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ORIGINAL ARTICLE

Exploring the triage accuracy of the Manchester Triage System and the Emergency Severity Index in emergency department patients with sepsis: A secondary retrospective analysis

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Objectives. To meet the requirement of the Sepsis-3 guidelines for rapid initiation of treatment, emergency department (ED) triage systems must assign patients with suspected sepsis to the highest-priority triage categories. Our aim was to explore how effectively the Manchester Triage System (MTS) and the Emergency Severity Index (ESI) assign these patients to appropriate urgency categories and avoid undertriage.

Methods. A secondary analysis was conducted from a prospective, multicenter observational study (LIFE-POC), which included patients presenting with suspected organ dysfunction in 1 of 3 participant EDs (2 using MTS and 1 using ESI). The primary endpoint was a diagnosis of sepsis within 24 hours of ED presentation. Patients diagnosed with sepsis who were assigned to urgent triage categories 1, 2, or 3 were classified as accurately triaged. Ethical approval was granted by the committees of the participating centers.

Results. A total of 388 out of 1,424 patients were diagnosed with sepsis within 24 hours of ED presentation. MTS showed a sensitivity rate of 88.2% (undertriage, 11.8%), while ESI reached 99.0% (undertriage, 1.0%). Both triage tools demonstrated low specificity: 17.5% (MTS) and 2.7% (ESI). Binary logistic regression analysis indicated that the probability of sepsis increased with higher urgency triage categories and decreased in lower urgency categories.

Conclusions. Both ESI and MTS demonstrated high sensitivity in assigning septic patients to higher urgency categories, with better performance by ESI. However, MTS showed superior discrimination between urgency levels and may therefore be more compatible with the resource limitations typically encountered in EDs.

Keywords: Hospital Emergency Department. Triage. Sepsis. Septic shock. Emergency Medical Services.

Análisis de la precisión del Sistema de Triaje Manchester y del Índice de Gravedad de Emergencias en el triaje de pacientes con sepsis atendidos en urgencias

Objetivos. Para cumplir el requisito de la guía Sepsis-3 de iniciar rápidamente el tratamiento, los sistemas de triaje de urgencias deben asignar a los pacientes con sospecha de sepsis a las categorías de triaje de mayor prioridad. El objetivo es explorar con qué eficacia el Sistema de Triaje Manchester (MTS) y el Índice de Gravedad de Emergencias (*Emergency Severity Index* –ESI–) asignan a estos pacientes las categorías de urgencia adecuadas y evitan el infratriaje.

Métodos. Se realizó un análisis secundario de un estudio observacional prospectivo y multicéntrico (LIFE-POC), que incluye a pacientes que se presentaron con sospecha de disfunción orgánica en una de los tres servicios de urgencias (SU) participantes (dos utilizaban MTS, uno utilizaba ESI). El resultado principal fue el diagnóstico de sepsis en las 24 horas siguientes a la presentación en el SU. Los pacientes diagnosticados de sepsis que fueron asignados a las categorías de triaje urgente 1, 2 o 3 se clasificaron como triaje preciso. La aprobación ética fue concedida por los comités de los centros de estudio.

Resultados. De los 1.424 pacientes incluidos en la base de datos, 388 fueron diagnosticados de sepsis en las 24 horas siguientes a su atención en urgencias. El MTS demostró una sensibilidad del 88,2% (infratriaje: 11,8%), mientras que el ESI alcanzó el 99,0% (Infratriaje 1,0%). Ambas herramientas de triaje mostraron una baja especificidad:17,5% (MTS) y 2,7% (ESI). El análisis de regresión logística binaria indicó que la probabilidad de sepsis aumentaba con las categorías de triaje de mayor urgencia y disminuía en las inferiores.

Conclusiones. Tanto ESI como MTS demostraron una alta sensibilidad en la asignación de pacientes sépticos a las categorías de mayor urgencia, con un mejor rendimiento de ESI. Sin embargo, el MTS mostró una discriminación superior entre los niveles de urgencia y, por tanto, puede ser más compatible con las limitaciones de recursos que suelen darse en los SU.

Palabras clave: Servicio de Urgencias Hospitalario. Triaje. Sepsis. *Shock* séptico. Servicios Médicos de Urgencia.

