

# Neurosurgical Coverage in Bandung : *Essential, Desired, or Irrelevant for Good Trauma Patient Care*

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**Introduction:** As a result of many factors, the availability of neurosurgeons (NS) to care for trauma patients (TP) is increasingly sparse. This study examines the profile of head-injured (HI) trauma patients in Bandung and their actual need for the specific expertise of a neurosurgeon.

**Methods:** The Neurosurgical Department, RS. Hasan Sadikin (NDRSHS) data base was queried for specific information relating to the volume, nature, timeliness, and outcome of HI TP from September 2010 – August 2011.

**Results:** Total number of NDRSHS data base patients studied was 5.274, of which 2.342 (44,4%) had a reported HI. Mild HI represented 30,6% of all TP and 68,9% of HI. Moderate HI was reported in 9,3% of all TP and was 20,96% of HI. Severe HI was reported in 4,49% of all TP and was 10,1% of HI. Craniotomy was performed in 133(5,68%) of all HI (2,52% of all TP). Mean Glasgow Coma Scale score (GCS) of craniotomy patients was 9, and 15 for the noncraniotomy group. Subdural hematoma occurred in 11,7% of HI (5,2% of TP), with 13% undergoing crani. Epidural hematoma occurred in 282(12,04%) of HI (5,3% of all TP), with 17% undergoing crani. Intracerebral hematoma occurred in 171(7,3%)of HI (3,2% of all TP). Median time to OR for all craniotomy was 13 hours. No craniotomy was performed within 1 hour of hospital admission.

**Conclusions:** Care of TP with HI rarely requires the explicit expertise and immediate presence of a neurosurgeon due to volume and nature of care. Immediate availability of NS is not essential if a properly trained and credentialed trauma surgeon or other health care provider can appropriately monitor patients for neurologic demise and effect early transfer to a center capable of, and committed to, operative and postoperative neurosurgical care.

**Key word:** Neurosurgical coverage    trauma patient    head injured    craniotomy

## **INTRODUCTION**

It is estimated that 1.5 million Americans sustain traumatic brain injuries each year.<sup>1</sup> As a result of many factors, the availability of neurosurgeons (NS) to care for trauma patients (TP) is increasingly sparse. One factor is lack of availability due to the limited number of NS nationally, particularly in rural areas.

This concept of non-NS caring for neurotrauma patients is predicated on the hypothesis that the only explicit need for a NS is to perform a craniotomy. Nonoperative management of mild to severe injuries, with or without intracranial hyper-tension, may be equally well managed by providers outside the discipline of neurosurgery. This concept is also founded on a reduced emphasis on the time-critical nature of lesions requiring craniotomy and a lesser immediacy of craniotomy need. It is conceivable that there are factors associated with a subsequent need for craniotomy which can be identified in the prehospital environment, or early on during initial hospital treatment, making patients who exhibit such characteristics candidates for bypass of certain hospitals or transfer to definitive neurosurgical care within a time period correlating with optimal outcome. There may also be identifiable characteristics that deem the patient unsalvageable and therefore not candidates for triage and transfer for neurosurgical care. The purpose of this study is to examine the profile of head-injured TP in Bandung and determine their actual need for the specific expertise of a NS, as well as the timeliness of that care.

## **METHODS**

The Neurosurgical Department, RS. Hasan Sadikin (NDRSHS) data base was queried for specific information relating to the volume, nature, timeliness, and outcome of HI TP from September 2010 – August 2011.

The Study patients were identified by reported *ICD-10* codes denoting open head injury

(OHI) or closed head injury (CHI) in isolation or in combination with other injuries. In addition to standard demographics, specific data elements analyzed related to the nature of head injury, head AIS, performance of craniotomy, performance of intracranial pressure monitoring, Glasgow Coma Scale score, time to craniotomy, and mortality.

## **RESULTS**

A summary of results is displayed in Tables 1 and 2. The total number of NDRSHS patients studied was 5,274, of which 2,342 (44,4%) had a reported HI. Mild HI comprised 30,6% of all TP and 68,9% of those reported to have head injury. Moderate HI was reported in 9,3% of all TP and represented 20,96% of reported head injuries. Severe HI was reported in 4,49% of all TP and was 10,1% of HI. Subdural Hematoma occurred in 11,7% of HI(5,2% of TP). With 13% undergoing craniotomy. Epidural Hematoma occurred in 282 (12,04%) of HI (5,3% of all TP, with 17% undergoing craniotomy. Intracerebral hematoma occurred in 71(7,3%) of HI (3,2% of all TP). Median time to OR for all craniotomy was 13 hours. No craniotomy was performed within 1 hour of hospital admission.

The mean GCS of all TP was 13.6. The mean GCS of head-injured patients was 12.1.. The mean GCS of craniotomy patients was 9, and for the patients not undergoing craniotomy, it was 13.

Mortality of all TP was 5.2%; for those with head injuries, it was 13%. In patients with reported head injuries, the mortality for those not undergoing craniotomy or ICP monitoring was 12%, and in those patients receiving such intervention, it was 25%.

