

*Contents:*

- ⊕ The Management of Posterior Urethral Injuries
- ⊕ Post Traumatic Thoracic Air Leaks
- ⊕ Trauma Care in Developing Countries

# TRAUMA

## Grapevine



### Introduction

In this issue Dr Manjul Joshipura shares with us the challenges for trauma care in developing countries. Coming at a time of Christmas, of peace and goodwill, it is an opportunity to reflect on our responsibilities to share in education, training and service delivery to developing countries.

Dr Joshipura has come as the Rowan Nick Scholar, funded by the Royal Australasian College of Surgeons to Liverpool Hospital to study trauma systems for three months.

Throughout Australasia there are many opportunities to obtain trauma training. With increasing development of Major Trauma Services in Australian states, these opportunities will increase. Through fellowship and care

many thousands of people will be helped worldwide. Through courses such as Essential Trauma Care and the National Trauma Management Course, such as utilised in India, DSTC is taking hold internationally, and with ATLS will form a template for care. Not only in developed but undeveloped countries.

The case review in this issue identifies another challenge of the AGS elderly trauma population that we have now got to deal with. Coupled with falls and the problems they pose.

From all in the Trauma Department at Liverpool Hospital we wish you a very peaceful Christmas and an exciting dynamic New Year.



## Early or Late: The Management of Posterior Urethral Injuries

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### Introduction

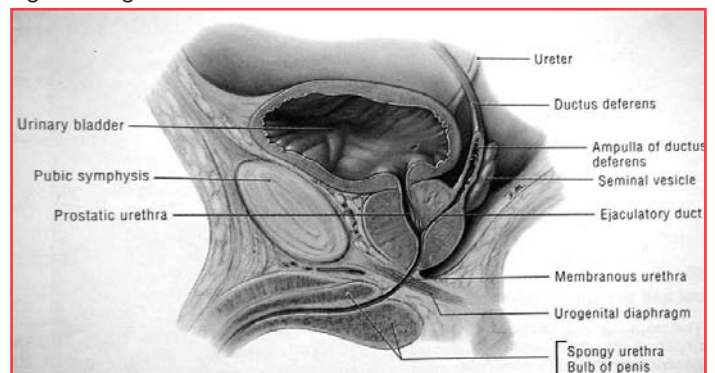
The management of posterior urethral injuries continues to be fraught with controversy. These injuries, which are rare in females due to short urethral length and protected retrosymphyseal position, range from urethral contusion with maintenance of epithelial integrity through to complete urethral transection and disruption. Pelvic fractures from motor vehicle accidents are responsible for the majority such that 14% of males sustaining pelvic fracture will have injury to the lower urinary tract and 7% of these will have partial or complete rupture to the posterior urethra<sup>10</sup>. We review the literature and together with our own experience at Liverpool Hospital suggest current guidelines for the management of these injuries.

### Anatomy

The urogenital membrane divides the urethra into anterior and posterior parts. The anterior urethra, which consists of penile and bulbar portions, extends from the external meatus to the membranous urethra. The posterior urethra is composed of

membranous and prostatic parts and extends from bladder neck to the distal sphincter mechanism.

Figure 1. Sagittal section of male urethra



Continued next page.



## Early or Late: The Management of Posterior Urethral Injuries

### Pathogenesis

The reported incidence of pelvic fracture associated urethral injury in males has significant variation: between 3-25%<sup>2</sup>. Of these 27% have concomitant intraabdominal injuries. It has long been misconceived that the predominant site of injury is the prostatomembranous junction. However recent evidence suggests that it is the bulbomembranous junction that is the site most prone to rupture<sup>1</sup>.

Traditionally posterior urethral injuries have been classified as complete or partial ruptures of the urogenital diaphragm. The injury is complete where no continuity exists between the two transected ends and partial where the rupture involves the full thickness of urethral wall but is only partially circumferential. The relative incidence of each injury is 73% and 27% respectively.

