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Systematic Review

Workability of the South African Triage Scale for Routine Prehospital Triage by Paramedics in Kenya: *A Secondary Analysis of Existing Evidence*

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ABSTRACT

Background:

Triage falls within the scope of practice of Kenyan prehospital emergency care providers, yet the evidence reviewed for this analysis did not identify a standardized triage tool validated for routine use in that setting. The South African Triage Scale (SATS) has been implemented in Kenyan emergency departments and studied among prehospital providers in South Africa. However, whether existing evidence supports SATS as a workable routine triage approach for Kenyan paramedics, distinct from formal validation, remains unclear.

Methods:

This secondary analysis draws on published evidence retrieved from PubMed, African Journals Online (AJOL), Google Scholar, the World Health Organization (WHO) Regional Office for Africa resources, and Kenya-specific institutional repositories for the period 2008–2026. No new primary data were collected.

Results:

Kenyan evidence on SATS was identified from the Kenyatta National Hospital (KNH) emergency department, where the tool showed 92.2% sensitivity for predicting patient disposition. South African prehospital evidence indicates that Emergency Medical Service providers can use SATS to structure assessment and handover communication, but the correct final SATS colour was assigned in 56.5% of vignette responses; Triage early warning Score (TEWS) was calculated correctly in 42.6% pointing to specific field-related sources of error rather than a wholesale failure of the tool. The prehospital system remains fragmented, with no national triage or destination-routing protocols.

Conclusion:

Existing evidence suggests that SATS may offer a structured approach to routine prehospital triage and communication. However, difficulties in TEWS calculation, discriminator interpretation, and changing patient conditions mean that its workability cannot be assumed in Kenya. Evaluation should first establish whether SATS can be applied consistently and practically during routine Kenyan paramedic assessment before proceeding to formal validation or implementation.

Key words: South African Triage Scale (SATS); Prehospital care; Kenya; Emergency Medical Services; Paramedics

1. Background

Kenya's emergency care system has expanded substantially over the past two decades, but prehospital emergency medical services (EMS) remain fragmented (Lee et al., 2022). EMS provision is devolved across 47 counties. Although Kenya has a unified national emergency dispatch number, the evidence reviewed for this analysis does not establish a standardized national system for triaging patients to appropriate destination facilities. Historical studies reported a mean prehospital time of 2.56 hours in Nairobi, with only 17.5% of patients reaching definitive care within 60 minutes, and average ambulance response times of approximately 162

minutes in data collected before 2017. These historical findings may not reflect current dispatch operations.

The South African Triage Scale (SATS) is a structured triage tool combining a physiological Triage Early Warning Score (TEWS) with a set of clinical discriminators to assign patients to one of five acuity categories (Red, Orange, Yellow, Green, Blue). Originally developed for in-hospital emergency department (ED) use in South Africa, SATS has since been adopted more widely across African emergency care settings, including implementation at Kenyatta National Hospital (KNH), Kenya's largest public tertiary hospital (Wangara et al., 2019). Separately, the Western Cape Government (WCG) in South Africa adapted SATS into its public EMS system in 2012, providing an important example of prehospital application.

2. Problem Statement

Triage is an essential component of routine prehospital emergency care because it supports early identification and prioritization of patients according to clinical acuity. SATS combines physiological assessment through the Triage Early Warning Score (TEWS) with clinical discriminators. Although SATS has been evaluated in a Kenyan emergency department and South African prehospital settings, those findings come from different clinical environments and cannot be assumed to apply directly to Kenyan ambulance care. Evidence from South African prehospital studies identified challenges including TEWS calculation errors and difficulties interpreting clinical discriminators. At the same time no study directly examining the practical use of SATS by Kenyan prehospital providers exists. Kenya's developing prehospital emergency care system, including the establishment of a national ambulance dispatch mechanism, highlights the need to examine the role of structured clinical triage in routine paramedic practice. However, the practical applicability and workability of the South African Triage Scale (SATS) in the Kenyan prehospital context remain insufficiently understood. Triage is already within the scope of practice of Kenyan prehospital emergency care providers; the question this analysis addresses is

