ASSESSMENT OF A ROAD TRAFFIC ACCIDENT VICTIM IN A PREHOSPITAL SETTING

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ABSTRACT

The priorities in trauma management are to prevent further injury, provide rapid transport, notify the facility and to initiate definitive treatment. Trauma care equates to right care, at the right time, and in the right place. It is thus essential, as with all emergencies, for the family physician to be systematic and efficient in managing a potentially time critical problem. The basis of care for all trauma casualties use; a) Mechanism of injury; b) Primary Survey and; c) Secondary Survey as the basic sequence of medical priorities, much the same as in hospital care. The overview of trauma management principles is based on recent articles from the Red Cross, Adult Trauma and Life Support (ATLS) and New York Emergency Room. An interesting section from the recent guidelines for essential trauma care by WHO tabulates the essential or desirable knowledge, skills and equipment needed by the family physician. There is in addition a brief update on some of the ECC guideline changes on CPR (2004) as summarized by the American Red Cross in Greater New York.

METHODLOGY

A Medline search was performed from the period 2000-2004 using the subject headings Trauma and management. In addition, the search engines of some of the peer reviewed Traumatology journals was used for selection of articles eg Annals of Emergency Medicine, Journal of Trauma, Annals of Surgery in addition to ATLS Trauma Protocols Resources.

INTRODUCTION

In Singapore, there were 11 fatal or injury accidents for every 1000 registered vehicles in the year 2000. The total number of accidents that led to fatalities or injuries decreased over the last two decades from 9,067 in 1984 to 7,228 in the year 2000.

However in the USA, trauma is the leading killer of young, productive people. An estimated ten million Americans will be disabled by trauma in the year 2003, 400,000 permanently and over 150,000 will die. In the United Kingdom, road traffic crashes cause some 320,000 injuries, 40,000 serious injuries, and 3,400 deaths a year.

The rising incidence of RTA has created a subspecialty in emergency medicine-prehospital trauma life support. This comprehensive trauma system with improved assessment, triage, resuscitation, and emergency care, allows for a co-ordinated approach to both pre-hospital and hospital care.

In the local context, with the lower incidence of road traffic accidents and the geographical proximity of major hospitals, the likelihood of a family physician assessing a severely injured accident victim in the family practice setting is not high. It may be more probable that the family physician is called to attend to an emergency at the crash site, as any traffic accident patient should not be moved unless they are in danger of further injury.

It is essential for a family physician to be familiar with the initial evaluation and management of a critically injured patient as every minute can make a difference between life and death.

ASSESSMENT OF A SEVERLY INJURED TRAFFIC ACCIDENT VICTIM

Mortality can be grouped into immediate, early, and late deaths. Immediate deaths are caused by fatal disruption of the great vessels, heart, lungs or a major disruption of body cavities. These usually occur at the crash site and cannot be prevented.

Early deaths may occur anytime from 15 minutes to 6 hours after the injury and are usually due to subtotal hematomas and epidural hematomas, hemo or pneumothorax, organ rupture, or blood loss. This is the golden hour when prompt intervention may save lives.

The initial evaluation follows a protocol of primary survey, resuscitation, secondary survey, and either definitive treatment or transfer to an appropriate trauma center for definitive care. This approach is the heart of the ATLS system, which is designed to identify life-threatening injuries and to initiate stabilizing treatment in a rapidly efficient manner.

Treatment should follow simple first aid (ABCD) principles, as in hospital care, with basic airway maneuvers and control of hemorrhage by pressure being the most important interventions.

It is important in the single practice to delegate the most well trained nurse to assist in preparing the necessary emergency equipment eg. automatic BP set reading, electrocardiograph machine, emergency resuscitation drugs, bag and mask etc whilst the lesser experienced nurse initiates immediate calling of the ambulance.

For every possible injury, there is a threshold of action – a point at which a physician will intervene even without proof of diagnosis.

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STEP 1: MECHANISM OF INJURY

The initial step is to carry out a rapid survey of the incident. This would include the safety of all present, ensuring that there is the use of protective equipment such as fluorescent jackets and safety helmets and consideration of special hazards.

If emergency help is needed, call the emergency service first. At more major accidents, there may be more than one casualty and triage is necessary to look for the most seriously injured victim first.