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Introduction

Sepsis is a life-threatening condition resulting from a dysregulated immune response to infection, leading to organ dysfunction and high mortality rates.[1,2] The Surviving Sepsis Campaign clinical practice guidelines, published in 2021, emphasise the importance of screening and early recognition of patients with suspected sepsis. Patients with sepsis should be identified as early as possible to allow sufficient time to confirm the diagnosis and initiate antibiotic treatment within 1 hour.[3]

Approximately two thirds of patients hospitalised with sepsis are initially treated in emergency departments (EDs), highlighting their central role in early detection and management.[4] Triage tools, such as the Manchester Triage System (MTS) or the Emergency Severity Index (ESI), are routinely used for the initial assessment of patients. Both systems comprise 5 severity levels (urgent categories: red [1], orange [2], yellow [3]; non-urgent categories: green [4], blue [5]). Both systems aim to prioritise patients according to the urgency of care while optimising the use of available ED resources.[5,6]

The MTS classifies patients into 52 triage flowcharts (presenting complaints). Each flowchart uses specific triage discriminators (symptoms) to assign patients to the corresponding category.[5] The ESI, in turn, is based on the clinical experience of the triage professional, signs of potential deterioration (eg, chest pain), vital signs, and the number of resources expected to be required to assign patients to 1 of the 5 triage categories.[6]

Former studies have shown that the MTS is a reliable tool for risk stratification in patients presenting to the ED.[7-10] Similarly, the ESI has shown good reliability for patient triage in several studies.[11-13] In comparison, the MTS has shown a greater tendency towards potentially dangerous undertriage than the ESI, suggesting that the latter may be a safer system.[9] Regarding the correct classification of patients with sepsis, the literature shows heterogeneous results. Most studies indicate moderate-to-good validity for both triage systems; however, none conclusively identifies the superiority of one over the other for detecting sepsis.[4,14-16]

The objective of this study was to analyse whether the MTS or ESI reliably classify patients diagnosed with sepsis within the first 24 hours after ED arrival into urgent triage categories (defined as categories 1-3), which would allow treatment to be initiated within 1 hour and potentially improve clinical outcomes. We also aimed to determine whether either system has greater ability to achieve this purpose.

Methods

We conducted a retrospective secondary analysis using data from 1,424 patients from the LIFE-POC study, a prospective, multicentre, uncontrolled observational study whose primary endpoint was to identify biomarkers for the early recognition of sepsis.[17] Between December 19, 2016, and June 7, 2019, a total of 1,465 patients were recruited from 2 EDs in Berlin, Germany, belonging to *Charité-Universitätsmedizin Berlin* (*Charité-Campus-Mitte and Charité-Virchow-Klinikum;* both using the MTS; hereafter, MTS centre), and from a third ED at *Universitätsmedizin Jena,* Germany (using the ESI; hereafter, ESI centre).

The study was approved by the Ethics Committee of Universitätsklinikum Jena (registration No. 4912-08/16) and by the Ethics Committee of *Charité-Universitätsmedizin Berlin,* which revalidated the initial approval. The study was registered in the German Clinical Trials Register (clinical trial No. DRKS00011188).

Inclusion and exclusion criteria

All adult patients presenting to the EDs with suspected acute organ dysfunction who gave their informed consent directly or through a legal representative were included. Acute organ dysfunction was defined as a score of at least 1 point on the quick Sequential Organ Failure Assessment (qSOFA). This score assigns 1 point for each of the following criteria: Glasgow Coma Scale score < 15 points, respiratory rate ≥ 22 breaths per minute, or systolic blood pressure ≤ 100 mmHg (total score ranging from 0 to 3).[3]

Patients with a clear primary diagnosis of acute myocardial infarction, stroke, or acute trauma were excluded to avoid interfering with timely treatment. Pregnant women and patients with treatment limitations (defined as those with a life expectancy < 28 days) were also excluded. In Berlin, recruitment was carried out during alternating shifts, whereas in Jena it was performed daily between 09:00 and 17:00.

Data collection and subsequent patient exclusion

Complete demographic and clinical data were recorded for all included patients. During hospitalisation, patients were followed for 96 hours, with daily recording of vital signs and laboratory parameters to assess changes in the Sepsis-related Organ Failure Assessment (SOFA) score. Hospitalised patients were followed for 28 days, including recording of intensive care unit (ICU) admission and mortality. All data were validated by an authorised physician from the research team.[17]

Data on the triage category were retrospectively extracted from hospital information systems. In Berlin, recruitment was completed within 15 months, whereas in Jena recruitment continued for approximately 37 months because of differences in patient volume and recruitment capacity. For this secondary analysis, 27 patients were excluded because of missing or implausible triage data. In addition, 14 patients diagnosed with sepsis more than 24 hours after ED arrival were excluded because this was considered too remote from the time of triage (Figure 1).

