EFEKTIVITAS SISTEM SKORING DALAM PENCEGAHAN KEGAWATDARURATAN TRAUMA ABDOMEN *SYSTEMATIC REVIEW*

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ABSTRACT

Abdominal trauma is one of the leading causes of morbidity and mortality in emergency cases, with an incidence rate of 7-10% of all trauma cases. Accurate and timely assessment is crucial to determine the need for surgical intervention and prevent fatal complications. Evaluating the effect of scoring system-based abdominal assessment instruments on the prevention of emergencies and patient clinical outcomes. A systematic review of quantitative studies was conducted. Full-text articles were retrieved from four databases: Web of Science, ScienceDirect, ProQuest, and PubMed for the period 2020-2025. The keywords used were: Abdominal Trauma OR Abdominal Injury AND Assessment OR Scoring OR Initial Assessment OR Preliminary OR Evaluation AND Emergency. The quality of the studies was assessed using the Joanna Briggs Institute (JBI) criteria. A narrative analysis was conducted to present the effectiveness of scoring-based abdominal assessment in preventing emergencies. A comprehensive analysis of 15 studies evaluated five major scoring systems: CASS, BATSS, ISS, RTS, and TRISS. BATSS showed the best diagnostic performance with excellent surgical intervention prediction capabilities, achieving sensitivity of up to 100% and specificity of nearly 97%. CASS showed wider performance variability but still provided satisfactory prediction accuracy. ISS proved effective in predicting morbidity and mortality, with critical values indicating very high-risk patients. TRISS demonstrated superior performance as a predictor of mortality with near-perfect prediction accuracy, making it a highly reliable instrument for mortality risk stratification. Abdominal assessment instruments based on scoring systems significantly influence the prevention of emergencies through early identification of high-risk patients, optimization of the use of diagnostic modalities such as CT scans, and facilitation of timely clinical decision-making. BATSS shows superiority in predicting the need for surgical intervention, while TRISS excels in predicting mortality. Implementation of this scoring system can improve the quality of triage and initial management of abdominal trauma in the emergency room.

Keywords: Abdominal Trauma , Assestment, Emergency.

INTRODUCTION

Trauma is the leading cause of death among the productive population under 45 years of age in developing countries (Abraha et al., 2023; Ghimire et al., 2023; Shojaee et al., 2020). Data from the World Health

Organization (WHO) shows that trauma causes approximately 5 million deaths per year, or 9% of all global deaths (Ismail et al., 2021; Yadollahi, 2025). In 2020, trauma is even projected to be the leading cause of lost productive years of life, or Disability-Adjusted Life Years (DALYs) (Shojaee et al., 2020; Turan & Öz, 2025).. The abdomen is one of the regions most frequently injured after the head and thorax, with a prevalence of 7–10% of all trauma cases (Yadav et al., 2020). Approximately 85% of abdominal trauma is blunt (blunt abdominal trauma/BAT), with traffic accidents being the dominant cause (70–80%) (Beltagy et al., 2021; Sener et al., 2021; Tadvi et al., 2022; Yadollahi et al., 2025). In Indonesia, traffic accidents cause 20.22% of deaths, making them the 15th leading cause of death nationwide (Tianda, 2025).

One of the main challenges in managing BAT is the difficulty of diagnosis due to variations in clinical presentation, ranging from asymptomatic to severe hypovolemic shock. (Abraha et al., 2023; Sadi et al., 2024; Solanki & Patel, 2018). Delayed diagnosis and intervention are important factors that increase morbidity and mortality (Alsubhi et al., 2026; Tianda, 2025; Wiik et al., 2022). Variables contributing to this delay include time of arrival at the hospital, limited diagnostic facilities, lack of competent medical personnel, and external injuries that mask clinical signs of abdominal injury (Hong et al., 2020; Kumar et al., 2025; Yadav et al., 2020).

Computed tomography (CT) scan of the abdomen is the gold standard for evaluating BAT, but its use is limited by high costs, radiation exposure, uneven availability, and inability to be used in patients with hemodynamic instability (El-Meligy et al., 2024). Meanwhile, Focused Assessment with Sonography for Trauma (FAST) examinations are faster and non-invasive, but they are highly dependent on the operator's skills and have low sensitivity for detecting injuries to hollow organs (E Manjush & Sathish Kumar R, 2024).

Given the limitations of ancillary examinations, a trauma scoring system was developed as an objective and standardized tool to assess the severity of injuries and predict clinical outcomes (Alam et al., 2021). This system offers various advantages, including: (1) objective risk stratification, (2) improved triage and resource allocation processes, (3) prediction of surgical intervention needs, (4) reduction of unnecessary examinations, (5) standardization of clinical communication, (6) enabling quality audits and benchmarking, and (7) providing prognostic information to patients' families (Sadi et al., 2024).