There is a need to observe the mechanism of injury. Examples of major trauma would include the following:

- Survivor of motor vehicle crash in which there was a death of an occupant in the same vehicle.
- Patient struck by a vehicle moving faster than 20 mph.
- Patient ejected from vehicle.
- High speed crash with resulting severe deformity of the vehicle.
- Vehicle rollover.

STEP 2: PRIMARY SURVEY

The basic sequence of medical priorities is much the same as in hospital trauma care. Treatment should follow simple first aid (ABC) principles, with basic airway maneuvers and control of haemorrhage by pressure being the most important interventions.

The steps of the primary survey are encapsulated by the mnemonic ABCDE (airway, breathing, circulation, disability, and exposure.) The primary survey identifies immediately life-threatening conditions. It includes immobilization of the cervical spine, securing an airway, assurance of adequate ventilation, and control of any severe haemorrhage.

A-Airway with C-spine control

- Assess the airway, and determine its adequacy while maintaining the cervical spine in its neutral position. The cervical spine has to be immobilized in any patient at risk (multiple trauma, any injury above the clavicle, or altered level of consciousness). A cervical collar in the hospital setting achieves the latter but improvising with sandbag-like structures and tape or an assistant holding the head may be necessary whilst pending the ambulance arrival.
- A chin lift, a jaw thrust, or an oropharyngeal airway manoeuvre may overcome upper airway obstruction. Suctioning may help to clear the mouth and pharynx of secretions or vomit. A simple gloved hand may be able to do the job in the absence of a suction machine.

  It is unlikely in a local family practice setting that endotracheal intubation will be performed as most clinics do not have the equipment to do so.
- If respirations do not begin, insert an oral airway and rapidly ventilate the patient with bag-valve mask with oxygen if available.

  Severe mechanical obstruction of the airway due to severe facial or neck injury should be treated by emergency cricothyroidotomy. Family physicians do not have a surgical cricothyroidotomy set at their disposal and will have to make do with needle cricothyroidotomy if there is life threatening airway obstruction.

B-Breathing

Assessment of breathing begins with a look at the patient's general state. Agitation suggests hypoxia, while obtundation may mean carbon dioxide retention. Assess the work of breathing and its efficacy by conducting the following:

Inspection

- Is the patient distressed or tachypnoeic?
- Is the patient using the accessory muscles, grunting, or wheezing?
- Are signs of disruption to chest wall evident?
- Does paradoxical movement occur that is associated with a flail chest?

Palpation for the trachea

- Is trachea located in the midline?
- Is any crepitus noted?

Percussion

- Percussion and auscultation of the chest, looking for signs of pneumothorax or hemothorax.
- Signs of a tension pneumothorax are a deviated trachea, distended neck veins, hypoxia, tachycardia, and hypotension. Tension pneumothorax is a clinical diagnosis and requires immediate decompression with a 14-gauge cannula (or the largest bore needle in the clinic) in the second intercostal space, midclavicular line, to convert this life threatening condition into a simple pneumothorax (which can later be relieved in hospital by a chest tube insertion).

Open Wound

- An open wound that sucks air should be covered with an occlusive dressing, taped on three sides so that air can escape from under it.

C-Circulation and haemorrhage control

The most common cause of shock after injury is haemorrhage. Signs of shock include tachypnea, tachycardia, poor pulse volume, hypotension, pallor, poor capillary refill, oliguria, and a depressed level of consciousness.

Urgent treatment of patients with exsanguinating haemorrhage or shock is lifesaving. Manage any rapid external hemorrhage with a pressure dressing. Shock may also be secondary to tension pneumothorax, cardiac tamponade or spinal cord injury.

A systematic approach for detecting the source of hypovolemic shock should consider 5 sources of ongoing haemorrhage:

- External i.e. from scalp, skin, nose
- Pleural space
- Peritoneum
- Pelvis
- Long bone fracture

Insert at least 2 large-bore peripheral lines, preferentially in the upper extremities. At the same time, obtain blood for further assessment eg. group and cross match.

Initial shock resuscitation begins with IV fluids (saline or lactated ringers) if there is clinical evidence of decreased perfusion; begin infusion of fluids at the most rapid rate possible. Plan an initial fluid bolus of 10-20 mls per kg body weight. The ATLS recommendation for hypotensive patients is a 2000ml crystalloid volume challenge.