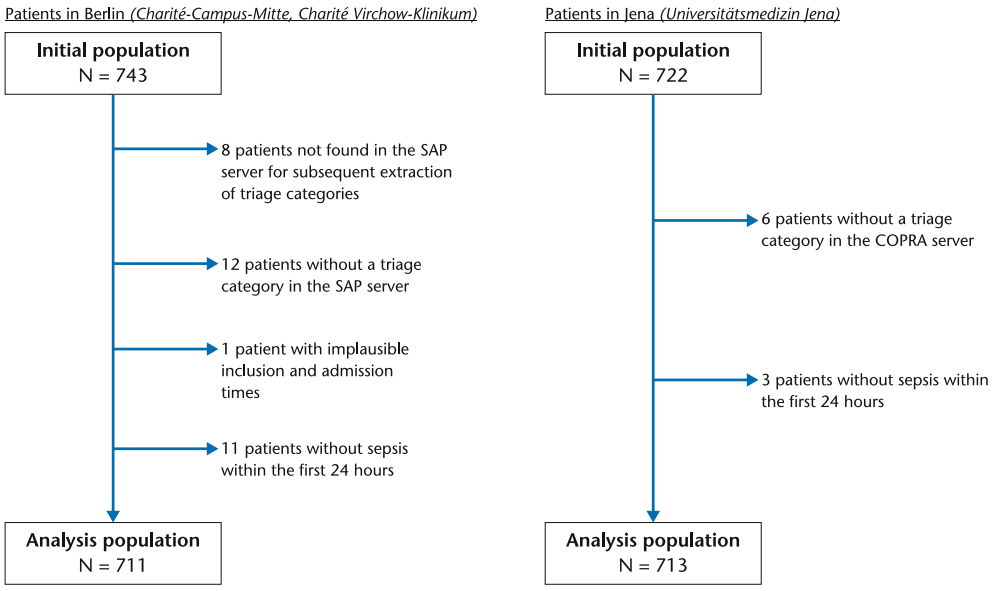


Figura 1. Patient flow diagram.

All included patients underwent triage by trained nursing staff according to routine clinical practice at each centre. For the ESI, nurses completed a structured 2-day training programme followed by a supervised implementation period until competency was achieved. For the MTS, staff completed a standardised certification programme provided by the institutional training academy. As a quality-control measure, triage decisions were retrospectively reviewed at random, with feedback provided to staff.

Definition of variables

The primary outcome variable was the diagnosis of sepsis within the first 24 hours after ED arrival. Sepsis was defined according to Sepsis-3 criteria as the presence of clinically confirmed or suspected infection together with an acute increase of at least 2 points in the SOFA score.[2]

The diagnosis of sepsis was verified after completion of data collection by a panel of 4 board-certified specialists in internal medicine or emergency medicine.[2] In cases of disagreement, 2 additional experts were consulted. A 24-hour time window was selected to assess the ability of triage tools to identify not only patients with sepsis at the time of admission but also patients in the early stages of the condition. To assess the accuracy of MTS and ESI triage, assignment to categories 1, 2, and 3 (urgent) was considered correct, because category 3 guarantees first medical contact within 30 minutes, allowing treatment to be initiated within the first hour.

Data analysis

Continuous variables are expressed as median (interquartile range) and were compared using the Mann-Whitney U test. Categorical variables are expressed as frequencies and percentages and were compared using the chi-square test. The distribution of patients across triage categories was summarised and presented using bar charts. The distribution of triage categories between centres was compared using the chi-square test.

Sensitivity, specificity, positive predictive value (PPV), and negative predictive value (NPV) were calculated from contingency tables, together with their 95% CIs using the exact binomial method (Clopper-Pearson), to assess the accuracy of the MTS and ESI for identifying sepsis.

Odds ratios (ORs) were estimated using binary logistic regression models, with category 3 used as the reference because it had the largest sample size. Owing to the small number of patients in categories 4 and 5, these were combined into a single category (MTS centre: category 4, n = 113; category 5, n = 1; ESI centre: category 4, n = 14; category 5, n = 2). Models were adjusted for age and comorbidity (Charlson Comorbidity Index).[18] Because of a significant interaction between the 2 adjustment parameters, they were included in the model as an interaction term using their product.

Absolute and relative ED discharge data were presented to estimate over- and undertriage. *P* values were not reported because of the small sample size. Statistical analysis was performed using SPSS version 27 (IBM Deutschland GmbH).