Although various scoring systems have been widely used, there has been no comprehensive review that systematically compares the effectiveness of each instrument. Therefore, this study aims to evaluate the effectiveness of various abdominal scoring systems in preventing emergencies and predicting clinical outcomes in patients with blunt abdominal trauma.

RESEARCH METHOD

A systematic literature review was conducted on Web of Science, ScienceDirect, ProQuest, and PubMed using a combination of keywords and MeSH terms related to abdominal trauma and scoring systems, with the application of Boolean operators *Abdominal Trauma OR Abdominal Injury AND Assestment OR Scoring OR Initial*

Assestment OR Preliminary OR Evaluation AND Emergency. The search was conducted on November 1, 2025, and limited to publications from 2020 to 2025 in English and Indonesian. Of the 2,121,074 articles identified, 474 were eliminated at the deduplication stage, and 2,120,575 articles were excluded after screening the titles and abstracts. A total of 25 full-text articles were reviewed, but only 15 met the inclusion criteria.

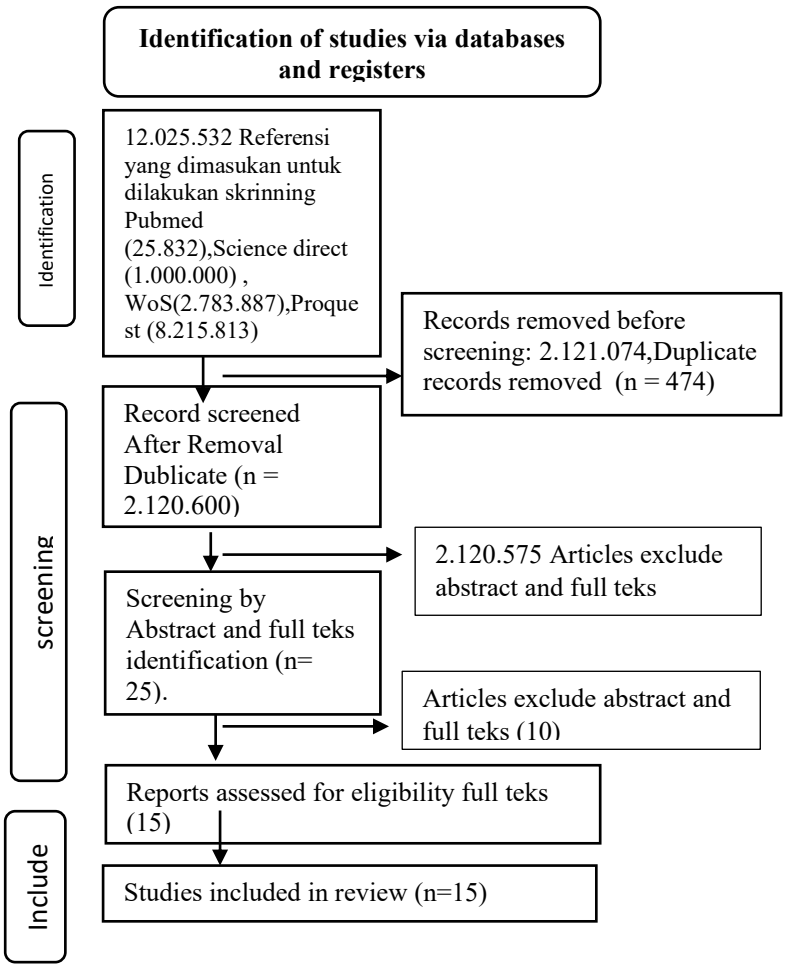
Study selection was performed by two reviewers independently with reference to the PRISMA guidelines, while adjudication was performed by a third researcher. Risk of bias assessment used the JBI instrument adapted to 8 criteria for cross-*sectional* studies, 9 criteria for quasi-experimental studies, and 11 criteria for cohort studies. Inclusion criteria included: (1) publication in peer-reviewed journals or proceedings; (2) full text available; (3) in English or Indonesian; (4) published between 2020 and 2025; (5) discussion of the application of a scoring system for abdominal trauma assessment in an emergency context; and (6) use of a quasi-experimental, cohort, cross-sectional, or diagnostic design. Exclusion criteria included: (1) review articles, systematic reviews, or meta-analyses; (2) case reports or case series; (3) studies in pediatric populations <18 years of age without adult comparators; (4) full text not available; and (5) did not use a standardized scoring system.

