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# TRAUMA

## Grapevine



### Introduction

Trauma service rationalisation has been revisited with a recent proposed reduction of the number of major trauma services in Sydney and NSW. A reduction to five has been a welcome move by all involved in trauma care. Quality trauma care, however, is not just a matter of the number of trauma services or the volume. Inherent in the delivery of quality trauma care must be some guidelines, better practice guidelines or reality guidelines. These guidelines must be suitable for the small to large hospitals throughout the trauma spectrum. While it would be wonderful for all hospitals to have a fully functioning trained trauma team and an established trauma program with a well oiled performance improvement program under the care of a fulltime Trauma Director, reality must prevail. To be successful better practice guidelines must be

instituted with ideals that are feasible encompassing the concept reality guidelines with trauma care.

This edition deals with the recommendations for South Western Sydney Area Health Service inter-hospital trauma transfer procedures. The document has been the work of our multi-disciplinary Injury Advisory Committee. It is the beginning for a comprehensive set of guidelines to be produced by the Committee. We welcome Elizabeth Halcomb, Better Practice Guidelines Project Officer to the Trauma Unit and would welcome your correspondence with her on any issues relating to Better Practice Guidelines.

Michael Sugrue



## Better Practice Guidelines: Inter-hospital Trauma Transfers

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This document has been developed to provide evidence based recommendations about the management of inter-hospital trauma transfers in South Western Sydney Area Health Service (SWSAHS). It encompasses recommendations based upon published literature coupled with expert local experience. The guidelines use a four point rating system to identify the evidence base for key decision points. The rating system is recommended by the National Health and Medical Research Council (NHMRC)<sup>1</sup>.

High level evidence is not available in many of the topic areas pertinent to this review. The Injury Advisory Committee, therefore, decided that it was appropriate to base its recommendations upon the available levels of evidence as they represent the best evidence at this time.

### Part I: IDENTIFICATION OF PATIENTS NEEDING TRAUMA TRANSFER

#### PREHOSPITAL TRIAGE / CATEGORY 4 PATIENTS

**Question:** Which patients should be triaged to the major trauma service (MTS)?

The concept of bypassing the nearest hospital to transport the trauma patient to the MTS was introduced by the N.S.W. Ambulance Service in 1992 as Protocol 4. It stems from the principles of reducing the time

between injury and reaching definitive treatment, and the improvements in outcomes demonstrated by facilities with large volumes of trauma patients.

The South Western Sydney Regional Trauma Registry reports that failed bypass occurred in 3.9% of cases between 1995-9. During this time, 43 patients were transferred to the MTS following failure of prehospital triage protocol 4. This accounted for almost 20% of all inter-hospital transfers during this period. Therefore, improvements in prehospital triage would most certainly significantly reduce the subsequent number of inter-hospital trauma transfers.

#### GUIDELINE

All patients meeting Protocol 4 prehospital triage criteria must be transferred directly to a MTS from the scene.



## Better Practice Guidelines: Inter-hospital Trauma Transfers

Continued

### PERFORMANCE INDICATORS

- Trauma patients are correctly triaged by ambulance officers under Protocol 4 guidelines.
- All inter-hospital transfers are monitored to establish the continuing effectiveness of prehospital triage and a formal report is made by the Regional Trauma Co-ordinator at each meeting of the South Western Sydney Area Health Service, Area Trauma Committee.

### CRITERIA FOR TRANSFERRING TRAUMA PATIENTS

**Question:** Which patients should be transferred to the MTS from urban / rural hospitals?

With improved regionalisation of trauma care and under the NSW Trauma Plan it has been the aim to promptly allocate the right patient to the right hospital. Whilst the prehospital use of Protocol 4 has reduced the number of severe trauma patients presenting at urban and rural EDs this is only one part of the process of rapidly transporting trauma patients to definitive treatment. Triage criteria relate to specific injury patterns, injury severity score, co-morbid factors and the local resources. There are few studies relating specifically to the triage criteria for identification of trauma patients requiring transfer to a MTS. All current publications are level III and IV evidence.