Results

Baseline characteristics

A total of 1,424 patients were included in this secondary analysis; approximately half presented to the EDs of the 2 Berlin University Hospital centres (n = 711; triaged

Table 1. Baseline characteristics of septic and non-septic patients classified by triage in the emergency departments of the 2 study centres

Variables	Initial population			Septic patients (within 24 h)			Non-septic patients (within 24 h)		
	Berlin cohort n (%)	Jena cohort n (%)	*P*	Berlin cohort n (%)	Jena cohort n (%)	*P*	Berlin cohort n (%)	Jena cohort n (%)	*P*
Demographic data									
Number, n (% of total)	711	713		186 (26.2)	202 (28.3)		525 (73.8)	511 (71.7)	
Age, years [median (IQR)]	68 (56-77)	76 (65-81)	< **.001**	70 (59-78)	76 (67-81)	< **.001**	67 (56-77)	76 (64-81)	< **.001**
Male sex	415 (58.4)	387 (54.3)	.120	113 (60.8)	111 (55.0)	.248	302 (57.5)	276 (54.0)	.255
CCI [median (IQR)]	5 (3-6)	5 (3-6)	.429	5 (3-7)	5 (3-6)	.085	4 (2-6)	4 (3-6)	.079
qSOFA score*									
qSOFA 1 point	546 (76.8)	605 (84.9)	< **.001**	99 (53.2)	157 (77.7)	< **.001**	447 (85.1)	448 (87.7)	.235
qSOFA 2 points	150 (21.1)	104 (14.6)	< **.001**	74 (39.8)	44 (21.8)	< **.001**	76 (14.5)	60 (11.7)	.193
qSOFA 3 points	15 (2.1)	1 (0.1)	< **.001**	13 (7.0)	0 (0.0)	< **.001**	2 (0.4)	1 (0.2)	.579
Triage									
Urgent triage (categories 1-3)	597 (84.0)	697 (97.8)	**.001**	164 (88.2)	200 (99.0)	< **.001**	433 (82.5)	497 (97.3)	< **.001**
Outcomes									
ICU admission	141 (19.8)	152 (21.3)	.488	83 (44.6)	88 (43.6)	.834	58 (11.0)	64 (12.5)	.461
Death	43 (6.0)	46 (6.5)	**.028**	23 (12.4)	24 (11.9)	.625	20 (3.8)	22 (4.3)	**.041**

*3 values not documented.
MTS: Manchester Triage System; ESI: Emergency Severity Index; CCI: Charlson Comorbidity Index; qSOFA: quick Sequential Organ Failure Assessment; IQR: interquartile range; ICU: intensive care unit.
Bold values indicate statistical significance ($P < .05$).

using the MTS), whereas the other half presented to Jena University Hospital (n = 713; triaged using the ESI).

Sepsis was diagnosed within the first 24 hours in 186 patients in the MTS group (26.2%) and in 202 patients in the ESI group (28.3%). Median age was significantly higher in the Jena population than in the Berlin population (Jena, 76 years; Berlin, 68 years). Similarly, a higher qSOFA score was more frequent among patients treated in Berlin (qSOFA 2-3 points: Berlin, 23.2% vs Jena, 14.7%).

The MTS in Berlin assigned urgent categories less frequently than the ESI in Jena (MTS urgent categories: 84.0% in categories 1-3; ESI: 97.8%). Table 1 shows the demographic characteristics.

Distribution across triage categories

Figure 2 illustrates the distribution of patients with and without sepsis according to triage category after ED arrival. With both systems, patients with sepsis were classified into urgent categories more frequently than patients without sepsis (MTS urgent: non-septic patients, 82.5% vs septic patients, 88.1%; ESI urgent: non-septic patients, 97.3% vs septic patients, 99.0%).

With the MTS, most patients with sepsis were assigned to categories 1 and 2 (54.8%), whereas with the ESI most were classified in category 3 (51.5%). Only 1.0% of patients with sepsis were classified as category 4 with the ESI, compared with 11.8% with the MTS. No patient with sepsis was assigned to category 5. The MTS classified patients more frequently into categories 1 and 4, whereas the ESI assigned more patients to category 3 (Table 2).

Accuracy of triage with the MTS and ESI

At the MTS centre, 164 of the 186 patients diagnosed with sepsis within the first 24 hours after ED arrival were correctly classified into urgent categories, corresponding to high sensitivity (88.2%) but relatively low specificity (17.5%). At the ESI centre, 200 of the 202 patients with sepsis were correctly assigned to urgent categories, indicating very high sensitivity (99.0%), although specificity was notably low (2.7%) (Table 3).