therefore not whether SATS could theoretically apply, but whether existing evidence supports it as a practically workable tool for that routine role, distinct from formal validation, and distinct from mass-casualty-incident (MCI) triage, which raises separate considerations (e.g., tools such as START) not addressed here. Secondary analysis of existing evidence can therefore help determine what is currently known, identify prehospital-specific challenges, and establish whether further Kenyan-specific evaluation is warranted.

3. Research Objectives and Question

General Objective

To assess the workability and practical applicability of the South African Triage Scale (SATS) for routine prehospital triage in Kenya using existing evidence.

Specific Objectives

1. To examine existing evidence on the use and performance of SATS in prehospital care.
2. To identify reported challenges associated with applying SATS in the prehospital setting.
3. To assess the relevance of existing SATS evidence to routine Kenyan paramedic practice.
4. To identify evidence gaps requiring further evaluation of SATS in Kenyan prehospital care.

Main Research Question:

What does existing evidence suggest about the workability of the South African Triage Scale (SATS) for routine prehospital triage by paramedics in Kenya?

Specific Research Questions

1. What evidence exists on the use and performance of SATS in prehospital care?

2. What challenges have been reported in applying SATS in the prehospital setting?
3. What aspects of existing SATS evidence are relevant to routine Kenyan paramedic practice?
4. What evidence gaps remain regarding the use of SATS in Kenyan prehospital care?

4. Methods

This is a narrative secondary analysis of previously published, publicly available evidence; no new primary data were collected. PubMed, AJOL, Google Scholar, WHO Regional Office for Africa resources, and Kenya-specific institutional repositories were searched for the period 2008–2026.

Search terms combined the tool (SATS, South African Triage Scale, TEWS, Triage Early Warning Score), the setting (EMS, emergency medical services, prehospital, pre-hospital, paramedics, EMT), the geography (Kenya, Africa), and performance/outcome terms (validity, under-triage, over-triage, sensitivity). Given the limited size of the relevant literature, a looser, iterative search strategy was used rather than a single rigid Boolean string, with each database searched using simplified term combinations suited to its interface. Eligible sources included primary studies (retrospective and prospective validity/reliability studies, qualitative provider-experience studies) and system-level descriptive literature on Kenyan prehospital care, in English, within the specified date range. Editorials and opinion pieces without original data or synthesis were excluded. Because this analysis draws on secondary sources, findings from the KNH emergency department are reported as ED evidence and are not presented as evidence of SATS performance in Kenyan ambulances.

5. Results

5.1. Overview of the Evidence Base

Five categories of evidence were identified as directly relevant (summarized in the extraction table below):

- Kenyan ED implementation and validity study
- South African prehospital validity/reliability study
- South African prehospital qualitative provider-experience study
- Rural South African ED validity study (as a low-resource comparator)
- System-level descriptive literature on the structure of Kenyan prehospital EMS.