In 1977 Colapinto and McCallum put forward a revised classification system for posterior urethral injuries on the basis of radiographic appearances<sup>4</sup>.

Type 1	Posterior Urethra stretched but intact
Type 2 (Supradiaphragmatic)	Membranous urethra is partially or completely disrupted at the upper aspect of Urogenital diaphragm. Extravasation into pelvis.
Type 3 (Subdiaphragmatic)	Disruption of urogenital diaphragm with complete rupture of membranous urethra with injury to proximal bulbous urethra.

Table 1. Colapinto & McCallum classification of Posterior Urethral Injuries.

In 1997 Goldman and colleagues added a fourth type for injuries to the bladder neck and the prostatic urethra<sup>5</sup>. Koraitim et al argue that all pelvic fracture associated urethral injuries are a progression of the same insult<sup>6</sup>. They begin as cephalad stretch of the membranous urethra usually at the bulbomembranous junction leading to eventual partial then complete urethral rupture with retraction of the proximal urethral end while the distal end remains fixed to the perineal membrane. The resultant extravasation is into the pelvis. Where there is disruption of the perineal membrane in severe trauma the distal urethral end may retract into the perineum allowing extravasation in pelvis and perineum.

### Diagnosis

Posterior urethral injury should be suspected in all patients with pelvic fracture. The risk of urethral injury increases with the presence of blood at the urethral meatus, inability to void and haematuria. Urethral bleeding or gross haematuria is the best indicator of urethral injury with a reported incidence ranging from 91-100% of cases of urethral disruption<sup>7,8</sup>. There is however poor correlation between the extent of bleeding and the severity of the injury as a mucosal contusion or partial tear may result in extensive bleeding while a complete urethral transection may result in only slight bleeding. Inability or difficulty voiding may be caused by urethral disruption but may also be due to pain from the pelvic fracture or an empty bladder.

Examination may reveal a perineal haematoma or swelling from extravasated urine. On digital rectal examination the presence of a

boggy mass, indicative of a pelvic haematoma, can obliterate the outline of the prostate. Palpation of a free-floating prostate is diagnostic of complete urethral rupture but this is rarely noted as a result of haematoma and tenderness<sup>7</sup>.

The investigation of choice is retrograde urethrography and is recommended in all where there exists a high degree of suspicion of urethral injury. Ideally performed under fluoroscopic surveillance a ballooned catheter is inserted into the distal urethral and the balloon filled in the fossa navicularis to occlude the urethra. Films are then obtained while injecting 20-30mls of water-soluble contrast. Extravasation of contrast without filling the bladder is diagnostic of a complete rupture while extravasation with bladder filling is indicative of a partial rupture<sup>1</sup>.



Figure 2. Retrograde Cystogram demonstrating complete urethral rupture

### Treatment

The management of these injuries remains controversial due to the varying injury patterns, concomitant injuries, treatment options available and the limited expertise of most urologists due to the relative infrequency of these injuries. Initial management is concerned with patient resuscitation in accordance with EMST guidelines. The next step, bladder drainage, is achieved by the placement of a suprapubic cystostomy tube, either by open or percutaneous route. This allows accurate assessment of urine output whilst diverting flow and preventing further extravasation into surrounding tissues. Definitive management can only be considered once life-threatening injuries have been attended and the patient stabilised.

The aim of definitive management is to minimise the late sequelae associated with these injuries in particular stricture formation, incontinence and impotence. These complications may develop as a result of the primary insult or be iatrogenic. Thus treatment options should reconstitute a patent urethra while maintaining pre-traumatic sexual potency<sup>1</sup>.

The majority of partial posterior urethral injuries can be managed by:

- ¥ Suprapubic cystostomy (SPC)
- ¥ Descending Urethrogram (at 14 days)
- ¥ If patent, remove SPC
- ¥ If complete urethral obstruction, delayed urethroplasty
- ¥ Follow up (stricture surveillance)

Complete posterior urethral ruptures can be managed one of three ways: primary suturing of the distracted urethral ends, primary realignment with urethral splinting (with or without traction and performed surgically or endoscopically) or suprapubic cystostomy and delayed repair.