Adjusted binary logistic regression analysis in the MTS group showed a significant increase in the probability of a diagnosis of sepsis within the first 24 hours among patients assigned to categories 1 (OR, 2.35) and 2 (OR, 1.49) compared with category 3. By contrast, the probability of sepsis appeared to decrease among patients assigned to categories 4 and 5 (OR, 0.83) (Table 4).

In the adjusted ESI model, no statistically significant association was observed between triage category and the probability of sepsis. Nevertheless, the model suggests that patients assigned to category 1 had a 1.43-fold higher probability of a sepsis diagnosis than those in the reference category (category 3). For patients in the remaining categories, a slight reduction in the probability of sepsis was observed (OR for categories 4-5, 0.33; category 2, 0.84).

In both models (MTS and ESI), the combined adjustment variables (age and Charlson Comorbidity Index) showed a minimal positive association with the diagnosis of sepsis (OR, 1.001) (Table 4). Subgroup analyses according to elevated qSOFA, Charlson index, and age are presented in the supplementary material (https://revistaemergencias.org/extra/5264.pdf).

Under- and overtriage

In the subgroup of undertriaged patients at the MTS centre, 31.8% (n = 7/22) required ICU admission and 9.1% (n = 2/22) died at the 28-day follow-up. At the ESI

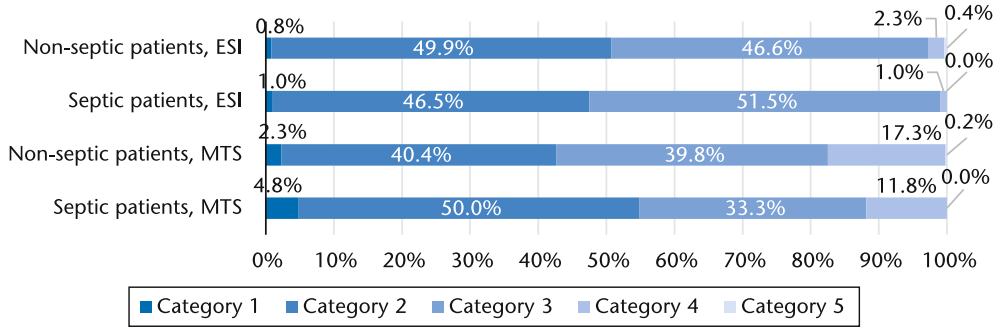


Figure 2. Percentage distribution of septic and non-septic patients according to triage categories 1-5 using the Emergency Severity Index (ESI) and the Manchester Triage System (MTS).

centre, only 2 undertriaged patients were identified, 1 of whom died. Nevertheless, the data suggest that patients with sepsis classified as non-urgent had a lower probability of ICU admission or death (MTS: OR for ICU admission, 0.54; OR for mortality, 0.68) (Table 5).

More than 1 in 4 non-septic patients classified as urgent were discharged directly from the ED for outpatient management (MTS, 30.7%; ESI, 27.2%).

Discussion

In this secondary analysis of the prospective LIFE-POC cohort study, both the MTS and ESI appear to be valid tools for triaging patients with sepsis who require early detection and treatment in the ED. The ESI showed greater sensitivity, with fewer patients with sepsis being undertriaged, whereas the MTS may have greater discriminatory ability across the different triage categories.

Former studies have shown that both triage systems have moderate-to-high sensitivity for the diagnosis of sepsis and other relevant prognostic outcomes, such as in-hospital mortality.[4,14-16] In triage categories 1 and 2, the ESI has shown particularly high sensitivity for outcomes such as ICU admission or mortality in patients with sepsis, comparable to that of established screening scores such as NEWS or SIRS.[16]

However, in a former study including 151 patients with suspected sepsis that assessed the ability of the ESI to classify them into categories 1 and 2, Geier *et al.* observed that the ESI had only moderate sensitivity and specificity (sensitivity, 70.8%; specificity, 45.6%).[15] The present findings are consistent with those of studies with larger sample sizes, indicating that both systems may perform well in assigning patients with sepsis to urgent categories, particularly the ESI.

The findings of Storm-Versloot *et al.*, which described undertriage with the ESI in general ED populations, were not reproduced in this cohort of patients with suspected organ dysfunction and sepsis. By contrast, the results suggest that the ESI may classify patients with sepsis appropriately, although it may tend to overtriage non-septic patients by assigning them more frequently to higher-acuity categories.[19]

The subanalysis of undertriaged patients in the MTS group showed that a considerable proportion of patients classified as non-urgent were in fact at high risk and therefore represented true undertriage.