**TABLE 1.** Profile of Head Injury In RSHS

<b>parameter</b>	<b>All injured patients (n= 5.274)</b>	<b>Head-injury patients (n=2.342)</b>
Head injury	44,4%	100%
Mild Head injury	30,6%	68,9%
Moderate Head Injury	9,3%	20,96%
Severe Head injury	4,49%	10,1%
Epidural hematoma	5,3%	12%
Subdural hematoma	5,2%	11,7%
Intracerebral hematoma	3,2%	7,3%
Mean GCS	13,6	12,1
Mortality	5,2%	13%

**TABLE 2.** Profile of Patients Undergoing Craniotomy

<b>Parameter</b>	<b>Craniotomy</b>	<b>Nonoperative management</b>
All injured patients (n=5.274)	8,8%	91,2%
Head injury patients (n=2.342)	19,8%	80,2%
Mild Head injury	5,6%	94,4%
Moderate Head injury	40,7%	59,3%
Severe Head injury	73,4%	26,6%
Epidural hematoma	71,6%	28,4%

Subdural hematoma	58,2%	41,8%
Intracerebral hematoma	59,6%	40,4%
Mean GCS	9	13
Mortality	25%	12%
Median time to craniotomy	9 hour	-
Craniotomy within 1 hour	0%	-

## DISCUSSION

This study suggests that the care of TP with head injury rarely requires the explicit expertise and immediate presence of a NS due to the volume and type of injuries sustained, as well as the nature of their care. Head injury is reported to be present in 44% of TP in RSHS and less than 30% in another study. Over 91% required nonoperative management, with only 8-9% of all TP and 19%– 20% of head-injured TP requiring craniotomy. This is consistent with the low frequency of neurosurgical intervention demonstrated by other studies, which ranges from 0%– 5.9% in the head injured.<sup>5–10</sup>

The immediate availability of a NS does not appear to be essential if a properly trained and credentialed general trauma surgeon, or perhaps other health care provider, can appropriately evaluate and monitor patients for neurologic injury and demise. The responsibility of these non-NS should also encompass the knowledge and ability to effect early transfer to a center capable of, and committed to, operative and postoperative neurosurgical care.

This study shows that from the standpoint of volume of those types of injuries generally thought to require craniotomy, as well as the number of craniotomies actually performed, neurosurgical availability does not appear to be crucial. Most of all TP, and in particular the head

injured, were managed without craniotomy. From the standpoint of timeliness to craniotomy, a median time of over 9 hours would again speak against the essential need for a NS to be “immediately” available. In this study, no craniotomy was performed within 1 hours of hospital admission.

In addition to an undersupply, there is unquestionably a functional lack of NS available to be involved in the care of TP. This may be particularly true for those TP not requiring surgical intervention, with many NS abdicating neurosurgical critical care to other physicians such as neurologists, trauma surgeons, and intensivists. Valadka et al<sup>12</sup> have shown that only 32% of NS surveyed indicated that in their experience, a NS is in charge of neurosurgical trauma care if no operation has been performed. There are initiatives to expand the scope of practice for general trauma surgeons in an effort to maintain viability and fill the voids in trauma care that currently exist.<sup>13</sup> The Leapfrog initiative<sup>14</sup> will also increase the availability and responsibility of intensivists for the provisions of care to TP. Given these facts, it would appear to be prudent to formalize and legitimize this nonoperative neurosurgical care, setting standards for performance and competency under the advisement of neurosurgical leadership.

Just as pertinent as the question of whether there is an undersupply of neurosurgical services is that of whether there is, perhaps, overutilization and inflated demand for such services. This may be true and inappropriate, regardless of the training background and professional credentials of the provider (ie, NS or trauma surgeon). Some authors have suggested that the propensity to obtain neurosurgical consultation is not indicated or associated with improved outcome.<sup>15</sup> Questions revolving around the need for specific neurosurgical consultation in patients with minor and moderate head injury require an answer. Finally, there is evidence to suggest that patients with suspected minor head injury and normal head CT findings can be safely discharged

from the emergency department without neurosurgical or trauma surgical consultation if there are no other indications to request one.<sup>5,11,18</sup>

From a systems perspective, it is critical to identify factors that are associated with a high probability of need for craniotomy. This would allow for identification of such patients in the prehospital phase of care, making it appropriate to bypass hospitals without craniotomy services. It would also be the basis of strict transfer criteria from hospitals without those capabilities, thereby facilitating early transfer. In this study, it appears a GCS of 9 may be one of those criteria, that being the average GCS of those undergoing craniotomy and having a reasonable chance of survival. Interestingly, the mere presence of subdural hematoma or epidural hematoma does not necessarily equate with an absolute need for craniotomy. Prudence would certainly seem to suggest that EDH and SDH with or without lateralizing clinical signs and symptoms would best be initially included in such neurosurgical triage criteria. Size of lesion and corresponding clinical examination can certainly be added as qualifiers as a system matures and outcome data are available for analysis. Other considerations for early or direct transfer might be identified as well and evaluated for under- and overtriage.

Finally, as mentioned previously, it is not possible to discern from this study whether the rates of craniotomy, ICP monitoring, neurosurgical consultation, or ICU or hospital admission extracted from the NTDB are accurate or represent over- or underutilization, appropriate utilization, or are associated with improved outcomes. It is assumed that the information gleaned from the NTDB represents benchmark data reflective of optimal management and outcome based on the fact it is submitted by hospitals committed to trauma care and willing to voluntarily contribute their data.

In conclusion, the abandonment of trauma care by rank-and-file NS has created a crisis in

access to neurotrauma care. Despite any limitations of the study, the results presented provide evidence to support that the immediate availability of a NS to participate in the care of all TP, including those with documented head injury, may not be essential to providing optimal care. Given the volume, nature, and timeliness of head injury and its care, it appears this crisis can be resolved to a great extent by having trauma surgeons or other properly trained, credentialed, and monitored providers assume nonoperative inpatient neurotrauma care when hospital admission is actually indicated. While part of the solution lies in increased supply of neurotrauma services, regardless of provider type, a second component rests in decreasing demand for those services in cases of mild, as well as extremely severe, head injury. Such a solution seems feasible and advantageous in a number of respects and should be seriously considered by health care policy makers, trauma system planners, and the leaders of the neurosurgical and trauma surgery disciplines.



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