In 1929 Young described the first open surgical repair of a posterior urethral injury via a perineal approach. Immediate open repair involves exploration, with the potential for further haemorrhage, and difficulties in identifying structures. In addition periprostatic and periurethral dissection may damage neurovascular bundles, further increasing the risk of impotence. Furthermore surgical dissection may damage surviving elements of intrinsic sphincter mechanism and also convert partial injuries to complete<sup>1</sup>.

In 1934 Ormond and Cothran introduced primary realignment as a management modality. Apposition of the ruptured urethral ends was achieved and maintained by a urethral catheter and traction with concomitant suprapubic cystostomy. Since this original description there have been several techniques described to navigate a urethral catheter across the urethral gap. These have included sound to sound, sound to finger, placement under direct vision and combined antegrade tied to retrograde catheter procedures<sup>1</sup>. More recently realignment has been carried out endoscopically and under fluoroscopic control.

In 1997 Koraitim reported on the various techniques used to manage 871 patients including a personal series of 100 patients<sup>9</sup>. The results of this review are summarised in table 2.

	<i>Incontinence</i>	<i>Impotence</i>	<i>Stricture</i>
<i>Immediate &amp; early realignment</i>	5%	36%	53%
<i>Primary suturing</i>	21%	56%	49%
<i>Suprapubic catheterisation &amp; delayed repair</i>	4%	19%	97%

Table 2. Complications according to Treatment method

It was concluded that the gold standard was to perform delayed urethral repairs, at a minimum of three months, after the initial trauma using a one-stage perineal approach<sup>9</sup>. By this means incontinence and impotence can be minimised although there is almost certainty

regarding the development of strictures the majority of which can be managed endoscopically. Recently, primary realignment has been performed endourologically and radiologically thus removing the need and risks associated with exploration of the disrupted urethra. Realignment is better carried out between the first and second weeks post injury once resolution of the pelvic haematoma has begun and the patient in a more optimal condition. Ideally endourological repair should not increase the impotence rate as there is no periprostatic dissection and no resultant trauma to the cavernous nerves<sup>1</sup>.

Koitrin concluded in 1996 that primary realignment and suprapubic cystostomy did not compete but rather complemented each other in the management of posterior urethral injuries. He recommended primary realignment when there is a wide separation of the urethral ends or associated injury of the bladder neck or rectum<sup>10</sup>. Alternatively where the urethral rupture is complete, urethral separation is minimal or the urethra cannot be realigned easily, suprapubic cystostomy is recommended. Jepson and colleagues reported an impotence rate of 13%, incontinence 13% and the need for subsequent open urethroplasty as 10% with delayed endoscopic realignment.

### Conclusion

There exists a variety of techniques for managing posterior urethral injuries and ultimately the choice of treatment depends on a number of factors including injury type, degree of urethral end separation, associated injuries, condition of patient and facilities & experience of the treating surgeon. A proposed management algorithm is as follows:

- Resuscitation & management of injuries in accordance with EMST guidelines
- Suprapubic cystostomy, unless indication for realignment (either endoscopically or under fluoroscopic control) including: concomitant rectal, bladder neck or major distracting injury
- Descending urethrogram at 14 days
- If patent remove SPC
- If complete obstruction, delayed urethroplasty
- All cases require follow-up for stricture surveillance

Additional evidence for newer realignment techniques may soon be available enabling resolution of the ongoing debate regarding early or late repair of posterior urethral injuries.



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# Management of Post Traumatic Thoracic Air Leaks

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## Introduction:

One third of trauma patients present with thoracic injuries. The majority of these patients need no more than observation or chest tube placement.<sup>1,2</sup> However, some trauma patients develop persistent air leak preventing a pneumothorax from healing and thus prolonging their stay at the hospital. In a study by Etoch et al. from 1995 on of 379 consecutive patients requiring tube thoracostomy after traumatic injuries, 4% had the complication of undrained pneumothorax.<sup>3</sup> Another study, by Helling et al in 1989, reviewed 216 patients who required tube thoracostomies after chest injury during a 30 month period. Air leak persisted in 3% and 24% developed a recurrent pneumothorax.<sup>4</sup> Different approaches are used for managing air leaks<sup>5</sup> and this papers reviews the current knowledge on the topic.

