An audit of the quality of care of traumatic brain injury at a busy regional hospital in South Africa

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Abstract

Access to care by a dedicated neurosurgical unit is limited in the developing world, and the vast majority of patients who sustain a head injury are managed by general surgeons. Prevention of secondary brain injury is paramount. While the principles of management are relatively straightforward, delivering this care may be difficult. This audit looks at the spectrum of head injuries presenting to a busy regional hospital and attempts to measure the quality of care offered to these patients.

Patients and methods. The audit includes three separate sections. The first is a prospective audit of all patients with a traumatic brain injury presenting to the Accident and Emergency (AE) department at Edendale Hospital, Pietermaritzburg, over a 2-month period. The next two sub-audits consist of a random review of referral letters and AE clerking notes to assess the quality of care received by these patients. A total of 25 referral letters and 28 AE inpatient notes were randomly chosen for review and compared with agreed standardised markers for quality of care.

Results. Over the 2 months October and November 2007, 150 patients with a head injury were seen in the AE department. Of these 117 were male. A total of 76 were discharged home after investigation with a head injury warning chart, 49 were admitted to the general wards, 11 were admitted to the surgical intensive care unit, 10 were referred to the neurosurgical centre in Durban, and 4 died in the AE department. Of the 10 who needed advanced neurosurgical care, 3 required urgent burr-holes before referral. One of these patients died. All the remaining 9 patients who were transferred to the neurosurgery unit survived. The referral letters and AE clerking notes revealed major deficits.

Conclusion. Traumatic brain injury is a common problem. Only a small subset of patients require specialised neurosurgical care. Although many patients with intracranial injury can tolerate the delay associated with transfer, some cases are acute and urgent intervention by non-neurosurgeons is needed. Prevention of secondary brain injury is poorly understood and not prioritised. This situation needs to be improved. The introduction of formalised standard referral and management sheets may help to improve care.

Traumatic brain injury (TBI) is a common clinical problem with significant long-term morbidity. Minimising this morbidity requires aggressive attempts to prevent secondary brain injury. The major early causes of secondary brain injury are hypoxia, hypovolaemia, hypoglycaemia and raised intracranial pressure (ICP). The first three conditions may be prevented by relatively simple clinical interventions that can be performed at almost any level of health facility and attempts to measure the quality of care offered to these patients.
Methodology

Edendale Hospital is a large regional hospital in Pietermaritzburg and admits over 300 trauma patients a month. It is the regional referral centre for western KwaZulu-Natal and serves a population of 3 million people. Although there is a tertiary hospital in the Pietermaritzburg metropolitan complex with advanced intensive care and radiological services, the nearest neurosurgical unit is situated at Inkosi Albert Luthuli Hospital in Durban, 80 km away. We follow the guidelines from the academic Department of Neurosurgery at the University of KwaZulu-Natal for the investigation and assessment of head injuries at our centre. Fig. 1 summarises these guidelines.

A prospective audit of all patients with a head injury presenting to the AE department at Edendale over a 2-month period was undertaken. Two sub-audits were performed. These consisted of a random review of referral letters and a random review of AE clerking notes and inpatient observations to measure the quality of care received. A total of 25 referral letters and 28 AE and inpatient observations were selected for review and compared against previously agreed standards for referral and management. These standards were agreed upon by the authors and were based on the management guidelines from the University of KwaZulu-Natal’s Department of Neurosurgery and published international guidelines (listed in Figs 1 and 2). Fig. 3 is a copy of the head injury warning chart given to all caregivers of patients who are discharged from our institution after a head injury.

Results

Over the 2 months October and November 2007, 150 patients with a head injury were seen in the AE department. Of these 117 were male. A total of 76 were discharged home, 49 were admitted to the general wards, 11 were admitted to the surgical intensive care unit, 10 were referred to the tertiary neurosurgical centre 80 km away, and 4 died in the AE department. Table I summarises details on the patients who required admission. The mechanism of injury was assault (41%), motor vehicle collision (28%), fall from a height (3%), and gunshot wound to the head (3%). In the remaining 25% of cases the mechanism was unrecorded. Of the 10 patients who required transfer to a neurosurgical unit 9 were males. The average age was 27 years (range 8 - 78 years). The mechanism was assault in 8 cases and a fall in 2. The documented pathology was extradural haematoma (4 cases), subdural haematoma (3), depressed skull fracture and contusion (2), and traumatic hydrocephalus (1). Of the group requiring transfer to the neurosurgical centre only 5 presented to the AE department on the day they were injured. In the remaining 5 the delay between injury and presentation was 2 days (2 cases), 4 days (1), 12 days (1) and 14 days (1). An operation was required in 8 of the referred group. The average length of stay was 9.8 days (range 1 - 16 days). There was 1 death in the operative group. The remaining patients who underwent operations were all subsequently discharged. The average delay in transportation of patients to the neurosurgical centre was 7 hours. In 3 of the patients with an acute extradural haematoma long delays in transfer and acute neurological deterioration necessitated emergency burr-holes being performed by the general trauma surgeons before transfer to the neurosurgical centre. One of these patients died. The patients who died in the AE department all had a GCS of 4 on presentation. Autopsy revealed diffuse axonal injury in all cases. A random sample of 25 referral letters was selected for review. Table II summarises the referral letters. The history was recorded in all the referral letters reviewed, the GCS