Data extraction was performed on the research design, sample characteristics, assessment domains, and the instruments and scoring systems used. The data were analyzed and synthesized descriptively to identify similarities in assessment approaches, with the entire process following systematic review guidelines and accompanied by critical assessments to ensure quality and relevance. This approach strengthens the standardization of assessment, supports evidence-based practices, and provides a scientific basis for optimizing emergency management and developing further research.

Tabel 1
PICO Formulation for Eligible Criteria

Criteria	Inclusion	Exclusion
Population	Patients with abdominal trauma requiring emergency assessment	Studies that did not review abdominal trauma
Intervention	Application of scoring systems (BATSS, CASS, ISS, TRISS) for abdominal trauma assessment	Studies that did not review the application of scoring systems for trauma assessment
Comparison	Clinical assessment method of scoring system	Does not use clinical assessment methods or scoring systems
Outcomes	Accuracy of predicting the need for laparotomy, mortality, morbidity, and effectiveness of emergency triage	Studies that did not discuss the accuracy of predicting the need for laparotomy, mortality, morbidity, and the effectiveness of emergency care

Criteria	Inclusion	Exclusion
Study Design	Randomized Controlled Trial, quasi experimental, chort study,cross sectional	Artikel review,systematic review, or meta-analysis,case report or case series;
Publication year	2020 and beyond	Before 2020
Language	English, Indonesian	In addition to English and Indonesian



RESEARCH RESULTS

A systematic search of ScienceDirect, ProQuest, PubMed, and Web of Science identified 2,121,074 articles. After deduplication removed 474 articles, 2,120,600 articles were screened based on title and abstract, and 2,120,575 of these were eliminated because they did not meet the initial criteria. A total of 25 full-text articles were reviewed further, but 10 were excluded because the full text was not accessible, leaving 15 articles that met the inclusion-exclusion criteria and were included in the final analysis. Data from the selected studies were synthesized descriptively to identify commonly used assessment domains. The following is a flowchart of the study selection process.

Table 2
Included Study Characteristics

No	Title	Country	Study Design	Study Duration	Sample Size	Inclusion Criteria	Exclusion Criteria	Sampling Method	Primary Outcome
1	*Comparison Of Blunt Abdominal Trauma Severity Scoring (Batss) And Clinical Abdominal Scoring System (Cass) In Blunt Abdominal Trauma For Need Of Surgical Interventio* (Sadi et al., 2024)	Pakistan	Cross-sectional	July-December 2023 (6 months)	185	Aged 18-60 years, blunt abdominal trauma	Penetrating trauma, without consent	Non-probability consecutive sampling	BATSS:sensitivity 65.9%, specificity 95%. CASS is lower. BATSS is superior for predicting the need for surgical intervention.
2	*Accuracy of the Trauma and Injury Severity Score (TRISS) in the Predicting Mortality of Emergency Patients : Focus on Evaluation at Three Critical Time Intervals* (Tianda, 2025)	Indonesia	Cross-sectional	January-March 2024 (3 months)	166	Age >16 years old, complete data	DOA, concomitant disease	Convenience sampling	TRISS: sensitivity 98.9%, specificity increased from 77.1% (6 hours) to 85.7% (48 hours), accuracy 89.7-93.3%. Superior in the 48-hour evaluation.
3	Evaluation of Blunt Abdominal Trauma Severity Score (Batss) in Predicting the Necessity of Laparotomy for Admitted Cases With Blunt	Mesir	Cross-sectional	May 2022-May 2023 (12 months)	100	Age ≥18 years, blunt trauma	Penetrating trauma, pediatric, pregnant, GCS <15	Convenience sampling	Mean BATSS 9.73±6.09. Low risk (<8): 47.7%, Intermediate (8-12): 20.2%, High risk (≥12): 32.1%. BATSS is effective for risk stratification