D-Disability

A brief assessment of neurological status should be performed. This includes the patient's posture (ie normal, symmetrical, decerebrate, decorticate) any pupil asymmetry, pupillary response to light, and a global assessment of patient responsiveness.

To achieve this, the Australian college of Surgeons and the ACS recommends the AVPU scale as follows:

A : Awake, alert.appropriate
V : Responds to voice
P : Responds to pain
U : Unresponsive

A more detailed assessment (Glasglow Coma Scale) is carried out during the secondary survey.

STEP 3: SECONDARY SURVEY

In the family physician's setting, a mildly to moderately injured patient, who is conscious and walking into the consultation room, would be a more likely scenario. In such situations, simple measures like dressing; pressure bandaging, stitching, tetanus immunization, antibiotic prophylaxis, and perhaps a referral letter may be all that is required.

The head to toe examination is essential in the multiply injured patient. However in an alert oriented person with mild injuries, the location of pain and mechanism of injury allows for a more focused approach. The secondary survey should be carried out after initial stabilization of the patient. It is important that ongoing monitoring of pulse rate, blood pressure, and respiratory rate is carried out simultaneously.

The time between initial stabilization and secondary examination is usually a good time to obtain history, either from patient, relatives or eyewitnesses at site of crash.

The history should include the following:

A : History of patient's allergies
M : Patient's medication history
P : Past medical and surgical history
L : Time of last meal
E : Full description of events leading to injury and hospital admission

It is important to get a detailed history of the mechanism of injury as this predicts the nature and severity of trauma.

It is timely to do a brief neurological examination, which includes level of consciousness, pupil size and reactivity, speech and motor function (Glasglow Coma Scale).

GLASGLOW COMA SCALE

Eye opening	Spontaneous	4
	To voice	3
	To pain	2
	None	1
Best verbal	Oriented	5
	Confused	4
	Inappropriate Words	3
	Incomprehensible Sounds	2
	None	1
Best Motor	Obeys commands	6
	Localizes Pain	5
	Withdraws to pain	4
	Flexion to pain	3
	Extension to pain	2
	None	1

Of the 3 parameters assessed, the best motor response elicited is the most accurate prognostic indicator. A GCS of 3-8 indicates a severe head injury, whereas a score of 14-15 is mild (a GSC of 15 is normal)

The most important medical therapy in a family practice setting for head injury is to ensure adequate cerebral perfusion pressure, avoiding hypoxia and rendering the patient euvolemic, whilst pending more definitive management of the head injury.

Head to toe examination for a multiply–injured patient

This step is usually carried out if the casualty's condition is not time critical

- Inspect the scalp for lacerations, hematomas, and tenderness. Test the facial bones for crepitance or instability. Check the eyes for foreign bodies and direct injuries. Look at the eardrums for rupture or blood.
- Check the neck for swelling, hematomas and "step-off" of posterior spinous processes. Palpate the larynx for crepitance and stability.
- Reexamine the chest for crepitance, tenderness, and abnormal sounds and chest wall motion. The heart should be screened for new murmurs and muffled heart tones.
- Examine the abdomen for distension, bowel sounds, and tenderness. Within the first hour or two of trauma, guarding and rebound sensitivity will usually not be present. The examiner relies on the initial location of tenderness to differentiate between various organ injuries.

  Palpate the flanks for tenderness and fullness, and compress the pelvis to elicit tenderness or crepitance. Check the integrity of the pubic symphysis, and evaluate the scrotom and perineum for hematomas and swelling. Do a rectal examination, noting prostate stability. Check the urethral meatus for blood.
- Inspect and palpate all extremities for deformity, swelling, and skin injuries. Stabilize all fractures Check all peripheral pulses, test motor functions and skin sensation if patient's consciousness allows. Log rolls the patient to examine the entire back.

The WHO (World Health Organization, the Injuries and Violence Prevention Department) Guidelines for Essential Trauma Care gives a useful tabulated summary of the

knowledge, skills and equipment that is essential or desirable for the family physician and is attached as an appendix. (Tables 1-3).

UPDATE OF THE ECC GUIDELINES CHANGES

The American Red Cross has a summary of the latest changes to the ECC guidelines which have been reflected in the First Aid / CPR program. Some of these changes are listed below:

Use of Breathing Barriers When Giving Rescue Breaths

Red Cross training incorporates the practice of using breathing barriers, such as face shields and resuscitation masks, when giving rescue breaths. However, a responder should not delay care if a breathing barrier is not immediately available or if he is unsure how to use it.

