 1 for mobility.

<table>
<thead>
<tr>
<th>Score</th>
<th>3</th>
<th>2</th>
<th>1</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Respiratory rate</td>
<td>Less than 10</td>
<td>10-14</td>
<td>15-20</td>
<td>21-29</td>
<td>More than 29</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Respiratory rate = 18. The respiratory rate is between 15 and 20. We will therefore score the patient 1 for respiratory rate.
### Score

<table>
<thead>
<tr>
<th>Score</th>
<th>3</th>
<th>2</th>
<th>1</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Systolic BP</strong></td>
<td>Less than 71</td>
<td>71-80</td>
<td>81-100</td>
<td>101-199</td>
<td>More than 200</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Blood pressure</strong></td>
<td>208/112</td>
<td>The systolic is more than 200. We will therefore score the patient 2 for systolic BP</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Temp</strong></td>
<td>Less than 35</td>
<td>35-38.4</td>
<td>More than 38.5</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Temperature</strong></td>
<td>36.5°C</td>
<td>The temperature is between 35°C and 38.5°C (35-38.5). We will therefore score the patient 0 for temperature</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>AVPU</strong></td>
<td>Alert</td>
<td>Reacts to Voice</td>
<td>Reacts to Pain</td>
<td>Unresponsive</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Patient Alert</strong></td>
<td>The patient is alert. We will therefore score 0 for AVPU</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Trauma?</strong></td>
<td>No</td>
<td>Yes</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>No Trauma</strong></td>
<td>We will therefore score 0 for Trauma</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### The calculation:

Simply write down all your findings and add the scores to generate the TEWS total. Table 5 below is a section of the observation sheet used by the triage provider to triage this patient. The provider has already completed both step 1 and step 2 and has calculated the TEWS total (step 3).

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Finding</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mobility</td>
<td>With help</td>
<td>1</td>
</tr>
<tr>
<td>Respiratory Rate</td>
<td>18</td>
<td>1</td>
</tr>
<tr>
<td>Heart Rate</td>
<td>118</td>
<td>2</td>
</tr>
<tr>
<td>Systolic BP</td>
<td>208</td>
<td>2</td>
</tr>
<tr>
<td>Temperature</td>
<td>36.5</td>
<td>0</td>
</tr>
<tr>
<td>AVPU</td>
<td>Alert</td>
<td>0</td>
</tr>
<tr>
<td>Trauma?</td>
<td>No</td>
<td>0</td>
</tr>
</tbody>
</table>

**Date: 27/05/2005**

**History:**

Patient arrived on a wheelchair and complained of weakness on the left side of the body. The patient is a known hypertensive and diabetic. The patient has a Glucostat value of 1.5 on finger prick testing.

**TEWS total: 6**

1. **Step 1: measure**
2. **Step 2: History**
3. **Step 3: calculate**

### Table 5.

**Section of observation sheet showing vitals, history and TEWS total for example 1**
Step 4: The symptom list

Now that the TEWS total has been calculated the provider can move on to the second part of the triage coding which concerns the symptom list. Step 4 can be easily achieved by dividing it up into two additional steps.

A. The TEWS total and the triage colour code:

The TEWS total has to be matched with a specific triage colour code. Compare the TEWS total to the triage colour code references. Look at example 1 again. In step 3 the triage provider calculated the TEWS total to be six (6). Looking at our symptom list we notice that a TEWS total of between five and six is an ORANGE triage code.

**FYI:**
The triage provider can now also prompt specific questions to the patient about the symptoms on the part of the list not covered by the provider’s right hand.

B. The symptoms:

After the triage code according to the TEWS has been selected, the triage code along with the symptoms listed in the same column, get covered by the triage provider’s right hand. The column(s) to the left of the provider’s hand are now examined and compared with the history taken in step 2. If there is a symptom listed to the left of the provider’s hand that corresponds with the history taken from the patient, the triage code is changed to the corresponding code of the column that symptom was found in. If no symptom is found, the triage colour code according to the TEWS is used.

Consider example 1 again. The TEWS was six, which corresponds to a triage colour code ORANGE. We learned from the history that the patient is a diabetic with a finger prick glucose test measuring 1.5. By covering the orange category now with the provider’s right hand the column to the left can be compared with the patient’s history.

It is now revealed (see below) that the patient is hypoglycaemic with a glucotest less than 3. Hypoglycaemia falls in the RED triage code and the patient is therefore triaged up from ORANGE (this is what the TEWS of six indicated) to a triage code RED (as the symptom list indicated).

**FYI:**
The triage provider must document who and when a senior health care professional changes the triage category of any patient.
4: MANAGEMENT AND TRIAGE AIDS

Management of the patient starts when the triage provider’s analysis starts. It is therefore critical that this management continues after the triage process has been completed. Table 6 indicates the appropriate management of the different triage categories by the triage provider.

<table>
<thead>
<tr>
<th>COLOUR</th>
<th>Management</th>
</tr>
</thead>
<tbody>
<tr>
<td>RED</td>
<td>Refer to the resuscitation room for emergency management</td>
</tr>
<tr>
<td>ORANGE</td>
<td>Refer to the anteroom for urgent management</td>
</tr>
<tr>
<td>YELLOW</td>
<td>Refer to the anteroom for management</td>
</tr>
<tr>
<td>GREEN</td>
<td>Patient for potential streaming</td>
</tr>
<tr>
<td>BLUE</td>
<td>Refer to doctor for certification</td>
</tr>
</tbody>
</table>

Table 6. Appropriate management of the different triage codes

It is also possible for the triage provider to commence management when treatment is readily available and the provider’s registration / qualification allows the intervention. Appropriate interventions directed at observed abnormalities during triage decreases the patient’s morbidity and increases patient satisfaction.

A triage provider may also, time permitting, use triage aids to enhance the triage sensitivity. Triage aids will assist the senior health care professional later if the patient has been referred according to the criteria set in Table 6 above. Triage aids (compulsory) should be performed, time permitting, whenever available but is not essential for the triage itself. Table 7 indicates appropriate interventions that must be commenced by the triage provider as well as triage aids that can be used to enhance the triage process (optional).

| FYI:       |
| Triage aids (compulsory) are additional tasks that should be undertaken by the triage provider. These aids provide additional information which can be used to enhance the triage diagnosis. The triage provider should only perform triage aids if this will not prolong the waiting time of the patient being triaged or that of other patients waiting to be triaged. |
| Triage aids should be performed, time permitting, whenever available |

All patients should be triaged using the CTS when Vital signs are checked and when transferred to a new area. The score can be continuously monitored for patient improvement and deterioration. The attending doctor should be alerted if there is any deterioration (increase in the CTS score). The senior doctor on the floor can upgrade or downgrade the triage score at their clinical discretion.

RED = Resus Unit, immediate

ORANGE = To be seen in 10 min by doctor and re-triaged according to clinical judgement (Resus, majors, minors ?)

YELLOW = To be seen in 1 hour by doctor

GREEN = non urgent, patients can wait until other more severe categories have been dealt with. Waiting time target of 4 hours