	Abdominal Trauma (Beltagy et al., 2021)								
4	*Assessment of Blunt Abdominal Trauma Severity Score in Predicting the Necessity of Laparotomy* (El-Meligy et al., 2024)	Mesir	Prospective observational	Not specified	243	Adult, blunt abdominal trauma	Age <18 years, warfarin user	Consecutive sampling	90.3% of patients identified with injury. All patients with injury had BATSS >8. Sensitivity 100%, specificity 97.3% with a cut-off of 8.5
5	Comparative Study Between Blunt Abdominal Trauma Scoring System (Batss) and Cect Abdomen To Detect Blunt Trauma Abdomen in Adult Patients (E Manjush & Sathish Kumar R, 2024)	India	Cross-sectional	February 2022-January 2023 (12 months)	155	Age >18 years, blunt abdominal trauma	LAMA, pregnancy, unambiguous FAST	Convenience sampling	Prevalence 9.65%. Age 18-30 years (43.57%). RTA most common cause (56.43%). Spleen most common organ (40%)
6	Blunt Abdominal Trauma among Patients Admitted to the Department of Surgery at a Tertiary Care Centre: A Descriptive Cross-sectional Study. (Ghimire et al., 2023)	Nepal	Descriptive cross-sectional	2013-2019 (6 years)	140	Adult dengan BAT, gastrointestinal tract injury	Incomplete data, death <24h, extra-abdominal emergency surgery	Retrospective record review	Mean ISS 16.06±7.9. ISS is a good predictor of morbidity and mortality. Cut-off 16.5 for mortality (sensitivity 60%, specificity 80%)

7	*Injury Severity Score as a Predictor of Mortality in Patients with Abdominal Trauma at a Tertiary Nigerian Hospital* (A Adenuga, 2023)	Nigeria	Retrospective observational	March 2016-September 2016 (7 months)	87	Ages 15-65 years, BAT within 3 days	Penetrating trauma, expired during resuscitation	Non-probability consecutive	Kidney most common (36.36%), liver (34.54%), spleen (28.48%). RTA 70% of cases. Majority male (80.6%)
8	Intra-Abdominal Solid Visceral Injuries in Adult Patients Presenting with Blunt Abdominal Trauma (Ismail et al., 2021)	Pakistan	Cross-sectional	January-June 2021 (6 months)	165	Age >18 years, blunt abdominal trauma	Life threatening non-abdominal injury, pregnant, GCS <15	Convenience sampling	Mean age 25.87±10.7 years. Median BATSS was higher in laparotomy patients [15 (14-16)] vs discharge [9 (5-16)]
9	Diagnostic Evaluation of Blunt Abdominal Trauma Scoring System (BATSS) (Safwat et al., 2022)	Mesir	Cross-sectional	March-October 2020 (8 months)	48	Ages 18-60 years, BAT	Penetrating trauma, nonconsensual	Non-Consecutive gm High risk	High risk (≥12): 64%, Moderate risk (8–11): 26%, Low risk (<8): 10%. Average BATSS 12.66±3.72
10	Evaluation of clinical abdominal scoring system for predicting outcomes of blunt abdominal trauma (Yordanius et al., 2023)	Indonesia	Retrospective observational	February-July 2022 (6 months)	80	Age >18 years, suspected BAT	Incomplete medical records, pregnancy, no laparotomy, GCS=3	Review of medical records	Average CASS 10.28±1.340. Sensitivity 80%, specificity 60%, PPV 96.7%, NPV 16.6%. Low specificity
11	Evaluation of ISS , RTS , CASS and TRISS scoring systems for predicting outcomes of	India	Prospective observational	Not specified (12 months)	43	Usia >18 tahun, blunt trauma abdomen	Co-morbidities (uncontrolled DM,	Consecutive sampling	Superior ISS: AUC 0.806. RTS and CASS are lower. ISS <42 predicts favorable outcome

	blunt trauma abdomen (Alam et al., 2021)						CAD, HTN)		(sensitivity 65.1%, specificity 64.7%)
12	*Efficacy of blunt abdominal trauma scoring system in management of blunt abdominal trauma* (Shah et al., 2022)	India	Comparative study	March 2019-May 2020 (14 months)	100	Blunt abdominal injury	Penetrating trauma, alcohol intoxication, GCS <15, age <18 years	Random selection	BATSS is not sufficiently useful. Some low-risk patients still require laparotomy. Modifications are needed.
13	*Performance validation of different trauma scoring systems among polytrauma patients having predominantly blunt abdominal trauma.* (Yadav et al., 2020)	India	Prospective observational	study 12 months	103	Age >10 years, multiple injuries with BAT within 24 hours	Orthopedic/neurosurgical procedures needed	Sequential sampling	Superior ISS: AUC 0.806. ISS <42 as the cutoff for favorable outcomes (sensitivity 65.1%, specificity 64.7%)
14	Efficacy of new scoring system for diagnosis of abdominal injury after blunt abdominal trauma in patients referred to emergency department (Shojaee et al., 2020)	Iran	Analytical study	June 2017 + 18 months	1000	BAT from RTA, fall, direct trauma	Pregnancy >3 months, age <18 years, warfarin, penetration	Non-random based on convenience	Average score 6.29±5.80. Low risk (<8): 66.1%, Moderate (8-12): 10.9%, High (≥12): 23%. AUC 0.823. Cronbach's alpha 0.76

15	prospective study comparing clinical abdominal scoring system (CASS) with blun abdominal trauma severity scoring (BATSS) (Sivarajan, 2021)	India	Prospective study	January 2020-March 2021 (15 months)	100	All ages, blunt abdominal trauma	Not willing, expired before evaluation	Prospective consecutive	CASS: sensitivity 54%, specificity 100%, PPV 100%, NPV 78.7%. BATSS: sensitivity 83.5%, specificity 100%, PPV 100%, NPV 91.3%. BATSS is superior.