5.2. Data Extraction Summary

Study	Country	Setting	Sample	SATS Focus	Key Findings	Prehospital Relevance
Wangara et al. (2019), Int J Emerg Med	Kenya	ED (Kenyatta National Hospital)	2,420 charts (1,209 pre-SATS; 1,211 post-SATS); 166 HCWs for reliability	SATS implementation, validity & reliability	Under-triage 3.8%→7.8% ($p=0.2$, ns); over-triage 70.9%→62.3% ($p<0.05$); sensitivity 92.2%, specificity 37.7% for admission/death/discharge; expert agreement rose 47%→64% post-training	High - only Kenyan quantitative SATS performance data available, but ED-based, not prehospital
Mould-Millman et al. (2021), BMC Emerg Med	South Africa	EMS (Western Cape Government, Cape Town)	102 EMS providers, 50 clinical vignettes	Prehospital SATS validity & reliability	Final SATS colour correct in 56.5% of responses; under-triage 29.5%, over-triage 13.1%. Component breakdown: TEWS correctly calculated in only 42.6%; clinical discriminators correctly identified in 58.8%. Good inter-rater reliability for final colour ($\kappa=0.71$) despite low accuracy; discriminator agreement weaker ($\kappa=0.59$)	Very high - only known formal prehospital SATS validity/reliability study; shows TEWS calculation, not just discriminators, is a major source of prehospital error
Dixon et al. (2021), BMC Emerg Med	South Africa	EMS (Western Cape Government, Cape Town)	15 EMS providers, 3 focus groups (BLS/ILS/ALS)	Provider experience using SATS in the field	Four themes: implementation/use; perceived effectiveness; limitations of clinical discriminators (too subjective, e.g. ingestions); special EMS considerations	Very high - the clearest evidence on prehospital-specific SATS challenges

Study	Country	Setting	Sample	SATS Focus	Key Findings	Prehospital Relevance
					(changing patient condition, transport time, social needs). Gestalt often diverged from SATS score	
Meyer et al. (2018), Afr J Emerg Med	South Africa	Rural district hospital ED (Zithulele)	Cross-sectional, all ED presentations Oct–Dec 2015	SATS validity in a low-resource rural setting	Acuity associated with outcome ($f = 0.37$, $p < .0001$); over-triage 49%, under-triage 9%; waiting-time targets poorly met	Moderate -rural, resource-constrained comparator relevant to Kenyan settings, but still ED-based
Lee et al. (2022); Reis et al. (2025)	Kenya	National prehospital/EMS system	System-level / narrative data (no single triage-specific sample)	Prehospital system structure, not SATS specifically	Historical long prehospital times; national emergency number exists, but the reviewed evidence does not establish a standardized national triage or destination-routing protocol	High context - establishes the structural gap SATS would need to fit into, not SATS evidence itself

5.3. SATS Performance in the Kenyan Emergency Department (KNH)

At Kenyatta National Hospital (Wangara et al., 2019), SATS was implemented alongside an educational intervention and evaluated using 2,420 patient charts (1,209 pre-implementation and 1,211 post-implementation). Reliability improved after training: exact agreement with an expert-defined standard increased from 47% to 64%, while agreement allowing a one-level discrepancy increased from 89% to 97%. Under-triage increased from 3.8% to 7.8%, a difference that was not statistically significant, whereas over-triage decreased significantly from 70.9% to 62.3%. SATS had 92.2% sensitivity and 37.7% specificity for predicting admission, death, or discharge. These findings support SATS use in this Kenyan emergency department, but they do not establish its performance in Kenyan ambulances.

5.4. SATS Performance Among South African Prehospital Providers

The only formal assessment identified of SATS performance among EMS providers was conducted in Cape Town (Mould-Millman et al., 2021). In that study, 102 Western Cape Government EMS providers completed 50 clinical vignettes covering TEWS calculation, clinical discriminators, and final SATS colour assignment. Providers assigned the correct final SATS colour in 56.5% of responses; under-triage occurred in 29.5% and over-triage in 13.1%. TEWS was calculated correctly in 42.6% of responses, while clinical discriminators were correctly identified in 58.8%. These findings indicate that TEWS calculation is also a substantial source of error in prehospital triage. Inter-rater reliability for final triage colour was good ($\kappa = 0.71$), meaning providers were relatively consistent with one another despite limited accuracy against the reference standard. Agreement on discriminators was weaker ($\kappa = 0.59$).