## Pathophysiology of air leaks:

The cause of the an air leak can be parenchymal injury due to direct lung puncture, laceration caused by shear injury, and alveolar disruption due to crush injury or sudden increase in intra-thoracic pressure.<sup>1</sup> In addition, a leak can be caused or prolonged by an incorrectly positioned chest tube.

## Classification of air leaks:

Cerfolio et al have developed a both a quantitative and qualitative classification system for air leaks from thoracostomy tubes. The four types of air leaks are continuous, inspiratory, expiratory, and forced expiratory of which the two former are large and uncommon whereas the two latter are more frequently seen. Using an air leak meter the size of the leak can be measured on a scale from 1 to 7 (7 quantifying the largest). This classification system has been used to predict the duration of persistent air leaks after pulmonary surgery<sup>6,7</sup> and would mostly be of interest in moderate air leaks.

Rarely, patients present with tracheo-bronchial injuries which require early recognition and aggressive airway management for a successful outcome. In 1972 Bertelsen et al reported an incidence of 0.03 % for injuries to the trachea or major bronchi in an autopsy study on 1178 trauma deaths.<sup>8</sup> In a study by Lee et al in 2000, tracheal injury accounted for approximately 1 to 2 % of thoracic trauma admissions.<sup>9</sup>

## Management:

The management depends upon presentation. If a major air leak exists, there is often life threatening "Airway, Breathing, and Circulation" problems also. The patient may have major surgical emphysema and a tension pneumothorax. Immediate thoracotomy is indicated. In this situation, the challenge can in deciding which side of the chest to open. Generally a postero-lateral thoracotomy will provide the best access to the relevant bronchial tree. However in a patient with multi-system trauma, access to the abdomen, which is difficult with a postero-lateral thoracotomy, may be important. If there is a major air leak on the left side, the endotracheal tube can be pushed into the right main stem bronchus. This will buy some time by reducing the air leak and improving ventilation. Alternatively, a bronchial blocker may be used, especially if the air leak is from the right side.

A small proximal injury to the trachea may be managed by simple endotracheal intubation, which is maintained until the wound is sealed, usually 24-48 hours. A bigger or more distal injury may require a double lumen tracheal tube or single lung ventilation prior to surgical

intervention. It is vital that the cuff of the tube is inflated distal to the wound to prevent or minimize air leakage through the wound.<sup>10</sup> A standard oblique or transverse neck incision can be used on injuries to the cervical part of the trachea, whereas a right thoracotomy exposes most thoracic tracheal injuries.<sup>11</sup> Only in some complex or distal bronchial tree injuries is a left thoracotomy or sternotomy required.<sup>12</sup>

Less frequently, the critical presentation includes a simple tension pneumothorax or a large pneumothorax. These patients should be managed non-operatively. They may require more than one chest drain to fully expand the lung. The major problem which can occur with an air leak is a pneumothorax that will not resolve, leading to difficulty with oxygenation and even delayed emphysema.<sup>13</sup>

An air leak can be confirmed by detection of bubbling in the water seal chamber. All air leaks will produce bubbling if the patent chest tube is put on water seal and suction. To ensure that air leaks are not due to displacement or incorrect connection of the chest tube, the entire system must be carefully checked. If the perforations in the end of the tube are outside the chest wall, not only will an air leak result but the lung may collapse and the likelihood of infection will increase. Is it important to only temporarily clamp a chest tube to avoid a recurrent and even tension pneumothorax.