Rescue Breaths

Whenever a breath is given to an unconscious victim, it is considered a rescue breath. The delivery of rescue breaths should be effective to reduce the risk of gastric inflation.

For the unconscious adult: Each breath should be slow gentle and last about 2 seconds. The responder should take a breath between breaths given to the victim.

For the unconscious child or infant: Each breath should be slow, gentle and lasts one and a half seconds. The responder should take a breath between breaths given to a victim. The victim's chest should clearly rise for both adult and child.

Pulse Check

When previously instructed to check for a pulse, responders are now instructed to look, listen and feel for signs of circulation. Signs of circulation include:

- Normal breathing.
- Coughing or movement in response to rescue breaths.
- A pulse check should last no more than 10 seconds.

Chest Compressions

- CPR for an adult victim will be taught at a ratio of 15 chest compressions to 2.
- Rescue breaths for one or two responders at a rate about 100 compressions per minute.
- CPR for a child victim will be taught at a ratio of 5 chest compressions to 1 rescue breath at a rate of about 100 compressions per minute.
- CPR for an infant will be taught at a ratio of 5 compressions to 1 rescue breath at a rate of at least 100 compressions per minute.

The rate of compressions has been increased to achieve the best possible blood flow during CPR. For the adult victim, the research shows that CPR is most effective when more uninterrupted chest compressions are delivered. As such, the ration of 15 chest compressions to 2 rescue breaths will apply in both a one or two responder situation. In children, breathing problems are the most common cause of arrest. Thus the emphasis remains on rescue breaths for maximum oxygenation, so the ratio will remain 5 chest compressions to 1 breath.

Unconscious Choking Victim

For an unresponsive choking victim, certified lay responders would be taught a modified CPR technique to clear the airway obstruction. Upon verification of the airway obstruction, the responder will begin CPR. Each time the effective airway is positioned to give rescue breaths, the responder will look for an object in the victim's mouth and remove and object if one is seen. This applies to infant; child or adult early scientific research indicates that chest thrusts are as effective, and potentially more than abdominal thrusts.

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TAKE HOME MESSAGES

- **The primary role of the family physician as in all emergency care is to firstly attempt to stabilize the vital signs of the patient and to identify life threatening conditions which may require emergency management whilst pending transfer to a hospital facility.**
- **The provision of a letter containing a description of the accident, the nature of injuries and treatment provided and other available relevant history should be handed to the paramedics who will facilitate the hospital's preparation in receiving the patient for emergency stabilization and to inform all necessary units involved to be on stand-by.**
- **The list of desirable and essential knowledge, skills and equipment for trauma management makes for a good check list to correct any deficiencies.**
- **The recent update on CPR is a good reminder that techniques and maneuvers will continue to improve as more evidenced based studies and research is being carried out.**
- **In patients with mild injuries, simple measures eg pressure bandaging; dressing, stitching, tetanus immunization, antibiotic prophylaxis, and stabilization of fractures may be all that is necessary.**

APPENDIX

TABLE 1: AIRWAY

	Basic	GP	Specialist	Tertiary
AIRWAY: KNOWLEDGE + SKILLS				
Assessment of airway compromise	E	E	E	E
Manual maneuvers (chin lift, jaw thrust etc)	E	E	E	E
Insertion oral or nasal airway	D	E	E	E
Use of suction	D	E	E	E
Assisted ventilation using bag valve mask	D	E	E	E
Endotrachael intubation	D	D	E	E
Cricothyroidotomy (with or without tracheostomy)	D	D	E	E
AIRWAY EQUIPMENT				
Oral or nasal airway	D	E	E	E
Suction device: at least a manual (bulb) or foot pump	D	E	E	E
Suction device: Powered: electric, pneumatic	D	D	D	D
Suction tubing	D	E	E	E
Yankauer or other stiff suction tip	D	E	E	E
Laryngoscope	D	D	E	E
Endotracheal tube	D	D	E	E
Esophageal detector device	D	D	E	E
Bag valve mask	D	D	E	E
Basic trauma pack	D	E	E	E
Magill forceps	D	D	E	E
Capnography	I	D	D	D
Other advanced airway equipment	I	D	D	D