### GUIDELINES

Patients meeting the criteria for inter-hospital trauma transfer outlined in Table 1. must be immediately transferred to a MTS as a trauma transfer.

Where specific occasions arise, when the resources at the urban or rural hospital are overwhelmed, the trauma patient should also be transferred to the MTS to ensure an adequate standard of care.

### PERFORMANCE INDICATORS

- All trauma admissions at urban and rural hospitals meeting the criteria in Table 1 must be transferred to the MTS as soon as practical.
- When adequate resources are unavailable at urban / rural hospitals patients are transferred to the MTS.
- Patients with minor head injuries and limb fractures should be treated at the urban or rural hospital where resources allow.

TABLE 1. CRITERIA FOR CONSIDERATION OF TRAUMA TRANSFER

<b>CENTRAL NERVOUS SYSTEM</b>	
<ul style="list-style-type: none"> <li>• <b>Head injury</b> <ul style="list-style-type: none"> <li>- Penetrating injury / open fracture (± CSF leak)</li> <li>- Depressed skull fracture</li> <li>- GCS &lt;14 or GCS deterioration</li> <li>- Lateralizing signs</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>• <b>Spinal cord injury or major vertebral injury</b></li> </ul>
<b>CHEST</b>	
<ul style="list-style-type: none"> <li>• Potential for prolonged mechanical ventilation</li> <li>• Wide mediastinum or signs of great vessel injury</li> </ul>	<ul style="list-style-type: none"> <li>• Cardiac injury</li> <li>• Major Pulmonary Contusion</li> <li>• Multiple fractured ribs / flail chest</li> <li>• Major chest wall injury</li> </ul>
<b>PELVIS / ABDOMEN</b>	
<ul style="list-style-type: none"> <li>• Unstable pelvic ring disruption</li> <li>• Open pelvic injury</li> </ul>	<ul style="list-style-type: none"> <li>• Solid organ injury</li> <li>• Pelvic fracture &amp; shock/ evidence of hemorrhage</li> </ul>
<b>MAJOR EXTREMITY INJURY</b>	
<ul style="list-style-type: none"> <li>• Open long-bone fractures</li> <li>• Fracture/ dislocation with loss of pulses</li> </ul>	<ul style="list-style-type: none"> <li>• Extremity ischaemia</li> </ul>
<b>MULTIPLE-SYSTEM INJURY</b>	
<ul style="list-style-type: none"> <li>• Burns with associated injuries</li> <li>• Multiple long-bone fractures</li> </ul>	<ul style="list-style-type: none"> <li>• Head + face, chest, abdominal, or pelvic injury</li> <li>• Injury to &gt; two body regions</li> </ul>
<b>COMORBID FACTORS</b>	
<ul style="list-style-type: none"> <li>• Age &gt;55 or &lt; 5 years</li> <li>• Insulin-dependent diabetes</li> </ul>	<ul style="list-style-type: none"> <li>• Morbid obesity</li> <li>• Pregnancy</li> <li>• Immunosuppression</li> <li>• Pre-existing cardiac or respiratory disease</li> </ul>
<b>SECONDARY DETERIORATION</b>	
<ul style="list-style-type: none"> <li>• Mechanical ventilation required</li> <li>• Sepsis</li> </ul>	<ul style="list-style-type: none"> <li>• Single or multiple organ system failure</li> <li>• Major tissue necrosis</li> </ul>

### MANAGEMENT OF THE DYING PATIENT (CATEGORY 7)

**Question:** What are the minimum standards for hospitals which receive Category 7 patient?

Under the metropolitan trauma triage plan patients are triaged into various categories (1-7) following the initial assessment by Ambulance Officers. Category 7 comprises of patients who are considered to be dying and deemed unlikely to survive the journey to the MTS – they are, subsequently, transported to the nearest hospital.

