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Impact of Implementation of An Emergency Department Sepsis Screening Tool and Checklist on Adherence to Sepsis Guidelines and Reduction in News-2 Score at a Tertiary Care Hospital.

Dr. Suman Reddy P.M.[1], Dr. Aruna C. Ramesh[2], Dr. Hariprasad K.V.[3], Dr. Neeraja P. Kumar[4]*.

[1]Assistant Professor, Department of Emergency Medicine, BGS Medical College and Hospital, Nagarur, Bengaluru, Karnataka, India.
[2]Professor and HOD, Department of Emergency Medicine, MS Ramaiah Medical College, Bengaluru, Karnataka, India.
[3]Associate Professor, Department of Emergency Medicine, MS Ramaiah Medical College, Bengaluru, Karnataka, India.
[4]Assistant Professor, Department of Emergency Medicine, MS Ramaiah Medical College, Bengaluru, Karnataka, India.

Correspondence:
Dr. Neeraja P. Kumar.
Assistant Professor, Department of Emergency Medicine, MS Ramaiah Medical College, Bengaluru, Karnataka, India.

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Abstract

Background: In this study, we wanted to evaluate the impact of implementing a standardized sepsis screening tool and a Sepsis-6 Checklist Bundle (S6CB) on adherence to the 1-hour sepsis bundle and the reduction in NEWS-2 scores in a tertiary care hospital emergency department. ***METHODS:*** This was a hospital based prospective observational study conducted among 102 patients who undergo standard sepsis protocol then will evaluate the implementation of sepsis screening tool and S6CB to Emergency Medicine Department of a tertiary care hospital. ***RESULTS:*** A total of 102 patients were included in the study. The most common source of infection was respiratory system followed by urinary system. All patients with red flag signs were started with sepsis-6 bundle with mean time for a senior clinician attend was 4.27 min, time to connect oxygen for required patients was 7.11 min, time to get IV access and take blood cultures if required was 12.22 min, to administer IV fluids time was 16.09 min, to administer IV antibiotics mean time was 44.62 min. Further all patients were monitored for 1hour in ED and continued in ICU. Significant reduction in NEWS-2 score was noted at 0 hr and 24th hours with mean total score of 9.59+2.953 and 7.29+3.2 respectively. ***CONCLUSION:*** The implementation of the sepsis screening tool and checklist resulted in a significant improvement in adherence to the sepsis guidelines within the critical 1-hour window. Additionally, there was a notable reduction in NEWS-2 scores at the 24-hour mark with p< 0.01, indicating an overall improvement in patient outcomes.

Keywords: Sepsis, Sepsis-6 Bundle, NEWS-2.

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INTRODUCTION

Sepsis is characterised by a life-threatening organ dysfunction due to a dysregulated host response to infection.[1] Sepsis remains a global emergency department (ED) challenge, contributing significantly to mortality, morbidity and resource utilization worldwide. Rapid recognition and intervention are critical as delays increase the risk of poor outcomes. In fact every hour delay in diagnosis and treatment of sepsis mortality increases by 7%.[1]

The sepsis cases in India alone were estimated to be 11.3 million, with 2.9 million deaths (297.7 per 100,000 population) in 2017.[2] The prevalence of sepsis in patients who directly present at the emergency department is between 1.7% and 2%. Notably, 1 in 5 deaths worldwide is associated with sepsis. 80% of sepsis related deaths are potentially preventable if treated in time.[3] Bundling of care refers to the use of a small set of evidence-based practices or interventions, usually three to five, which are applied together as a package to improve patient outcomes more effectively than when implemented individually. International initiatives, notably the Surviving Sepsis Campaign, emphasize evidence-based care bundles for timely diagnosis and management, including early fluid resuscitation, blood cultures before antibiotics, prompt broad-spectrum antibiotics, lactate measurement, and vasopressor support for refractory hypotension. Adherence to these protocols in EDs has demonstrated reduced mortality, shorter hospital stays, and improved outcomes in various settings. However, the dynamic, high-throughput ED environment especially in our country often leads to inconsistencies in compliance to the sepsis bundle and often with delays. Deployment of automated sepsis alerts and digital screening tools have demonstrated improved guideline adherence and reduced mortality in multicentre studies, underscoring their utility.