Although a systematic review found no significant association between patient volume and triage performance, increasing workload and system pressure could influence decision-making at the time of triage.[20] Nevertheless, specific data on triage accuracy under overcrowded conditions remain limited.

The low specificities observed for both the MTS and ESI in this study are consistent with former reports.[14,16] This finding is consistent with the role of EDs, which manage a wide range of acute and urgent conditions and prioritise immediacy of care over precise diagnostic differentiation. In addition, inclusion of patients with at least 1 qSOFA point resulted in a cohort with greater baseline severity, which contributes to reduced specificity.

Table 2. Comparison of triage category frequencies between the 2 centres

	Cat. 1 n (%)	Cat. 2 n (%)	Cat. 3 n (%)	Cat. 4 n (%)	Cat. 5 n (%)	Total number of patients, n
Septic patients						
MTS centre	9 (4.8)	93 (50.0)	62 (33.3)	22 (11.8)	0 (0.0)	186
ESI centre	2 (1.0)	94 (46.5)	104 (51.5)	2 (1.0)	0 (0.0)	202
P						**< .001**
Non-septic patients						
MTS centre	12 (2.3)	212 (40.4)	209 (39.8)	91 (17.3)	1 (0.2)	525
ESI centre	4 (0.8)	255 (49.9)	238 (46.6)	12 (2.3)	2 (0.4)	511
P						**< .001**

MTS: Manchester Triage System; ESI: Emergency Severity Index; Cat: triage category.
Bold values indicate statistical significance ($P < .05$).

Table 3. Contingency table of triage category assignment in septic and non-septic patients

	Sepsis (within 24 h)	No sepsis (within 24 h)	Total	
ESI – urgent (categories 1, 2, 3)	200	497	697	VPP (IC 95%): 28.7% (25.4-32.2)
ESI – non-urgent (categories 4, 5)	2	14	16	VPN (IC 95%): 87.5% (61.7-98.5)
Total	202	511		
	Sensitivity (95% CI) 99.0% (96.5-99.9)	Specificity (95% CI) 2.7% (1.5-4.6)		
	Sepsis (within 24 h)	**No sepsis (within 24 h)**	**Total**	
MTS – urgent (categories 1, 2, 3)	164	433	597	VPP (IC 95%): 27.5% (24.0-31.2)
MTS – non-urgent (categories 4, 5)	22	92	114	VPN (IC 95%): 80.7% (72.3-87.5)
Total	186	525		
	Sensitivity (95% CI) 88.2% (82.6-92.4)	Specificity (95% CI) 17.5% (14.4-21.1)		

ESI: Emergency Severity Index; MTS: Manchester Triage System; PPV: positive predictive value; NPV: negative predictive value; CI: confidence interval.

In the present analysis, the ESI assigned patients with sepsis to urgent categories more frequently than the MTS, consistent with the findings reported by Mirhaghi *et al.* in unselected ED populations.[11] This pattern may be explained by the incorporation into the ESI of vital signs such as respiratory rate, which overlap with qSOFA criteria.[6]

Notably, in the ESI cohort, patients with sepsis were less frequently assigned to category 2 and more frequently to category 3 than patients without sepsis. This pattern suggests a possible binary distribution within the septic population: one subgroup with overt clinical signs, classified directly into category 1, and another with subtler presentations, assigned to category 3. This could be explained by the structure of the ESI, which classifies unstable or critically ill patients as category 1 but, in the absence of high-risk criteria or signs of deterioration, tends to assign lower categories (3-5), potentially underusing category 2.[3,6] The MTS shows better discrimination across the different urgency levels, although this does not necessarily imply more conservative use of resources because overtriage rates were similar. Rather, the MTS follows a more conservative approach to resource allocation by avoiding excessive concentration of patients in specific categories and showing better discrimination between urgency levels.

This study has several limitations. First, the retrospective nature of this secondary analysis limits the inferential scope of the findings. Nevertheless, few patients were excluded because of incomplete data, minimising the risk of selection bias. Second, the data were collected in 2019 and therefore reflect the pre-COVID-19 pandemic context; some clinical practices or population characteristics may have changed since then. Third, the cohort included patients with suspected sepsis based on qSOFA, which was recommended at the time as a screening tool. This probably resulted in a population with greater severity than that usually encountered in EDs, although most patients had a qSOFA score of 1. This preselection may have contributed to the low specificity observed with both systems. Fourth, the small number of patients in categories 4 and 5 required these categories to be combined, with a consequent loss of information. Future studies with greater representation in these categories should specifically reassess triage levels 4-5. Similarly, the 24-hour interval for the diagnosis of sepsis may complicate the assessment of triage tools designed to prioritise immediate urgency rather than predict complex clinical outcomes. Furthermore, differences between centres, populations, and nursing practices limit direct comparability between the MTS and ESI.