Fig. 1. Head injury management criteria, University of KwaZulu-Natal.

Fig. 2. Minimum expected level of care for a patient with TBI at Edendale Hospital.
in 88%, a management plan in 75%, associated localising signs in 50%, and the condition of the pupils in 13%. In none of the referrals was an assessment of the integrity of the cervical spine recorded. A random sample of 28 inpatient records was also selected for review. Tables III and IV summarise the inpatient records and observations. In 57% of cases the reason for admission was not recorded, in 42% a skull radiograph was omitted despite being indicated, and in 15% a computed tomography (CT) scan was omitted despite the case meeting our criteria for this investigation. In the management plans of this group there were no recorded orders for supplemental oxygen and intravenous (IV) fluids. Clear instructions to perform neurological observations were omitted in all cases. In the observation charts of this group the GCS was recorded in 92%, the state of the pupils was recorded in 71%, pulse rate and blood pressure were documented in 70%, oxygen saturation was only recorded in 42%, and neither blood glucose readings nor core body temperature were ever recorded.

**Discussion**

TBI is a major global public health problem and the World Health Organization (WHO) estimates that approximately 10 million people are affected annually.\(^1\)\(^2\) This burden is spread throughout the world, but is especially acute in developing countries. WHO statistics show that Latin America and sub-Saharan Africa have a significantly higher incidence of TBI (150 - 170 per 100 000) than the global rate of 106/100 000. In the developing world there are many risk factors for TBI. Of note is that intentional trauma is more common than unintentional trauma as a cause of TBI. This is in keeping with most reported forms of trauma in South Africa. Throughout the world, access to acute specialist neurosurgical services is limited.\(^3\)\(^4\) This is especially true in our environment, and the situation is unlikely to change in the foreseeable future. The care of TBI will remain largely in the hands of generalists: referring staff, paramedical staff, AE doctors, trauma surgeons and intensive care staff. These diverse groups will interact with the patient as he or she passes along a continuum of care from initial receiving point to definitive management. It is imperative that the ‘chain of care’ should not be broken at any point. If the chain of care is broken, hypoxia, hypovolaemia or hypoglycaemia may develop and exacerbate the neurological damage.\(^7\)\(^8\) The generalist’s role is to co-ordinate this chain of care to prevent secondary brain injury while identifying patients who will benefit from advanced neurosurgical care. Once the need for
specialist neurosurgical intervention has been identified, it is
the responsibility of the managing generalist to ensure timely,
safe and appropriate transfer to a definitive centre.

Referral of patients from peripheral hospitals to the regional-
centre appears to be problematic. The lack of information
on key physiological parameters in the reviewed referral let-
ters suggests that the pathology being treated is poorly under-
stood. Poor referral and communication translates into poor
management. The problem we have identified in our series
is a common one throughout the literature.9-13 Strategies
designed to improve the level of communication generally
revolve around the use of standardised referral letters and
enforced protocols. These have been shown to improve the
level of communication between units and hospitals and
when combined with tick box style checklists act as prompts
and stimuli for appropriate investigation and treatment.9-13
Such a letter needs to be introduced on a region-wide basis
to be effective.

More than half of the patients in our study did not require
admission and were discharged to the care of their fami-
lies. Provided there is no skull fracture and the patient is
fully conscious with no significant loss of consciousness or
amnesia, we are happy to discharge a patient into the care
of accompanying and responsible family members. A docu-
ment detailing signs of raised ICP and instructing the patient
to return urgently if indicated is given to the accompanying
family on discharge (Fig. 3). Loss of consciousness with
amnesia, and signs and symptoms of raised ICP such as blur-
ing of vision, headache, vomiting or a skull fracture, prompt
admission.7,8 The guidelines for CT scanning published by
the academic department of neurosurgery are relatively con-
servative with regard to its use (Fig. 1). A GCS of 10 or lower
and any depressed level of consciousness in the presence of a
skull fracture or localising sign are indications for an urgent
CT scan. Patients with a GCS of 11 - 14 and no localising
signs or skull fractures only qualify for a CT scan during
working hours. However, the international trend seems to be
towards more liberal use of the CT scan.14-17 The empha-
sis on managing patients who do not meet the criteria for
emergency CT scan is admission and regular ‘neurological
observation’. The principle is that with adequate observation
acute deterioration will be detected early and appropriate
interventions instituted. However, our series highlights the
concerns that physiological parameters are poorly monitored
and that there is very little quality control of the neurological
observations.

