

# Communicating a Traumatic Brain Injury Patient's Potential Need for Operative Intervention: The Surgical Intervention for Traumatic Injury Scale

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#### Introduction

Scoring systems facilitate communication in many areas of medicine, e.g. Glasgow coma scale (GCS). However, there is no tool for communicating the urgency of possible surgical intervention in patients with traumatic brain injury (TBI). This study was done to develop a system to communicate the potential need for surgical decompression in TBI patients. This scoring system, the Surgical Intervention for Traumatic Injury (SITI), was designed to be comprehensive and easy to use.

# Methods

The SITI scale uses various findings to assess possible need for surgical intervention (Table 1). To validate the scale, the patient database for the Progesterone for the Treatment of Traumatic Brain Injury III Trial (PROTECT III) was used, and 871 patients were included in the analysis. We area under the receiver operating characteristic curve (i.e. area under the curve analysis) to further validate the SITI scale.

Feature	Finding	Points
GCS	>12	0
	9-12	1
	<9	2
Eyes		
Unilateral	yes	2
Enlarged Pupil	no	0
Head CT	< 5 mm	0
Midline Shift	5-10 mm	2
	> 10 mm	4
Temporal Blood	yes	1
	no	0
Epidural		
Hematoma	yes	2
≥ 10 mm	no	1 0

# Results

Of the 871 patients reviewed, 159 underwent craniotomy, and 712 were treated non-operatively. The mean SITI score was 5.3 for operative patients and 2.4 for nonoperative patients (p < 0.0001). We found that, applying a cutoff at a SITI score of 3 or greater, resulted in an area under the curve of 0.887.

	Non-operative	Operative
Total number of patients, nª	707 (81.2)	164 (18.8)
Mean Age (y) <sup>‡</sup>	37.8	44.17683
Female Patients, nª	184 (26.0)	44 (26.8)
Mechanism, nª‡		
MVC/MTC/ATV/Scooter	425 (60.1)	62 (37.8)
Fall	101 (14.3)	33 (20.1)
Assault	38 (5.4)	16 (9.8)
Bicycle	38 (5.4)	8 (4.9)
Other/Unknown	23 (3.2)	13 (7.9)
Pedestrian Struck by a Vehicle	82 (11.6)	32 (19.5)
Mean Time from Injury to Emergency Room Intake (minutes)‡	55.1	47.23171
Intubation, nª	169 (23.9)	41 (25)
Mean GCS <sup>†</sup>	7.64	8.05
Enlarged pupil, nª†	94 (13.2)	34 (20.7)
Midline Shift, nª‡		
0 - 5 mm	688 (97.3)	61 (37.2)
5-10 mm	19 (2.7)	68 (41.5)
> 10mm	0	35 (21.3)
Temporal Pathology, n <sup>a‡</sup>	245 (34.7)	143 (87.2)
Epidural Hematoma, n <sup>a‡</sup>	56 (7.9)	49 (29.8)
Treatment with Progesterone, nª	352 (49.8)	80 (48.7)





Figure 2. The area under the receiver operating characteristic (ROC) curve using a Surgical Intervention for Traumatic Injury (SITI) score of 3 as the threshold



Figure 1. The Surgical Intervention for Traumatic Injury (SITI) score at admission for operative and nonoperative patients

### Conclusions

The SITI scale was designed to be a simple, objective system for communication between clinical services regarding the potential need for surgical decompression for TBI. Application of the SITI scale to the PROTECT III database demonstrates that a SITI score of 3 or more correlated well with the patient receiving a craniotomy. These results further demonstrate the potential utility of the SITI scale in clinical practice.

# References

1) Sribnick EA, Hanfelt JJ, Dhall SS. A clinical scale to communicate surgical urgency for traumatic brain injury: A preliminary study. Surg Neurol Int. 2015 Jan 5;6:1

# **Learning Objectives**

By the conclusion of this session, participants should be able to answer the following questions: (1) What are the clinical characteristics that may help in determining a traumatic brain injury patient's need for operative intervention? (2) What is area under the receiver operating characteristic curve analysis? (3) How can a clinical decision support tool be used to improve patient care?