Table 4. Binary logistic regression analysis of the probability of a sepsis diagnosis according to triage category using the Manchester Triage System and the Emergency Severity Index

Triage category (MTS)	Unadjusted			Adjusted			No. of patients
	OR	95% CI	*P*	OR	95% CI	*P*	
Manchester Triage System							
1	2.53	1.02-6.28	.05	2.35	0.94-5.89	.07	21
2	1.48	1.02-2.15	**.04**	1.49	1.02-2.18	**.04**	305
3	Reference			Reference			271
4 and 5	0.81	0.47-1.39	.44	0.83	0.48-1.45	.83	114
Adjustment parameters							
Age × CCI				1.001	1.00-1.00	< **.05**	
Emergency Severity Index							
1	1.36	0.24-7.53	.73	1.43	0.26-7.98	.68	6
2	0.84	0.61-1.17	.31	0.84	0.60-1.67	.29	349
3	Reference			Reference			271
4 and 5	0.33	0.07-1.46	.14	0.33	0.07-1.48	.15	16
Adjustment parameters							
Age × CCI				1.001	1.00-1.00	.17	

MTS: Manchester Triage System; CCI: Charlson Comorbidity Index; CI: confidence interval; OR: odds ratio; ESI: Emergency Severity Index.
Bold values indicate statistical significance ($P < .05$).

Table 5. Clinical outcomes of undertriaged septic patients

	ESI – urgent (categories 1, 2, 3)	ESI – non-urgent (categories 4, 5)	MTS – urgent (categories 1, 2, 3)	MTS – non-urgent (categories 4, 5)
ICU admission, % of septic patients (total numbers)	44.0% (88/200)	0.0% (0/2)*	46.3% (76/164)	31.8% (7/22)*[1]
Deaths, % of septic patients (total numbers)	11.5% (23/200)	50.0% (1/2)*	12.8% (21/164)	9.1% (2/22)*[2]

*All *P* values were calculated for exploratory purposes; owing to the small number of patients, they did not reach statistical significance and are therefore not presented.
[1]Odds ratio from binary logistic regression for ICU admission in patients classified as nonurgent (MTS): 0.54 (P = .20)*.
[2]Odds ratio from binary logistic regression for mortality in patients classified as nonurgent (MTS): 0.68 (P = .62)*.
MTS: Manchester Triage System; ESI: Emergency Severity Index; ICU: intensive care unit.

Unfortunately, data on time to antibiotic administration were unavailable, which could have allowed better assessment of the impact of urgent triage. In this regard, the findings should be considered exploratory and hypothesis-generating.

Additional studies are needed to optimise triage pathways and improve their overall accuracy. It is essential to analyse which algorithms are applied in patients with overt vs subtle manifestations of sepsis, as well as the factors influencing these decisions. Such pathways could be classified as higher urgency, explicitly flagging the possibility of sepsis when selected by triage staff. Gräff *et al.* highlighted the importance of integrating parameters from sepsis screening scores into triage systems, as well as incorporating specific indicators of systemic infection into the MTS, some of which have already been implemented.[4,5] The triage pathway derived from these indicators should not only facilitate rapid medical assessment but also trigger close monitoring of patients at risk of early sepsis.[3] Nevertheless, integration of these improvements must be balanced against ED resource constraints, which remains an important challenge requiring further research.

In conclusion, this secondary analysis suggests that both the ESI and MTS are valid tools for identifying patients with sepsis in EDs. The ESI showed greater sensitivity, with no undertriage cases in this cohort. Both systems showed comparable proportions of outpatient discharge among patients classified as urgent. The MTS showed greater discriminatory ability across urgency levels, which could promote more efficient resource allocation; nevertheless, even the small number of undertriaged patients with sepsis could compromise its reliability for the early recognition of septic patients.