DISCUSSION

Based on table 2, scoring systems on blunt abdominal trauma involve adult patients (≥18 years) who are predominantly male, with a total of 2,712 patients from 15 studies. In general, the most commonly used scoring systems include BATSS, CASS, ISS, and TRISS, which play an important role in the initial assessment of the severity of abdominal trauma. The majority of studies confirm that BATSS is the most dominant and superior scoring system, with a sensitivity of 83–100% and specificity of up to 100%, as reported by Sadi *et al*., (2024), El-Meligy *et al*., (2024), Safwat *et al*., (2022) dan Beltagy *et al*., (2021). On the other hand, ISS and TRISS demonstrate strong predictive capabilities for morbidity, mortality, and the need for further intervention, as noted in the study. Tianda, (2025) and Yadav *et al*., (2020).

From a diagnostic capability perspective, BATSS showed the best performance, where the use of a cut-off ≥8 was able to achieve a sensitivity of up to 100% and a specificity of 97.3% (El-Meligy et al., 2024). In contrast, CASS showed less stable performance, with sensitivity ranging from only 54–80% and varying specificity, as reported by Yordanius *et al*., (2023) and Sivarajan, (2021). Meanwhile, ISS and TRISS are considered more reliable in predicting the severity and outcome of patients, with an AUC value of around 0.806 as found by Alam *et al*., (2021) dan Yadav *et al*., (2020).

Clinically, BATSS has high applicability in healthcare facilities with limited resources, as it is simple, fast, and accurate. Conversely, ISS and TRISS are more suitable for use in referral facilities or trauma centers with complete imaging capabilities, given that both are superior in predicting clinical outcomes and the need for surgical intervention. Geographically, the use of these scoring systems has been extensively studied in developing countries, particularly India (6 studies), Egypt (3), Pakistan (2), Indonesia (2), Nepal (1), Nigeria (1), and Iran (1), with India having the most publications.

However, there are several important limitations. The majority of studies excluded patient groups with significant clinical conditions, such as penetrating trauma, decreased consciousness, anticoagulant use, pregnancy, alcohol intoxication, unclear FAST

results, pediatric patients, severe comorbidities, incomplete medical records, LAMA patients, and DOA. These restrictions meant that the study population represented only a small proportion of abdominal trauma patients. This is reflected in the findings Sadi *et al*., (2024). that some low-risk patients still require laparotomy, and that the specificity of some scoring systems, such as CASS, is low, reaching only 60% (Yordanius et al., 2023). In addition, variations in research design and the predominance of non-probability sampling methods also limit the generalization of findings.

Future research should include the development of an integrated scoring system that combines vital parameters, FAST results, and inflammatory biomarkers. External validation in specific populations, such as children, the elderly, and patients with comorbidities, is also needed, as well as exploration of the integration of artificial intelligence-based scoring systems to improve the accuracy of predictions and the efficiency of abdominal trauma management.

CONCLUSION

Based on the results of an analysis of fifteen studies, BATSS is the most recommended scoring system for the initial assessment of blunt abdominal trauma, especially in facilities with limited resources. This is supported by its consistent performance, with a sensitivity of up to 100% and specificity of 97.3% at a cut-off of ≥8 (El-Meligy et al., 2024). Conversely, CASS is not recommended as a sole tool due to its sensitivity of only 54–80% and unstable specificity, which could potentially miss significant injuries (Yordanius *et al*., 2023; Sivarajan, 2021). For predicting injury severity and patient outcome, ISS and TRISS are more suitable for use in referral hospitals or trauma centers due to their high accuracy (AUC ±0.806), as shown by Alam *et al*.,(2021) and Yadav *et al*., (2020). Thus, recommendations for the use of scoring systems should be tailored to the context of the facility: BATSS for rapid triage in emergency departments with limited diagnostic capabilities, and ISS/TRISS for further evaluation in facilities with imaging capabilities and comprehensive treatment options.

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