5.5. Provider Experience Using SATS in the Field

A companion qualitative study conducted focus groups with 15 Western Cape EMS providers across basic, intermediate, and advanced life support levels (Dixon et al., 2021). Four themes emerged: implementation and use of SATS; perceived effectiveness; limitations of the clinical discriminator; and special EMS

considerations. Providers generally found SATS easy to use and valuable for structuring handover communication with receiving facilities. However, they frequently described cases where clinical gestalt diverged from the SATS-generated acuity, and identified several discriminators as too subjective or too broad to apply consistently (ingestions were cited as a specific example). Providers also described prehospital-specific factors absent from the ED context that complicated SATS application: patients' clinical condition changing during transport, variable transport times, and social or contextual needs of patients in the field.

5.6. Comparator Evidence from a Low-Resource Rural ED

A study at Zithulele Hospital in rural South Africa (Meyer et al., 2018) found an association between SATS acuity and patient outcome. The study reported over-triage of 49% and under-triage of 9%. Although this was an emergency-department study, it provides a resource-constrained comparator. Waiting-time targets linked to triage categories were poorly met, suggesting that downstream system capacity can limit the practical benefit of a triage tool even when acuity is associated with outcome.

6. Discussion

This secondary analysis found evidence on SATS use in a Kenyan emergency department and South African prehospital settings, but no study of SATS in Kenyan ambulance care was identified. The evidence supports considering SATS for routine prehospital triage, but it does not establish its workability or performance in the Kenyan prehospital context.

The Kenyan emergency-department findings demonstrate that SATS can be implemented and used with training in a resource-limited setting. However, the differences between emergency-department and ambulance environments are important. Prehospital providers must assess patients under time constraints, with variable environmental conditions and limited opportunity for repeated

observations. Therefore, the favourable findings from KNH cannot be directly transferred to Kenyan ambulance care.

The South African prehospital evidence provides the closest available comparison. Providers achieved good agreement in assigning the final SATS colour, suggesting that the overall framework can be applied with reasonable consistency. However, accuracy was limited, with the correct final colour assigned in only 56.5% of responses and under-triage occurring in 29.5%. TEWS was correctly calculated in only 42.6% of responses, while clinical discriminators were correctly identified in 58.8%. These findings indicate that practical use of SATS in the field may be affected not only by clinical judgement but also by accurate collection and calculation of physiological parameters.

The qualitative evidence further suggests that prehospital application requires consideration of factors that are less prominent in emergency-department triage. Providers reported difficulties with some clinical discriminators and situations where their clinical judgement differed from the SATS-generated category. Changing patient condition, transport circumstances and other field factors may therefore influence how consistently SATS can be applied.

For Kenya, these findings suggest that the key question is not simply whether SATS has been validated elsewhere, but whether it can be incorporated consistently into routine paramedic assessment under local prehospital conditions. Since no Kenyan ambulance study was identified, this remains an unanswered question. The existing evidence supports further Kenyan-specific evaluation rather than assuming that results from either KNH or South African EMS can be directly generalised to Kenyan prehospital care.

7. Evidence Gaps

- No study was identified that evaluated SATS or another structured triage tool specifically in Kenyan prehospital or ambulance care. Usability and accuracy in that setting therefore remain unexamined.

- No data exist on how SATS or TEWS would perform under Kenya's specific prehospital conditions (longer transport times, variable provider training levels (Nicholson et al., 2017), absence of standardized dispatch)
- The only prehospital provider-experience data identified (Dixon et al., 2021) came from one South African EMS system. The literature reviewed did not include perspectives from Kenyan prehospital staff on whether SATS would be workable within routine practice and their existing scope of practice.
- No evidence addresses how SATS acuity categories would interact with Kenya's devolved, county-based destination-routing decisions, which — unlike Western Cape EMS — lack standardized protocols
- No Kenyan-specific evidence exists on why TEWS calculation might be difficult in the field (e.g., equipment availability, time pressure, training level), despite this being identified as a substantial source of error in the South African data

8. Limitations of This Analysis

This analysis relied on existing published evidence and did not collect primary data. The search was narrative and iterative rather than systematic, so relevant unpublished or poorly indexed studies may have been missed.