Basic: Outpatient clinic, often-non-doctor staffed
GP: General Practitioner staffed hospitals.
Specialist: Specialist staffed hospital, usually having a general surgeon and possibly other specialties.
Tertiary: tertiary care hospitals, often university hospitals: wide range of specialists.
E: essential D: desirable PR: possibly required I: Irrelevant

TABLE 2 : BREATHING

	Basic	GP	Specialist	Tertiary
BREATHING; KNOWLEDGE + SKILLS				
Assessment of respiratory distress and adequacy of ventilation	E	E	E	E
Administration of oxygen	D	E	E	E
Needle thoracotomy	D	E	E	E
Chest tube insertion	I	E	E	E
Three way dressing	E	E	E	E
BREATHING: EQUIPMENT				
Stethoscope	E	E	E	E
Oxygen supply (cylinder, concentrator, or other source)	D	E	E	E
Nasal prongs, face mask, associated tubing	D	E	E	E
Needle + syringe	D	E	E	E
Chest tubes	I	E	E	E
Underwater seal bottle (or equivalent)	I	E	E	E
Pulse oximetry	I	D	D	D
Arterial blood gas determinations	I	D	D	D
Bag valve mask	D	E	E	E
Mechanical ventilator	I	I	D	D

TABLE 3 : SHOCK AND CIRCULATION

		Basic	GP	Specialist	Tertiary
CIRCULATION: SKILLS AND KNOWLEDGE					
1)	Assessment and External Hemorrhage Control				
	Assessment of presence of shock	E	E	E	E
	Compression for control of hemorrhage	E	E	E	E
	Arterial tourniquet for extreme situations	E	E	E	E
	Splinting of fractures for hemorrhage control	E	E	E	
	Deep interfascial pacing for severe wounds eg (landmine)	D	E	E	E
	Pelvic wrap for hemorrhage control	D	E	E	E
2)	Fluid resuscitation				
	Knowledge of fluid resuscitation	D	E	E	E
	Peripheral percutaneous intravenous access	D	E	E	E
	Central venous access for fluid administration	I	D	E	E
	Intra-osseous access for children under 5 years	D	D	E	E
	Transfusion knowledge and skills	I	E	E	E
3)	Monitoring				
	Knowledge of parameters of resuscitation	D	E	E	E
	More advanced monitoring (central venous pressure)	I	D	D	D
	More advanced monitoring (right heart)	I	I	D	D
4)	Other				
	Differential diagnosis of causes of shock	D	E	E	E
	Use of pressers for neurogenic (spinal) shock	I	D	D	D
	Use of fluids and antibiotics for septic shock	I	E	E	E
	Recognition of hypothermia	E	E	E	E
	External rewarming for hypothermia	E	E	E	E
	Use of warmed fluids	I	D	E	E
	Knowledge of core warming	I	D	E	E
CIRCULATION: SUPPLIES AND EQUIPMENT					
1)	Assessment and External Hemorrhage Control				
	Stethoscope	E	E	E	E
	BP cuff	E	E	E	E
	Gauze and bandages	E	E	E	E
	Arterial tourniquet in extreme situations	E	E	E	E
2)	Fluid resuscitation				
	Crystalloid	D	E	E	E
	Colloids	D	D	D	D
	Blood transfusion capabilities	I	E	E	E
	Intravenous infusion set (lines and cannulae)	D	E	E	E
	Intra-osseous needle or equivalent	D	D	E	E
	Central Venous line	I	D	E	E
3)	Monitoring				
	Stethoscope	E	E	E	E
	BP cuff	E	E	E	E
	Urinary catheter	D	E	E	E
	Electronic cardiac monitoring	I	D	D	D
	Central venous pressure monitoring	I	D	D	D
	Right heart catheterization	I	I	D	D
	Laboratory facilities for haemaglobin or haematocrit	D	E	E	E
	Laboratory facilities for electrolytes, lactate and arterial blood gas	I	D	D	D
4)	Other				
	Pressors (for neurogenic /spinal shock)	I	D	D	D
	Naso-gastric (NG) tube	D	E	E	E
	Thermometer	E	E	E	E
	Fluid warmers	I	D	D	D
	Weighing scale for children	D	E	E	E