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References

1 Singer M, Deutschmann CS, Seymour CW, Shankar-Hari M, Annane D, Bauer M, et al. The Third International Consensus Definitions for Sepsis and Septic Shock (Sepsis-3). JAMA. 2016;315:801-10.
2 Rudd KE, Johnson SC, Agesa KM, Shackelford KA, Tsoi D, Kievlan DR, et al. Global, regional, and national sepsis incidence and mortality, 1990-2017: analysis for the Global Burden of Disease Study. Lancet. 2020;395:200-11.
3 Evans L, Rhodes A, Alhazzani W,Antonelli M, Coopersmith CM, French C, et al. Surviving sepsis campaign: international guidelines for management of sepsis and septic shock 2021. Intensive Care Med. 2021;47:1181-247.
4 Gräff I, Goldschmidt B, Glien P, Dolscheid-Pommerich RC, Fimmers R, Grigutsch D. Validity of the Manchester Triage System in patients with sepsis presenting at the ED: a first assessment. Emerg Med J. 2017;34:212-8.
5 Mackway-Jones K, Marsen J, Windle J, Krey J. Ersteinschätzung in der Notaufnahme: das Manchester-Triage-System. 4., revised and expanded edition ed. 2018, Berna: hogrefe.
6 United States. Agency for Healthcare, and Quality, Emergency severity index. Emergency Nurses Association. Version 5 [Internet] : implementation handbook. Emergency severity index, 2023. (Accessed 10 November 2025). Available at: https://media.emscimprovement.center/documents/Emergency_Severity_Index_Handbook.pdf
7 Azeredo TR, Guedes HM, Rebelo de Almeida RA, Chiana TC, Martins JC. Efficacy of the Manchester Triage System: a systematic review. Int Emerg Nurs. 2015;23:47-52.
8 Gräff I, Latzel B, Glien P, Fimmers R, Dolscheid-Pommerich RC. Validity of the Manchester Triage System in emergency patients receiving life-saving intervention or acute medical treatment-A prospective observational study in the emergency department. J Eval Clin Pract. 2019;25:398-403.
9 Mirhaghi A, Mazlom R, Heydari A, Ebrahimi M. The reliability of the Manchester Triage System (MTS): a meta-analysis. J Evid Based Med. 2017;10:129-35.
10 Parenti N, Reggiani M L, Iannone P, Percudani D, Dowding D. A systematic review on the validity and reliability of an emergency department triage scale, the Manchester Triage System. Int J Nurs Stud. 2014;51:1062-9.
11 Mirhaghi A, Heydari A, Mazlom R, Hasanzadeh F. Reliability of the Emergency Severity Index: Meta-analysis. Sultan Qaboos Univ Med J. 2015;15:e71-7.

12 Takaoka K, Ooya K, Ono M, Kakeda T. Utility of the Emergency Severity Index by Accuracy of Interrater Agreement by Expert Triage Nurses in a Simulated Scenario in Japan: A Randomized Controlled Trial. J Emerg Nurs. 2021;47:669-74.
13 Baumann MR, Strout TD. Triage of Geriatric Patients in the Emergency Department: Validity and Survival With the Emergency Severity Index. Ann Emerg Med. 2007;49:234-40.
14 Zaboli A, Ausserhofer D, Pfeifer N, Solazzo P, Magnarelli G, Siller M, et al. Triage of patients with fever: The Manchester triage system's predictive validity for sepsis or septic shock and seven-day mortality. J Crit Care. 2020;59:63-9.
15 Geier F, Popp S, Greve Y, Achterberg A, Glöckner E, Ziegler R, et al. Severity illness scoring systems for early identification and prediction of in-hospital mortality in patients with suspected sepsis presenting to the emergency department. Wien Klin Wochenschr. 2013;125:508-15.
16 Phungoen P, Khemtong S, Apiratwarakul K, Ienghong K, Kotruchin P. Emergency Severity Index as a predictor of in-hospital mortality in suspected sepsis patients in the emergency department. Am J Emerg Med. 2020;38:1854-9.
17 Bolanaki M, Winning J, Slagman A, Lehmann T, Kiehntopf M, Stacke A, et al. Biomarkers Improve Diagnostics of Sepsis in Adult Patients With Suspected Organ Dysfunction Based on the Quick Sepsis-Related Organ Failure Assessment (qSOFA) Score in the Emergency Department. Crit Care Med. 2024;52:887-99.
18 Charlson ME, Pompei P, Ales KL, MacKenzie CR. A new method of classifying prognostic comorbidity in longitudinal studies: development and validation. J Chronic Dis. 1987;40:373-83.
19 Storm-Versloot MN, Ubbink DT, Kappelhof J, Luitse JS. Comparison of an informally structured triage system, the emergency severity index, and the manchester triage system to distinguish patient priority in the emergency department. Acad Emerg Med. 2011;18:822-9.
20 Zachariasse JM, van der Hagen V, Seiger N, Mackway-Jones K, van Veen M, Moll HA. Performance of triage systems in emergency care: a systematic review and meta-analysis. BMJ Open. 2019;28:e026471.