### GUIDELINES

Hospitals receiving dying trauma (Category 7) patients must have;

- a) ability to receive prehospital notification directly to the resuscitation room.
- b) Hospital Trauma Team response with activation criteria and group paging mechanism.
- c) ability to perform basic airway manoeuvres in the ED from intubation to cricothyroidotomy.

d) ability to arrest external blood loss as required.

e) ability to control major vessel bleeding within 5-10 minutes of patient arrival.

f) ability to provide 24 hour theatre staff / facilities and a surgical specialist on call.

g) ability to provide immediate chest and pelvic radiology 24 hours a day.

The impending arrival of all Category 7 patients should be advised by the Ambulance service to the ED of the receiving hospital. In addition Ambulance control must notify the MRU, who in turn will notify the MTS and the retrieval team. The Retrieval Team would be automatically dispatched.

Notification of arrival of a Category 7 patient to an urban hospital should lead to an automatic dispatch of a medical retrieval team.

### PERFORMANCE INDICATORS

- The Ambulance Service of NSW will notify the ED of the receiving hospital and the MRU of all Category 7 patients prior their to arrival.

## Review of last issue's case of the Month

**33 year old male self presented to an Urban Hospital Emergency Department with neck pain. He was at a buck's party and dived into a swimming pool after consuming 11 stubbies of beer.**

**Emergency Cubicle**  
Primary Survey

- A** Airway fine Pain in the neck
- B** OK
- C** OK
- D** OK

Secondary survey revealed 10cm vertex laceration with haematoma and a tender upper cervical spine with no swelling, bruising or step deformities. Both the upper and lower limbs were neurologically intact, with no abnormality of tone, power, reflex or sensory function. Anal tone was intact and there was no priapism.

**Question:** *What do you do now? Can you clear his spine clinically?*

Clearance of the C-spine can only occur in the presence of a fully conscious patient with no distracting injury without the administration of opiates. In this particular case the patient is still intoxicated, therefore his spine cannot be cleared clinically.

**Question:** *How many X-rays does he need?*

He needs a minimum of a lateral, AP and odontoid peg view. Given that he is intoxicated, it is still better to leave his cervical collar on until his neck movement can be assessed because if he is clinically tender on the following morning he will need a flexion extension view under control conditions with the doctor present.

**Question:** *Should he have a CT if his X-rays*

*are normal?*

Generally not, unless there is a reason to scan his head when the addition of C1/C2, C6/C7 is useful. If there is a clinical area of tenderness in his neck the entire spine should be scanned.

**Question:** *If he did have a fracture how would you transfer him?*

By road or air transport with full spinal precautions taking care to watch the pressure areas.

**Question:** *If he had a fracture should he go to a dedicated spinal centre or a major trauma service?*

One that provides a level of excellence and interest with feedback to the urban and rural hospital. In our case he goes to Liverpool Hospital where spinal assessment fixation and treatment will occur. In the presence of a neurosurgical deficit, the patient will eventually be transferred to a spinal unit from our major trauma service.

## Meetings



### SWAN 10

#### Definitive Surgical Trauma Care Course (DSTC) Sydney

2001 course full (Taking bookings now for 2002) 31st July and 1st August, 2002

Email: [charmaine.miranda@swsahs.nsw.gov.au](mailto:charmaine.miranda@swsahs.nsw.gov.au)

SWAN 10 will be held on the 2nd and 3rd of August, 2002, bringing to you a number of world leaders in trauma care from overseas. Registration is limited, so get in early!

Contact: Thelma Allen

Email: [thelma.allen@swsahs.nsw.gov.au](mailto:thelma.allen@swsahs.nsw.gov.au)

Phone: 02 9828 3927

<http://www.swsahs.nsw.gov.au/livtrauma>



*Remember if your are not a member of ATS you could be!*

## BACKCHAT

*Congratulations to Professor Tim Hodgetts, former Honorary Trauma Fellow at Liverpool, who has received the Mitchiner Medal from the Royal College of Surgeons of England, and has been made an honorary Fellow of the Royal College of Surgeons of Edinburgh.*

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Magnetic resonance imaging can be used in the stable patient with scanning times of around 15 minutes.<sup>16</sup> Obtaining early (<48hrs) images is safe and reliable in coma or obtunded patients. It can be used to identify injuries to supportive ligaments, disc interspace and facet capsule as well as assisting with identification of fractures and alignment abnormalities.<sup>16</sup> However this is not possible in our patient.