The most commonly available tools include systemic inflammatory response syndrome (SIRS) criteria, quick Sepsis-related Organ Failure Assessment (qSOFA), modified Early Warning Scores and, in the UK, National Early Warning Score

NEWS-2.[4] SIRS and qSOFA were initially developed as diagnostic tools for sepsis, but are now commonly used for highlighting patients at risk of poor outcomes from sepsis. These tools often have high sensitivity, but low specificity. UK sepsis trust developed sepsis 6 protocol to be completed within 1 hour to improve mortality of patient with sepsis. We used the sepsis-6 care bundle which was a part of the protocol in our study.[5] Standardized scoring systems such as the National Early Warning Score 2 (NEWS-2) are essential for early recognition of a critically ill patient and often used in many health care systems. We propose that since NEWS-2 improves predictive accuracy for early mortality and ICU admission when compared to qSOFA and SIRS, allowing rapid identification of patients at risk of sepsis-related deterioration.[6]

Integrating NEWS-2 into triage leads to earlier recognition, facilitated treatment, and significant reductions in morbidity and mortality of ED patients in sepsis. In the Indian context, challenges such as high ED volumes, limited resources, overcrowding, and variability in clinician training complicate timely sepsis identification and guideline adherence. The present study aims to critically evaluate the impact of such measures, addressing an essential gap in ED sepsis care at both the global and Indian levels. The primary objective of the study was to investigate the ability of Red Flag sepsis criteria to identify the patients at high risk of sepsis and institute sepsis 6 bundle within one hour.

METHODOLOGY

This was a hospital based prospective observational study conducted among 102 patients in whom sepsis 6 clinical bundle checklist (S6CB) was implemented to Emergency Medicine Department of an urban tertiary care hospital, over a period of 6 months from January 2025 to August 2025 after obtaining clearance from institutional ethics committee and written informed consent from the study participants. All adults who were diagnosed as sepsis based on clinical gestalt by the emergency physician upon presentation with a NEWS-2 score ≥ 5 were included and the following patients were excluded from the study. Secondary presentations after treatment initiation for sepsis in another hospital were excluded from our study. In our study we wanted to evaluate impact of implementation of (S6CB) on adherence to the 1-hour sepsis bundle by ED doctors and nurses. Additionally, we wished to determine the mean reduction in the NEWS-2 score at 24th hour compared to the 0-hour score. Data was analysed using SPSS 22 version software (IBM SPSS Statistics, Somers NY, USA). Categorical data was represented in the form of Frequencies and proportions. Continuous data was represented as mean and standard deviation. Paired t test is the test of significance for paired data such as zero vs 24hr for quantitative data. p value of <0.05 was considered as statistically significant after assuming all the rules of statistical tests.

RESULTS

A total of 102 patients diagnosed with sepsis were included in the study. The incidence of sepsis was found to increase with age, with the majority of cases occurring between 61 and 80 years of age. The gender distribution was nearly equal, indicating that both males and females are equally susceptible. Respiratory (40.2%) and urinary tract (32.4%) infections were identified as the predominant sources of sepsis (Table 1). Among red flag signs, elevated lactate levels (79.4%) and tachypnoea (63.7%) were the most common, highlighting their importance as early indicators of sepsis (Table 2). A significant reduction in the mean NEWS-2 score was observed after 24 hours of management (from 9.59 ± 2.95 to 7.29 ± 3.29, $p < 0.001$), demonstrating the effectiveness of timely intervention. (Table 3). Critical interventions, including clinician attendance, oxygen therapy, IV fluids, and antibiotics, were administered within the first hour of presentation (Table 4). After 24 hours, 94.1% of patients showed improvement, while only 5% had worsening scores (Table 5). These findings emphasize the importance of rapid identification and management of sepsis to improve patient outcomes.

Table 1: Source of Infection

Source	Frequency	Percent
Respiratory	41	40.2
Urine/Urinary tract	33	32.4
Gastrointestinal	15	14.7
Indwelling device	9	8.8
Surgical	5	4.9
Skin/Joint/Wound	3	2.9
Cholecystitis	1	1.0
Drug-induced	1	1.0
Pyelonephritis	1	1.0