Inadequate observation of the head-injured patient in hos-
pital is not unique to South Africa. In the USA it has been
shown that the frequency of observations performed by the
attending staff was inadequate to detect subtle and early
signs of deterioration.8,14,15 In the UK ‘neurological observa-
tions’ are generally performed by non-specialist nursing and
medical staff without any neurological training. The situa-
tion is similar in our environment. Lack of basic observation as
well as failure to check blood glucose and oxygen saturation
levels imply that care is substandard. In a busy general ward
with no dedicated neurosurgical nursing staff and without
dedicated observation areas it is unlikely that we will be able
to improve the quality of observation. Staff not adequately
trained in neurological assessment are unlikely to detect
subtle changes in the patient’s condition.

One solution is to liberalise the indications for CT scan-
ing. This has been the trend in most guidelines published
in the developed world4,14-17 and there is good evidence that
a negative CT scan after a head injury allows a clinician to
discharge a patient safely. The international trend is towards
a much more aggressive use of CT scanning than our local
guidelines. However, this approach may not be easily appli-

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### TABLE III. SUMMARY OF AE ADMISSION NOTES (N=28)

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<td>Instructions to perform neurological observations</td>
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<td>Need for IV line</td>
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<td>Need for oxygen</td>
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### TABLE IV. SUMMARY OF RECORDED OBSERVATIONS (N=28)

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We need to find the reasons for such non-compliance. It appears that our local guidelines are not being followed, and 15% of patients are not being scanned when indicated. Compliance with CT scanning was much better, with only 1% of patients not being scanned. Poor compliance with these guidelines is widespread in South Africa for TBI at present, although various local guidelines are in use (Fig. 1). However, our series revealed major protocol violations and omissions. Failure to institute aggressive intracranial pathologies such as acute extradural haematoma and that relatively simple clinical interventions are being omitted. In general, protocols and guidelines are not being followed, and cervical spine assessment was not done at all. Skull radiographs were not performed by non-neurosurgeons have been shown to be a safe and viable option. The deaths in the AE department represent unsalvageable injuries. All these patients had extremely poor comprehension of the death in hospital. The successful use of protocols is widespread and that relatively simple clinical interventions are being omitted. In general, protocols and guidelines are not being adhered to. It is unlikely that access to advanced acute neurosurgical care will improve in the immediate future in South Africa, and it will remain the responsibility of general surgeons to care for these patients. Surgeons involved in acute care at all levels need to provide leadership if we hope to improve the care offered to patients with TBI. We need to develop and enforce protocols and to agitate for resources to manage these patients more appropriately.

Conclusion

TBI is a major problem in South Africa. The vast majority of these patients will never see a neurosurgeon and their care will continue to rest with generalists. Unfortunately, the care of TBI appears to be deficient in many respects, and TBI is a neglected problem in our hospitals. The quality of referral is poor and communication is lacking; in hospital there are major protocol violations and omissions. Failure to institute basic clinical interventions such as blood glucose level monitoring, intravenous fluid administration and supplemental oxygen will result in secondary brain injury which serves to exacerbate the primary injury. Many of the patients who are referred through to neurosurgical units are a self-selected group who have relatively chronic and indolent pathologies. In large general hospitals remote from specialised neurosurgical services, generalist trauma surgeons will need to be able to perform burr-holes as temporising measures in a select group of patients. It is important that this skill be taught and maintained.

In view of the volume of patients sustaining TBI it is of concern that care is poor. Referral and inpatient documentation implies that the pathophysiology is poorly understood and that relatively simple clinical interventions are being omitted. In general, protocols and guidelines are not being adhered to. It is unlikely that access to advanced acute neurosurgical care will improve in the immediate future in South Africa, and it will remain the responsibility of generalists to care for these patients. Surgeons involved in acute care at all levels need to provide leadership if we hope to improve the care offered to patients with TBI. We need to develop and enforce protocols and to agitate for resources to manage these patients more appropriately.

REFERENCES


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REFERENCES


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### BASIC SURGICAL SKILLS COURSES 2010

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22nd BIENNIAL SURGICAL SYMPOSIUM 2010

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PRETORIA CONTROVERSIES VASSA MEETING 2010

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