Dynamic fluoroscopy, used to gain flexion extension views, has been demonstrated as a safe and effective way of clearing the C-spine of unconscious patients.<sup>17, 18, 19</sup> Studies have shown this technique can detect cervical instability due to ligamentous injury, which has previously been missed.<sup>17, 18, 19</sup> Meta-analysis of these studies revealed an incidence of 2.2% of occult C-spine injuries not identified with three view radiographs with CT supplementation.<sup>20</sup> In addition these studies demonstrated no spinal cord injury through passive flexion / extension.<sup>17, 18, 19</sup>

Our patient has had the standard three view series with CT focused on the areas, which were difficult to view. According to the literature we have now excluded cervical spine injury with almost 100% reliability. However the chance of occult injury remains around 2.2%.

### Spinal immobilisation

Interestingly enough the effectiveness of semirigid collars in providing immobilisation is questionable any way when used alone.<sup>21, 22</sup> Indeed prolonged use of spinal immobilisation is itself associated with considerable morbidity. Observational studies have shown that rigid collars may cause:

- Airway difficulties and raised intracranial pressure<sup>23</sup>
- Increased risk of aspiration<sup>24</sup>
- Restricted respiration<sup>25</sup>
- Dysphagia<sup>26</sup>
- Skin ulceration<sup>19, 27</sup>

Due to a lack of high quality research, the effect of spinal immobilisation on mortality, neurological injury, spinal stability and adverse effects in trauma patients remains uncertain.<sup>28</sup> There are also no significant differences in the effectiveness of different cervical collars, sandbags and tape being the best method of spinal immobilisation.<sup>22</sup>

### Current protocols

Given the potential consequences as a result of missed C-spine injuries it is surprising that as yet there remains no universal protocol for clearing the cervical spine in unconscious patients. Indeed there is wide variation in the approaches and detail with which this subject is dealt with.

Perhaps the most telling research showing inconsistencies in the approach to C-spine clearance, was a 1997 telephone survey of consultants responsible for intensive care units in South West Britain:<sup>29</sup>

\* Of 25 units surveyed only 10 units had defined protocols. A range of neurosurgeons, orthopaedic surgeons, radiologists and multidisciplinary teams had set these.

\* In 19 units immobilisation was stopped on the basis of radiology alone. 6 units combined radiology with clinical examination once the patient regained consciousness.

\* Of the 19 who used radiology alone:

12 units used lateral views only (yes twelve!).

5 units used lateral and AP views.

2 units used lateral, AP and open mouth odontoid views.

\* Of the six units who combined radiology with physical exam:

4 units used lateral only.

2 units used lateral, AP and open mouth odontoid views.

This information is even more surprising when you consider that the information regarding the efficacy of lateral views had been around for four years when this survey was done.<sup>8</sup>

In 1998 Pasquale et al. conducted a comprehensive review of the literature on

behalf of EAST.<sup>30</sup> Following this EAST was able to make recommendations believed to be reasonably justifiable by the available scientific evidence and strongly supported by expert opinions.<sup>30</sup> A review in 2000 has developed a comprehensive guide for C-spine clearance, including measures taken in comatose patients:<sup>20</sup>

Altered mental status and return of normal mental status not anticipated for 2 days or more:

1. Three view radiographs (lateral – occiput to T1, AP – C2 to T1, Open mouth odontoid) with axial CT supplementation, at 3mm intervals with sagittal reconstruction, through suspicious areas or for inadequate views.

2. Axial CT images at 3mm intervals with sagittal reconstruction from the base of the occiput through C2.

3. All to be reviewed by an experienced physician.

4. If 1 and 2 are normal: flexion / extension lateral cervical spine fluoroscopy with static images obtained at extremes of flexion and extension.

5. Any neurological deficit proceeds to MRI.

Chui et al.<sup>6</sup> conducted a retrospective study of 14,577 blunt trauma victims and found the 1998 EAST guidelines to be very effective in detecting cervical spine injuries.