Moderate air leaks are often successfully treated with chest tubes connected to suction of up to 20 cm H<sub>2</sub>O.<sup>14</sup> A study by Martino et al (1999) on trauma patients initially treated with chest tubes connected to suction, suggested that a short trial of water seal alone before removing the chest tubes would allow occult air leaks to become clinically apparent, thus predicting a recurrent pneumothorax.<sup>15</sup> Cerfolio et al (2001) showed that chest drains with air leaks connected to water seal without suction from day one after pulmonary resection, allowed a pneumothorax to resolve more quickly and shortened the hospital stay, compared to chest drains connected to suction. These results are supported by Marshal et al (2002). However, the approach of immediate water seal is not applicable to chest tubes with large air leaks (4 or larger on Cerfolios scale). In these cases, the patient may develop an enlarging pneumothorax or a subcutaneous emphysema. Cerfolio suggests the use of minimal amount of suction needed in these patients.<sup>6,7</sup>

A study by Schermer et al. in 1999 compared video-assisted thoracoscopic surgery (VATS) with non-operative management of patients with air leaks persisting longer than 3 days. The patients involved in this study were otherwise ready for discharge and the VATS method showed significantly less days with chest tubes in place

and a shorter stay in hospital.<sup>16</sup> These results were supported in a study by Carillo et al from 1998.<sup>17</sup> However, it was not clear whether the patients in the non-operative group had chest tubes connected to suction or water seal only.

### Conclusion:

The management of air leaks often seems to be based on habit or practical aspects rather than on statistical evidence. Major air leaks require immediate or even urgent surgery if the patient is in extremis.

Moderate leaks in the lung should be treated with chest tubes on low suction, whereas a chest tube placed to water seal seems to be advantageous in smaller leaks. There is a role for thoracoscopic intervention where air leaks persist longer than 3 days. Most moderate to minor air leaks seal spontaneously but cardiothoracic consultation may be important.

\*Drs Croner and O. Leonardsson visited Liverpool for a month on a scholarship from Sweden.

## EDITORIAL COMMENTS

In "Management of Post Traumatic Thoracic Air Leaks," Croner and Leonardsson have reviewed the range of traumatic tracheal and bronchial injuries and the treatment of those. They promote the use of a new classification system and method of controlling thoracostomy air leaks in trauma patients. The technique places the chest tube on water seal alone rather than on suction when the air leak is expiratory or forced expiratory and small to moderate in size. Theoretically, this minimizes the escape of air from the alveoli and allows the leak to seal more quickly. This technique has been shown to significantly reduce air leaks after pulmonary resection for lung carcinoma.

The conclusion drawn from the lung

resection population may also be applicable to the trauma population. Care should be taken as this population may have "missed injury" and penetrating trauma may create more significant lung injury and larger air leaks. The trauma population, however, is unlikely to have the same degree of underlying obstructive and restrictive lung disease with inherent difficulty in healing and resolution of air leaks. Every effort to reexpand the lung and maximize nutrition should be made. If this technique is adopted, vigilance is advised for that proportion of the thoracic trauma population which may develop a pneumothorax with the chest tube on water seal (i.e. those with an inspiratory or expiratory air leak and with a leak moderate in size).<sup>1</sup> It is contraindicated in those with a continuous or large air leak.

The motivation for adopting this technique is to allow chest tubes to be removed earlier and, thereby decrease length of stay. Although thoracostomy air leaks have been significantly reduced by using water seal alone, randomised studies carried out in a large trauma population are required to show improved length of stay. The recent use of fibrin sealants in video-assisted thoracoscopic surgery may also have an impact on the reduction of air leaks and hospital stay.