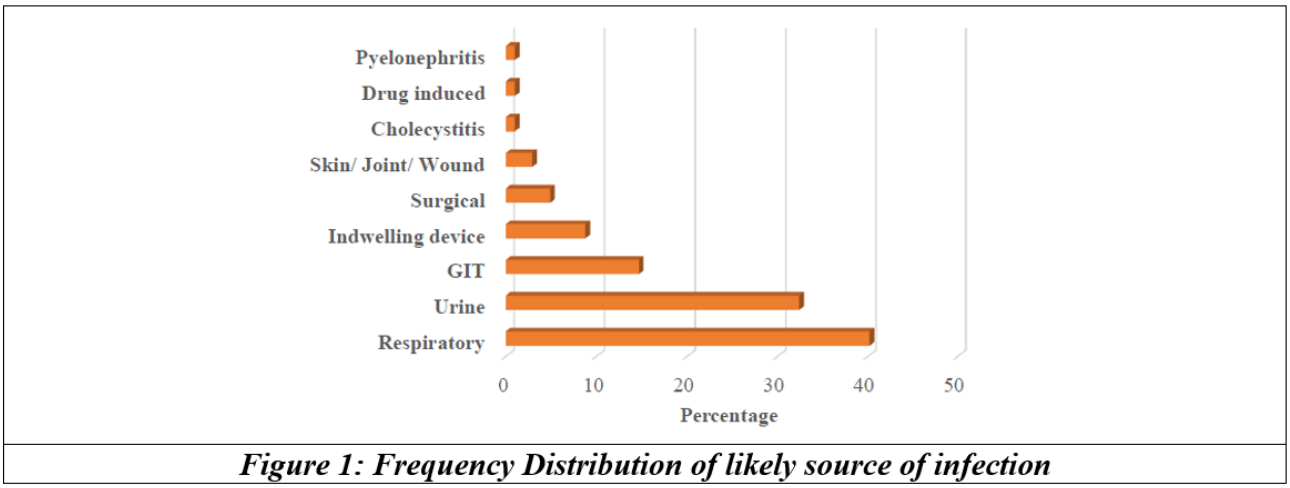

Figure 1: Frequency Distribution of likely source of infection

Table 2: Red Flag Signs

Parameter	Frequency	Percent
Systolic BP ≤ 90 mmHg	34	33.3
Heart rate ≥ 130/min	18	17.6
Respiratory rate ≥ 25/min	65	63.7
Lactate ≥ 2 mmol/L	81	79.4
O_2 requirement to maintain SpO_2 ≥ 92%	60	58.8
Altered mental status	8	7.8
Oliguria (<0.5 mL/kg/hr)	4	3.9
Recent chemotherapy	1	1.0

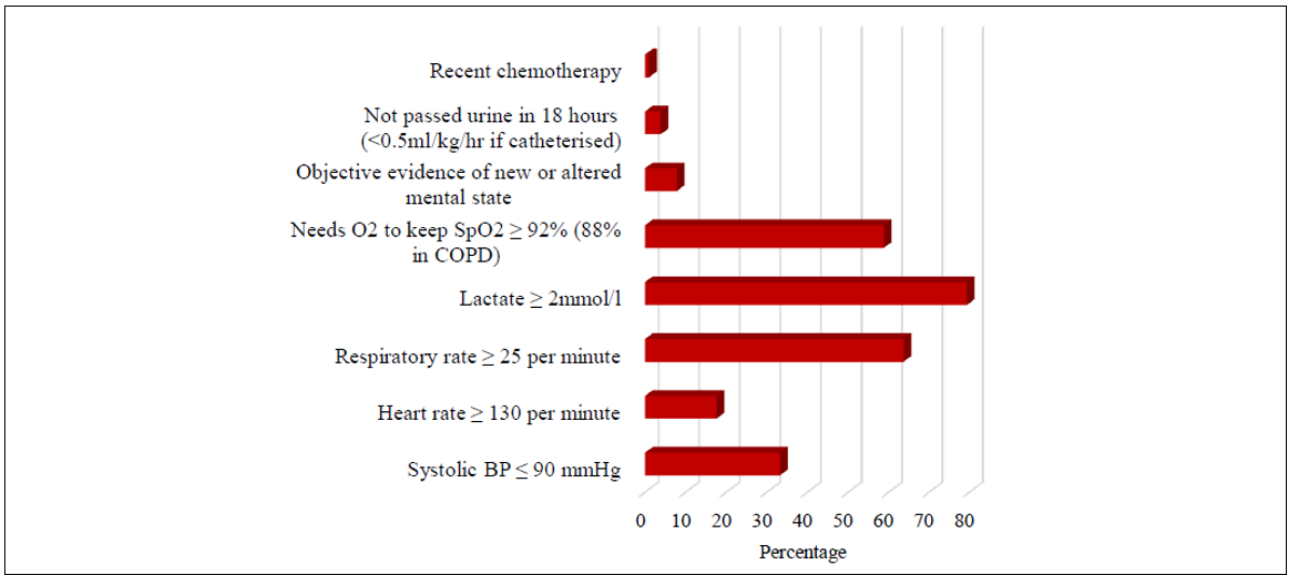

Figure 2: Frequency Distribution of red flag sign

Table 3: Comparison of NEWS2 Scores

Parameter	Mean	SD	p-value
0 hr Total Score	9.59	2.953	<0.001
24 hr Total Score	7.29	3.287	