Perhaps the 2000 guidelines have finally established a definitive protocol for the detection of cervical spine injuries in the comatose patient. Prospective trials using such guidelines are needed.

Invited comments on the key questions raised are to follow:

- Should this patient have fluoroscopy?
- Can we safely remove his collar with these dynamic views?

References on page 7

## Review: Case of the Month: What About the Cervical Collar?

Clearing the cervical spine of injury in an unconscious or unreliable trauma patient is a difficult task. There is currently no single recognised method that excludes injury definitively. Current techniques of static imaging (3 views plain X-ray and CT scanning) approach a sensitivity of 100% when used in combination with each other. However, there is still the risk of an unstable ligamentous injury albeit much less than 1%. Dynamic flexion-extension views using bedside fluoroscopy can be effective in excluding unstable ligamentous injury but only when done by highly experienced radiologists, as the risk of causing injury is present.

In the patient presented by Mr. Rhodes, plain radiographs and CT scans of the cervical spine were considered normal. With normal dynamic fluoroscopy by an experienced radiologist, I

would clear the c-spine and remove precautions. If fluoroscopy were unavailable, I would remove the hard cervical collar and place a Philadelphia collar until able to clear the neck clinically. This may both lessen the risk of decubitus ulceration and provide some protection to a potentially injured cervical spine. Additionally, the collar serves to remind staff that the cervical spine is not definitively cleared. Although the risk of an unstable injury is very small in this patient following plain films and CT scanning, the consequences of potential injury are high enough to deter me from definitively clearing the cervical spine based on these images alone.

SK D'Amours MD.CM FRCS(C) Trauma Fellow, Liverpool Hospital

- The MRU will notify the MTS of all Category 7 patients being transported to referring hospitals in their region.
- All hospitals to which Category 7 patients are transported have available resources that meet the above criteria.
- A medical retrieval team will automatically be dispatched after notification by the Ambulance Service that a Category 7 patient is being transported to an urban / rural hospital.

### MANAGEMENT OF PATIENTS WITH SUSPECTED OR PROVEN SPINAL INJURY

**Question:** *Should patients with suspected spinal injury be transported to the MTS?*

- All patients who have an index of suspicion of spinal injury should have a hard collar applied and remain immobilised until the presence or absence of spinal injury can be determined.

#### GUIDELINE

Patients with spinal column injury with or without neurological deficit injured in SWSAHS should be transferred directly to the MTS. Transfer to a specialised spinal injury unit will be at the discretion of the Consultant Neurosurgeon at Liverpool Hospital.

#### PERFORMANCE INDICATOR

- Patients with spinal injuries with and without neurological deficit will be transferred to the MTS in SWSAHS.

### MANAGEMENT OF PATIENTS WITH BURN INJURY

**Question:** *Should patients with burns be transferred to the MTS or a Burn Unit?*

The unique problems and long term nature of the treatment of severely burnt patients frequently requires early intervention from specialised staff and dedicated Burns Unit. All patients being transferred to a Burns Unit should have a clearly documented fluid balance chart and a copy of the NSW Burns Transfer Information chart completed and with the patient.

#### GUIDELINE

Patients meeting the following criteria should be transferred to a specialised Burns Unit either directly or as soon as practical within 4-6 hours of injury;

- Full thickness burns > 5% BSA in any age group

- Partial thickness burns involving > 20% BSA in adults
- Partial thickness burns involving > 5% BSA in patients < 10 years or > 50 years.
- Inhalation injury
- Partial or full thickness burns involving the face, hands, feet, genitalia, perineum or skin over major joints
- Electrical burns, including lightning strike
- Significant chemical burns
- Lesser burns with complicating pre-existing disease or concomitant trauma that could complicate management, prolong recovery or adversely affect mortality
- Burn injury with special social requirements (e.g. suspected child abuse) or long term rehabilitation.

#### PERFORMANCE INDICATOR

- Patients meeting the above criteria are transferred directly to a specialised Burns Unit as soon as practicable, preferably within 6 hours of injury.