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## Case Report by Oscar Aldridge, University of Tasmania, September 19, 2003

### Pre-hospital information

- (M) Fall of 1.5m from ladder
- (I) Shortening and rotation of left leg
- (S) RR 20bpm, AE L=R, SpO2=97%  
P 72bpm, BP 155/75  
GCS=15 throughout
- (T) Hard collar, leg splint, methoxyflurane

### Emergency

#### Primary survey

- A OK
- B RR 20bpm, AE L=R, SpO2=99%
- C P69/m, BP 158/79
- D GCS=15, nil apparent distress

### Secondary survey

- Head, neck, chest, back, upper limbs: NAD
- Abdo: soft, non-tender, bowel sounds present, palpable liver edge
- LLL: shortened, rotated, swelling and decreased ROM to hip, good movement, pulses and capillary refill distally

### Summary of imaging

- (L) Hip XR:
  - #(L) acetabulum w. central dislocation of femur
  - #(L) iliac wing
  - #(L) inferior pubic ramus

- CT pelvis/abdo: Intra/retro-peritoneal haematoma w. superomedial displacement of (L) kidney & insinuation of bowel loops.

### Subsequently

- What is the most likely outcome?
- What can we do to optimise care?



## Challenges to Trauma Care in Developing Countries:

Manjul Joshipura, Rowan Nicks Scholar, Trauma Department, Liverpool Hospital

### Introduction

Injury accounts for 16% of the global burden of disease<sup>1</sup>. The burden of death and disability from injury is especially notable in low and middle-income countries. The vast majority, approximately 90%, of the total burden of injury occurs in such countries. Of the 1,170,700 people killed due to trauma in 1998, 141,000 were in industrialized societies, while more than one million lived and died in Africa, Asia, South and Central America, the Caribbean, the Middle East, and Central and Eastern Europe<sup>2</sup>. This burden is set to rise in next two decades to be one of the leading killers in these countries<sup>1</sup>. Clearly there is direct relationship between injury mortality burden and the economic development of the country. With same severity of a major multi system injury, the probability of survival is six times worse in developing countries<sup>3</sup>. Decreasing the burden of injuries is among the main challenges for public health in these countries. There are number of challenges to the delivery of efficient care for injured persons in developing world — many of them are surmountable with limited resources.

### Disparity in trauma outcomes

There are notable disparities in mortality rates for injured patients around the world. For example, one study looked at the mortality rate for all seriously injured (defined as injury severity score of  $\geq 9$ ) adults in three cities in countries at different economic levels. The mortality rate (including both pre-hospital and in-hospital deaths) rose from 35% in a high income setting to 55% in a middle income setting to 63% in a low income setting<sup>4</sup>. Considering only patients who survive to reach the hospital, a similar study demonstrated a six fold increase in mortality for patients with injuries of moderate level severity (injury severity score of 15 — 24). Such mortality increased from 6% in a hospital in a high-income country to 36% in a rural area of a low-income country<sup>5</sup>.

In addition to an excess mortality, there is a tremendous burden of disability from extremity injuries in many developing countries<sup>6,7</sup>. By comparison head and spinal cord injuries contribute a higher percent of disability in high-income countries<sup>8</sup>. Much of the disability from extremity injuries in developing countries should be eminently preventable with low cost improvements in orthopedic care and rehabilitation.

### Surveillance

In absence of a sound injury surveillance system, the interventions and policy for the care of the injured continue to be adopted without much evidence. Government reports on accidents and violence in developing

countries are almost universally based upon police data, which are typically incomplete and unreliable<sup>9</sup>. It is estimated that in South East Asian countries, every trauma death, nearly 10—20 people will get hospitalized and 50—100 will receive emergency care in hospitals<sup>10</sup>.

### Education and Training

ATLS<sup>®</sup> is a well-established programme promoted by American College of Surgeons<sup>11</sup>. It has been established formally in 42 countries including 23 high-income countries, 17 middle income countries and 2 low-income countries. Formal promulgation to low income countries has been hindered by start-up costs of around \$80,000 per country<sup>12</sup>. Continuing education courses have been documented to improve the process and outcome of trauma care however there is no formal programmes adopted by surgical colleges or the governments in most of these countries. There are sporadic attempts in this direction in Africa, India and elsewhere with moderate success. Large proportion of health care workers continues to remain deprived of the formal education and training in basic trauma life support skills and knowledge, contributing to sub-optimal care in given resources. Prior surveys from some countries have indicated a dearth of such educational programmes, trainers and materials<sup>13</sup>.

