

Trauma Activation Protocol Evaluation using Injury Severity Scale

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Introduction

Trauma Activation Protocols (TAP), or trauma team activation, have become a standard component of emergency care in many hospitals globally. Although implementation details may vary across institutions, TAP has consistently demonstrated improvements in response times for diagnosis and imaging(1). Previous studies have used the Injury Severity Score (ISS) to evaluate the appropriateness and effectiveness of TAP, with an ISS >15 often used to define severe trauma(2). However, this study adopts the Abbreviated Injury Scale (AIS) 2008 revision and uses an ISS >12 to define severe trauma. This threshold has been shown to provide more accurate assessments compared to earlier versions(3).

Hospital Tengku Ampuan Afzan (HTAA) is a state hospital located in district Kuantan, Pahang, on the east coast of Peninsular Malaysia. With approximately 800 beds, it serves as a referral center for trauma care in the region. The TAP at HTAA as in Figure 1 was developed through consensus among departmental heads and was implemented in mid-November 2021. The activation criteria are based on both anatomical and physiological parameters.

Methodology

This retrospective study included trauma patients came to emergency department HTAA from January to October 2023 from Malaysia Trauma Registry (MTR) database. Inclusion criteria were based on MTR data entry criteria, patient initially triage to or upgraded to resuscitation zone. Exclusion criteria are patient at own risk discharge, referral from another tertiary hospital, brought in death and death in department. 126 patients with complete ISS data were included out of 256 patients. The remaining patient was excluded due to incomplete MTR data and failure to trace patient files. Patients were categorized based on trauma activation status (yes vs. no) and ISS severity (>12 vs. ≤12). Results presented in contingency table. Sensitivity, specificity, positive predictive value (PPV), and negative predictive value (NPV) were calculated to evaluate the protocol's performance in identifying major trauma (ISS >12). Statistical significance was assessed using the Chi-square test via Python 3.10 programming language.

Table 1 Characteristic of study population

Variable	All patients (N= 126)
Age	34.4(±19.9)
Gender	
Male	103(81.7%)
Female	23(18.3%)
Type of injury	
Blunt	123(97.6%)
Penetrating	3(2.4%)
Mechanism of injury	
Transport related	111(88.1%)
Low energy fall	4(3.2%)
Recreational related injury	3(2.4%)
Other/Unknown	8(63.4%)
Initial ED triage	
Red	83(65.8%)
Yellow	39(31.0%)
Green	4(3.2%)
Trauma activation	
Yes	108(85.7%)
No	18(14.3%)
ISS	28.64(±23.88)
ISS >12	83(65.9%)
ISS <12	43(34.1%)
Inpatient mortality	24(19.0%)

Objectives:
Primary Objective: To evaluate the appropriateness of TAP using an ISS > 12 to identify severe trauma.
Secondary Objective: To assess the mortality rate among patients.

Figure 1 HTAA Trauma Activation Protocol criteria:

1. Polytrauma: trauma involving 2 or more organ system
2. Suspected unstable trauma patient with blunt or penetrating injury (chest, abdomen, spine, or pelvic). SBP < 90mmHg
3. Severe maxillofacial injury with airway compromise
4. Blast injury
5. Pregnant patient with torso injury
6. Emergency physician / registrar discretion
7. Traumatic vascular injury

Results

Demographic data of the study population shown in Table 1. Contingency table generated from extracted sample data visualized in Table 2. Among the 126 patients, 68 (54.0%) were in the TAP:Yes group with ISS >12, 15 (11.9%) in the TAP:No group with ISS >12, 40 (31.3%) in the TAP:Yes group with ISS ≤12, and 3 (2.4%) in TAP:No group with ISS ≤12. TAP demonstrated a sensitivity of 63.0%, specificity of 16.7%, PPV of 81.9%, and NPV of 7.0%. The Chi-square analysis yielded a value of 2.848 correspond to p-value of 0.091. Using p < 0.05 significance threshold, there is no statistically significant association between trauma activation and ISS severity. Calculated mortality rate in ISS > 12 was 20.5% and ISS ≤ 12 was 16.3%

Table 2 Contingency table

	TAP: Yes	TAP: No	Total
ISS > 12	68(54.0%)	15(11.9%)	83
ISS ≤ 12	40(31.3%)	3(2.4%)	43
Total	108	18	126

Discussion

The majority of patients with major trauma (ISS >12) were appropriately identified by the TAP. In term of sensitivity and PPV, TAP shows decent accuracy and high prediction to detect patient with severe trauma. There is however, the lack of statistical significance and low specificity highlight the potential of inaccurate activation. Overactivation in TAP:Yes with ISS ≤ 12 group need to be address because this may lead to wastage of resources(4).

Conclusion

The ISS is a valuable tool for retrospective evaluation of TAP. While HTAA's current TAP criteria shows decent performance in identifying severe trauma, further refinement and larger studies are necessary to enhance its accuracy.

References

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