## Part 2: THE TRANSFER PROCESS

Delays are common in the course of inter-hospital trauma transfer for a variety of reasons including; the failure to initially recognise that the trauma patient requires transfer to a MTS, communication difficulties between the referring hospital, the transport / retrieval service and the MTS, administrative issues and inadequate patient preparation prior to the arrival of the transport / retrieval team. Some studies have demonstrated significant reductions in transfer times as a result of the institution of administrative policies or triage guidelines that have simplified and streamlined the decision making process.

#### COMMUNICATION WITH THE MTS

**Question:** *When and how should the referring Doctor contact the MTS?*

Once it is established that a patient requires inter-hospital transfer it is essential that this is promptly communicated to both the MTS and the retrieval service. The SWS Regional Trauma Registry 1995/99 report indicates that there is currently a significant delay in transferring trauma patients within the region. It would appear that up to 60% of delay relating to inter-hospital trauma

transfer is related to the time taken to notify the retrieval team. Establishing communication with the MTS / retrieval service not only serves to initiate the retrieval process but also facilitates contact with trauma experts that can provide practical advice in terms of patient management and suitability for transfer.

#### GUIDELINES

The medical officer at the urban / rural hospital should notify Liverpool Hospital of the arrival of a patient meeting trauma transfer criteria. This notification should be via the Trauma Hotline as soon as possible, but preferably within 20 minutes of patient arrival. This call will be received by the ICU Registrar.

A dedicated "Hotline" number should always be used to allow staff from referring hospitals to communicate directly with a member of the trauma team at the trauma service for all patients who potentially require High Dependency or Intensive Care admission.

#### PERFORMANCE INDICATORS

- Activation of the trauma hotline occurs within 20 minutes of the arrival of the trauma patient at the urban / rural hospital.
- The trauma hotline (9828 3666) is used to arrange the transfer of all trauma patients who might require intensive care / high dependency admission.

#### MODE OF TRANSPORTATION

**Question:** *How does the trauma patient get transported to the MTS?*

Whilst helicopter transportation has been demonstrated to be far quicker than road transport, the higher costs of air travel outweigh the significant time savings in this mode of transport. The benefits of air transport is reportedly related to the severity of the injury and demonstrated by some studies only in patients with a probability of survival of < 90% or when injured in rural or remote areas. Therefore, despite the apparent benefits of helicopter transportation, the types of patients whom it would benefit are still to be determined.

#### GUIDELINE

Trauma transfers should be carried out in a manner which transports the patient to a location where definitive management can be instituted as soon as practical. The following times are recommended for the Retrieval team within SWSAHS;



- Response time  $\leq$  10 minutes
- Scene time  $\leq$  30 minutes
- Transport time  $\leq$  30 minutes

## PERFORMANCE INDICATORS

- The time interval between time of calling the Retrieval team to time of departure from Base (response time) is  $\leq$  10 minutes.
- The time of arrival of the medical Retrieval team at the referring hospital to the time of leaving the referring hospital (scene time) is  $\leq$  30 minutes.
- The interval between leaving the referring hospital to arriving at the MTS (transport time) is  $\leq$  30 minutes ( $\leq$  50 for Bowral Hospital).

## PATIENT PREPARATION

**Question:** *How can the trauma patient be best prepared for transfer to reduce delays when the retrieval team arrive?*

Thorough preparation of the trauma patient is essential prior to inter-hospital transfer to minimise complications secondary to missed or inadequately treated injury. Whilst the transfer of patients may delay other surgical priorities, failure to investigate and treat significant injuries prior to transfer significantly increases morbidity and mortality. It is important to acknowledge, however, that the process of investigation, stabilisation and preparation for transfer are all limited by the available resources and practitioner experience at the urban / rural hospital and the need to expeditiously transport the patient to a location where definitive management can be achieved. Therefore, careful evaluation of priorities needs to occur to assess the best practice in each case. The implementation of the N.E.W.S. checklist can assist in streamlining the preparation of the trauma patient for safe transfer. The N.E.W.S. checklist supplements the concept of the primary and secondary survey with a checklist of whether each item is Necessary, Enough, Working and Secure.