### Trauma Systems

Almost all of the evidence of the effectiveness of improvements in the organization of trauma care services comes from developed countries. In most cases the better organization comes in the form of two related activities, trauma center verification and trauma system planning. Verification applies to a review of individual facilities as to their completeness for a variety of items, including human resources (e.g. availability of personnel with certain qualifications), physical resources (equipment and supplies), and several administrative and organizational functions, such as quality improvement. Trauma system planning implies several integrated functions, including political jurisdictions designating which hospitals are to fill the roles of trauma centers at varying levels of complexity, ranging from large urban trauma centers to small rural hospitals. It also implies planning as to emergency medical services, prehospital triage regarding which patients should go to which types of designated facilities, transfer criteria, and transfer arrangements between hospitals.

Even with the above knowledge supported by a good evidence, the concept of trauma system is yet to catch up in majority of developing countries. In a few urban centres, some efforts are under way to establish EMS and trauma system but that is largely "exclusive" in nature with "trauma centres" coming up catering

to only seriously injured patient in the community. There is no statewide medical supervision, legislation, public participation or political commitment to support the trauma system development in addition to lack of resources<sup>14</sup>.

### Prehospital Care

Prehospital care is virtually non-existent in most rural and semi-urban areas throughout the developing world and implementation of the 'golden hour' concept is still an unachieved goal<sup>14</sup>. The concept of a coordinating agency and a designated authority is restricted mainly to urban areas in some countries. Quite often there is an overlapping of private and public facilities and ambulance services in an urban areas. Gross discrepancy is seen in prehospital services between urban and rural settings, as well as between paying and non-paying patients. In the absence of guidelines and trained paramedical staff, decisions about evacuation of the victim and the choice of the destination hospital are made on an individual-case basis. These choices are often made at the behest of patients or their kin. Formal licensing to run an ambulance service is not mandatory in many countries. Ambulance services are run by a multitude of organizations including government, police, fire brigades, hospitals and private charities. The absence of minimal educational and training standards for paramedics brings in unskilled manpower to handle the most delicate of tasks. Some private hospitals in large cities offer efficient prehospital care, but this covers too small an area and too small a segment of the population. In most countries no national or regional guidelines exist for triage, patient-delivery decisions, prehospital treatment plans and transfer protocols. Policies, procedures and regulations governing medical directions are not in place therefore resources, training and personnel for prehospital services remain poorly defined leading suboptimal care for the injured.

### Definitive Care

Definitive care for trauma victims is offered by government hospitals, majority of, which remain over burdened and underfunded. Further, such hospitals often lack trained staff, adequate infrastructure and supply of consumables. Such establishments struggle to manage severely injured patients, resulting in substandard care and high mortality. Only a few hospitals have set protocols for triage. Often, the casualty medical officers are the only physicians available to provide resuscitation. Their level of training and experience in providing life support is not uniform. The concept and practice of forming dedicated trauma-response teams is yet to

percolate beyond tertiary-care hospitals. In acute and elective management of trauma patients, only a small number of surgeons follow ATLS taught or locally developed clinical protocols.

There are no dedicated trauma surgeons in most countries in the developing world. Trauma surgery is not a recognised medical specialty and often neglected in absence of adequate training and appropriate resources for diagnosis and treatment. Clinical decisions are often delayed, in the absence of clear perceptions of clinical responsibility amongst specialists, putting patients with multi-system injury at a greater risk. Referral protocols and linkages between rural and urban hospitals are weak. Services of dedicated centres offering specialised care for certain injuries (e.g. Paediatric, Burns, Spine etc.) are not necessarily available to the entire population.