Differences in study settings and methods limited direct comparison between Kenyan emergency-department findings and South African prehospital findings. The results should not be interpreted as evidence that SATS has been validated or demonstrated to be workable in Kenyan prehospital care.

9. Conclusion

SATS offers a structured approach that may support routine prehospital triage, but the available evidence also identifies challenges in TEWS calculation and interpretation of clinical discriminators. Kenyan evidence identified in this analysis is limited to emergency-department settings. SATS should therefore be

considered a candidate for routine prehospital triage in Kenya, with Kenyan-specific evaluation needed to determine its usability, consistency, and suitability for paramedic practice.

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12. Conflict of interest

The authors declare no competing interest.

13. Ethical approval

No ethical approval sought since this study is a systematic review and no human or animal experiment was conducted.

References

Dixon, J., Burkholder, T., Pigoga, J., Lee, M., Moodley, K., de Vries, S., Wallis, L., & Mould-Millman, N. K. (2021). Using the South African Triage Scale for prehospital triage: A qualitative study. *BMC Emergency Medicine, 21*(1), Article 125. https://doi.org/10.1186/s12873-021-00522-3

Lee, J. A., Wanjiku, G., Nduku, N., Aluisio, A. R., Kharel, R., Simiyu, J. T., & Wachira, B. W. (2022). The status and future of emergency care in the Republic of Kenya. *African Journal of Emergency Medicine, 12*(1), 48–52. https://doi.org/10.1016/j.afjem.2021.11.003

Mould-Millman, N. K., Dixon, J. M., Burkholder, T., Pigoga, J. L., Lee, M., de Vries, S., Moodley, K., Meier, M., Colborn, K., Patel, C., & Wallis, L. A. (2021). Validity and reliability of the South African Triage Scale in prehospital providers. *BMC Emergency Medicine, 21*, Article 8. https://doi.org/10.1186/s12873-021-00406-6

Musyoka, F. N., & Kioko, A. N. (2021). Pre-hospital emergency care system: Utilization of ambulance services in Nairobi County. *Emergency Care Journal, 17*(4), 33–37. https://doi.org/10.4081/ecj.2021.10217

Nicholson, B., McCollough, C., Wachira, B., & Mould-Millman, N. K. (2017). Emergency medical services (EMS) training in Kenya: Findings and recommendations from an educational assessment. *African Journal of Emergency Medicine, 7*(4), 157–159. https://doi.org/10.1016/j.afjem.2017.06.002

Reis, D. P., Nawaggi, P., Fraenzel, A., & Dolkart, C. (2025). Leveraging innovative technology and health data to enhance access to emergency care and referral services in Kenya. *Oxford Open Digital Health, 3*, oqaf019. https://doi.org/10.1093/oodh/oqaf019

Meyer, J. C., Meyer, G. D., & Gaunt, C. B. (2018). Validity of the South African Triage Scale in a rural district hospital. *African Journal of Emergency Medicine, 8*(4), 145–149. https://doi.org/10.1016/j.afjem.2018.07.004

Wachira, B. W., & Mwai, M. (2021). A baseline review of the ability of hospitals in Kenya to provide emergency and critical care services for COVID-19 patients. *African Journal of Emergency Medicine, 11*(2), 213–217. https://doi.org/10.1016/j.afjem.2021.01.001

Wangara, A. A., Hunold, K. M., Leeper, S., Ndiawo, F., Mweu, J., Harty, S., Fuchs, R., Martin, I. B. K., Ekernas, K., Dunlop, S. J., Twomey, M., Maingi, A. W., & Myers, J. G. (2019). Implementation and performance of the South African Triage Scale at Kenyatta National Hospital in Nairobi, Kenya. *International Journal of Emergency Medicine, 12*(1), Article 5. https://doi.org/10.1186/s12245-019-0221-3

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