## GUIDELINES

Prior to transfer the patients' airway, breathing and circulation should be stabilised. All significant haemorrhage must be controlled. A haemodynamically unstable patient with known intra-abdominal injury should have the bleeding controlled prior to transfer.

The Intensive Care Registrar from the MTS or medical doctor from the retrieval team should advise the referring hospital regarding patient

management and preparation for transfer using the established processes. In SWSAHS the N.E.W.S. system is to be utilised.

Attempts should be made to thoroughly assess the patient prior to transfer to determine the full extent of their injuries. All patients identified as requiring inter-hospital trauma transfer should be seen by the Consultant Surgeon or Surgical Registrar prior to leaving the primary hospital.

## PERFORMANCE INDICATORS

- Upon the arrival of the retrieval team patients will have been prepared for transfer as per the advice of the MTS / retrieval service and using the N.E.W.S. system.
- Transferred patients will have all life-threatening injuries identified and controlled prior to transfer.
- Transferred inter-hospital trauma patients should all have been reviewed by the surgical on call specialist or registrar at the urban or rural hospital.

## EDUCATION / TRAINING IN REFERAL HOSPITALS

**Question:** *How can we ensure optimum standards of care from referral hospitals?*

The evidence suggests that a strong association exist between MTS volume and patient outcomes. There are significant improvements in mortality and length of stay when the MTS volume exceeds 650 cases per year, especially in patients at high risk of adverse outcomes. This assertion has, however, not been fully supported in terms of specific practitioners' caseloads and outcomes. Whilst the implementation of the trauma bypass system has had the beneficial effect of transporting severely injured patients to definitive treatment sooner, it has subsequently reduced the volume of trauma cases seen in urban and rural EDs. It is difficult, therefore, to maintain standards of education, training and competency in advanced procedures within the urban and rural environments.

## GUIDELINES

The MTS will provide a minimum of one formal multidisciplinary trauma education session in each urban / rural hospital every six months.

All new registrars and senior registrars at the MTS who accept the care of trauma patients must have attended a trauma education and orientation program within one week of commencing their term.

## PERFORMANCE INDICATORS

- The MTS will provide a minimum of one education session for urban and rural hospitals every six months.
- All ICU, surgical and emergency registrars must undergo an education and orientation program clarifying their role in trauma care within one week of commencing duty at their respective hospitals.

## COMPOSITION OF THE RETRIEVAL TEAM

**Question:** *Who is responsible for transporting trauma patients between hospitals?*

The high acuity of many trauma transfer patients requires medical staff with adequate training in anaesthetics / intensive care (inotropic support, airway management & mechanical ventilation) who can undertake advanced procedures both prior to and during transportation. Whilst nurses and paramedics have been reported in the literature to be able to undertake a range of advanced procedures, it is also reported that they had a significantly lower success rate and ability to strictly follow protocols / procedures when compared to teams that included medical practitioners. Given the relative shortage of paramedics in the distant sectors of SWSAHS, most complex retrievals in this region will require the utilisation of the medical retrieval team.

## GUIDELINE

All patients requiring invasive procedures prior to or during transport, particularly airway management, must be transferred using a medical retrieval team.

## PERFORMANCE INDICATOR

- All patients requiring airway management or advanced procedures were transported to the MTS using a medical retrieval service.

## REFERENCE LIST

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# Case of the Month



## WHAT ABOUT THE CERVICAL COLLAR?

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### CASE HISTORY

32 year old male presented to police station following alleged assault. Subsequently collapsed and was brought to hospital by ambulance.

- M** - Assault with baseball bat.
- I** - Left sided scalp lacerations.
- S** - Haemodynamically stable. GCS13 (E3 V4 M6).
- T** - Hard collar.

#### Primary survey:

- A** - Vocalising but vomiting. Hard collar in situ.
- B** - Breathing spontaneously. AE R=L chest clear.
- C** - P 62bpm. BP 140/70
- D** - GCS 13. PEARL 3mm. Right sided weakness.

#### Secondary survey:

- Open head injury left occipito-parietal region with visible brain.
- GCS decrease from 13 to 8.