### Current Efforts to Improve Trauma care in Developing Countries

Current efforts to improve the delivery of trauma care in developing countries can best be termed as "fragile" and "sporadic". The World Health Organization (WHO) is playing an important role in meeting this challenge. In particular, the Department of Injuries and Violence Prevention (VIP) has spearheaded efforts to improve the spectrum of injury control activities. These include improving and standardizing injury surveillance systems; promoting injury control policy initiatives for violence, traffic, and other major sources of injury; and promoting low cost improvements in injury care, in both the prehospital and hospital based arenas. There are also a number of professional associations, NGOs, academic institutions, governments and other individuals working to reduce the burden of

injury in developing countries. However all of these efforts are needed to be coordinated and adequately strengthened to meet this challenge.

Essential Trauma Care (ETC) Guidelines project is such a co-ordinated effort between WHO and International Association for Surgery of Trauma and Surgical Intensive care (IATSIC)<sup>15</sup>. A central theme to the guidelines is to achieve improved outcomes for injured patients by better organization and planning of trauma care services. There is well-documented evidence of the benefit of such improvements in organization and planning in the form of trauma system implementation in Australia, the United States, Canada, the UK and many other high-income countries. In part, the improved survival and functional outcome among injured patients in developed countries comes from high cost equipment and technology. Unfortunately, much of this may be unaffordable to the average injured person in the world for the foreseeable future. However, much of the improvement in patient outcome in higher income countries has come from improvements in organization of trauma care services<sup>16</sup>. Improvement in the organization of trauma services should be achievable in almost every setting and may represent a way to improve patient outcomes in a cost-effective fashion. This is the basis of the Essential Trauma Care project. The Essential Trauma Care Project envisages making improvements in organization and planning that are low in cost in comparison to the cost of the existing treatment system itself. It lists all elements of trauma care and provides a flexible template checklist of these elements at a range of health care facilities — from a village health post to university teaching

hospitals.

Another area where some tangible efforts are seen is trauma life support education for doctors and other health care workers. Some examples of such efforts are listed: National Trauma Management Course (NTMC) has been developed and implemented by IATSIC. It has been established principally in India in partnership with the Academy of Traumatology (India). Primary Trauma Care Course is administered by the PTC Foundation. It has been funded, in part, by the World Federation of Societies of Anaesthesiologists (WFSA). It has been put on in 23 countries in Africa, Asia, and South America. Kwame Nkrumah University of Science and Technology (KNUST) Trauma Course is developed in response to the particular needs of rural hospitals in Ghana, which are almost exclusively staffed by GPs.

Trauma Team Training course (TTT) is run collaboratively by the Injury Control Center in Kampala, Uganda and the Canadian Network for International Surgery. There is a need for some credible research to ascertain their impact on trauma care services.

### Conclusion

There is gross disparity in trauma care services between the developed and developing world adding significant burden to global burden of injury. By 2020 is expected to be the third leading causes of death even in developing countries. The awareness and efforts to contain this epidemic are lacking globally including even in those countries. This burden can be minimised by efforts to prevent injuries and improving trauma systems. Some of the strategies to address this could be resource intensive but there is a scope for many low-cost high-yield interventions for improvements in training and education, organisation and planning in the trauma systems in middle and low income countries.

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## Meetings



### Definitive Surgical Trauma Care Course (DSTC)

Liverpool Sydney 28th and 29th July 2004  
Melbourne November 17th and 18th 2004  
For both courses Contact: Michael Sgrue or Charmaine Miranda (61 2) 9828 3928  
Email: charmaine.miranda@swsahs.nsw.gov.au

### Austrauma 2004

February 20-21st Parramatta Sydney  
Contact Greg Weir 98457458

### SWAN 12

SWAN 12 will be held on the 30 and 31 July 2004  
Bringing to you a mine 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  
Phone: (61 2) 9828 3927  
[http:// www.swsahs.nsw.gov.au/livtrauma](http://www.swsahs.nsw.gov.au/livtrauma)

### World Congress on Abdominal Compartment Syndrome

December 6-8th Noosa Queensland 2004  
Contact: Michael Sgrue or Charmaine Miranda (61 2) 9828 3928  
Email: charmaine.miranda@swsahs.nsw.gov.au

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