#### Treatment:

- Paralysed and intubated.
- Cervical spine X-ray: Lateral views C1-5 no obvious fracture or soft tissue swelling.
- CT head: Fractured left frontoparietal bone and zygoma with underlying cerebral contusion. Left sided subdural haematoma. Left-sided shift with compression of left lateral ventricle.

- CT cervical spine: C1-2 and C5-T1 no obvious abnormality.
- CT abdomen: No obvious injuries.

#### Subsequently:

- Left sided craniotomy and ICP monitor placed.
- Phenytoin and IV antibiotics.
- ICU.
- Further cervical spine views: Swimmers view inadequate. AP views – NAD. Open mouth odontoid - NAD

The patient remained relatively stable in ICU with ICP sporadically rising in response to handling. The hard collar was removed but C-spine precautions continue in form of sandbags and tape.



**The key question this case poses is; Can this unconscious patient with three normal plain cervical X-rays and a normal CT of C1-2 and C5-T1 have spinal precautions removed?**

### INTRODUCTION

It is hoped that this review would provide some insight as to whether you feel comfortable removing the patient's collar.

#### Incidence of Cervical spine injuries

The incidence of cervical spine injuries is thought to be in the region of 2.3 to 12% of all admissions for blunt trauma victims.<sup>1,2,3,4</sup> This number is increased in the group of patients with more severe injuries, with figures ranging from 5.9 - 34% of those with GCS<8.<sup>4,5</sup> Of cervical spine injuries 85.6 to 90 % are fractures of vertebrae, whilst around 10% are ligamentous or dislocation injuries.<sup>5,6</sup> Demetriades found 3.8% of c-spine injuries to be cord injury without fracture or dislocation.<sup>5</sup> The diagnosis of cervical spine injury is initially missed in around 4.6% of cases.<sup>1</sup> Inadequate x-ray views are the usual cause and the sites missed are most commonly the upper and the lower extremes of the cervical spine.<sup>1</sup> Delayed diagnosis (>1 day from admission) occurs in 4.2 to 22.9%.<sup>4</sup> Since our patient is in the GCS<8 category we

must assume his risk of c-spine injury is in the range of 5.9-34%.

#### Diagnosing Cervical Spine Injury

In trauma the c-spine is immobilised at the earliest possible opportunity. Those with severe head injury (GCS<8) are usually anaesthetised and intubated and eventually go to ICU. Immobilisation remains in place until injury can be excluded. Assessment of injury usually involves clinical examination and radiography. By applying certain clinical criteria, up to 99% of cervical spine injuries can be detected.<sup>7</sup> However, within these criteria it is stated that the patient must be fully alert and with no intoxication. In our ICU patient we are therefore unable to rely on clinical features and must rely more heavily on radiographic techniques. The standard lateral cervical spine view is commonly done in the ED. It has been shown that this single view misses around 15% of dislocations and fractures, 37-63% of which are potentially unstable.<sup>8</sup> The conventional 3 view series (lateral view / AP / open mouth

odontoid) is more reliable with a detection rate of around 90-99%.<sup>8,9</sup> These figures have been challenged by Woodring et al. who found the standard trauma series missed up to 61% of fractures and 36% of dislocations and subluxations.<sup>8</sup> Purely ligamentous injuries can be unstable<sup>10</sup> and are more difficult to detect on plain x-ray. Thirty-degree supine views have been shown to be reliable at detecting ligamentous injury.<sup>11</sup> Many therefore consider five c-spine views (Lateral / AP / open mouth odontoid / R+L obliques) to be a reliable 'standard series'.<sup>12</sup> Combining CT scanning with three plain views is another method, which has been shown to be effective. Though CT can miss horizontal fractures, when it is targeted to poorly visualised areas and reviewed in combination with plain views sensitivity approaches 100%.<sup>9</sup> Some authors recommend using helical CT to assess the complete cervical spine and have found this to be a useful investigative technique.<sup>13,14</sup> It has even been postulated that this is a cost-effective method of assessing the cervical spine of unevaluable patients given the unreliability of plain films.<sup>15</sup>



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