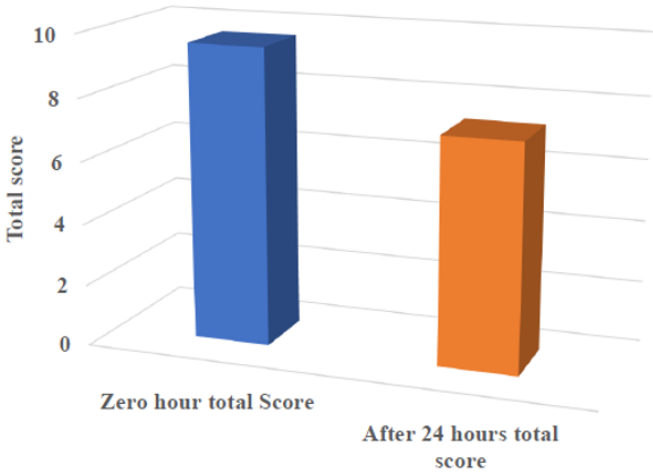

Figure 3: Comparison of mean total Score at 0hr vs 24hrs

Table 4: Mean Time for Interventions

Intervention	Mean (min)	SD
Senior clinician attendance	4.27	1.436
Oxygen administration	7.11	2.564
IV access & bloods	12.27	3.058
IV antibiotics	44.62	7.152
IV fluids	16.09	4.360

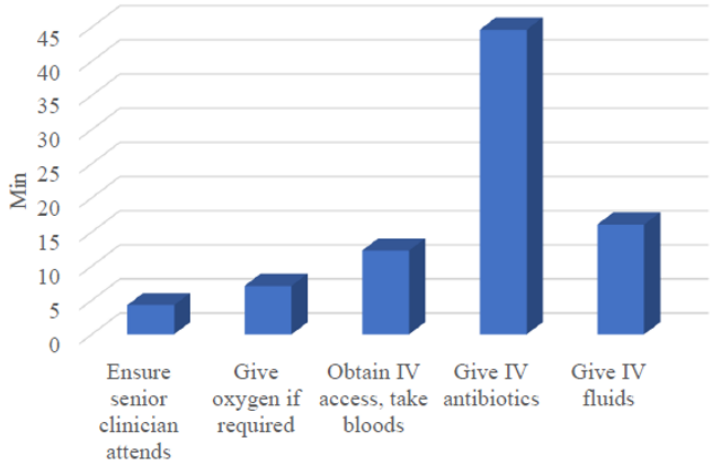

Figure 4: Mean time for Intervention

Table 5: Change in Scores after 24 Hours

Outcome	Frequency	Percent
Decreased	96	94.1
Increased	5	4.9
Same	1	1.0

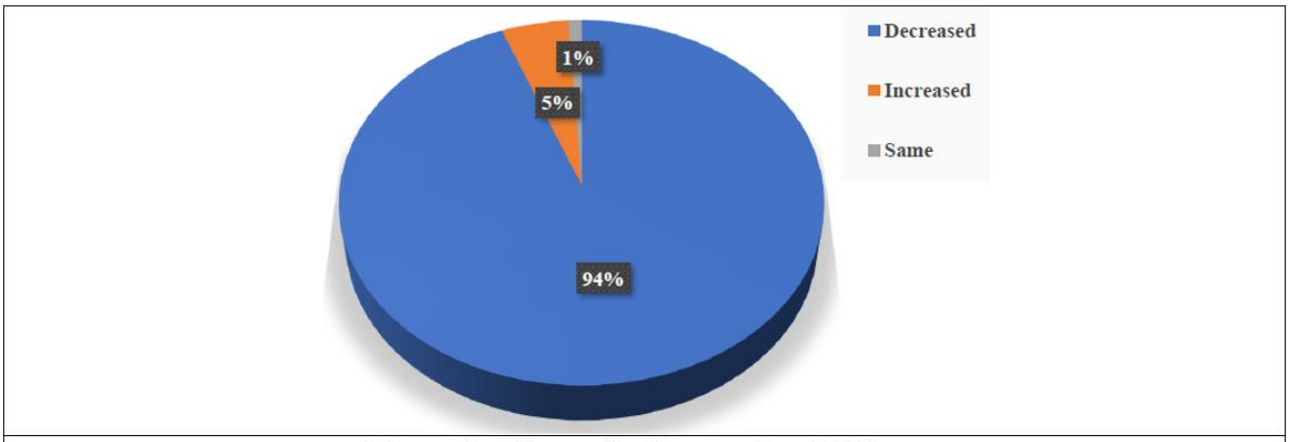

Figure 5: Change in Scores after 24 Hours

DISCUSSION

Sepsis is the leading cause of death from infection, especially if not recognized and treated promptly. Its recognition requires urgent attention. Sepsis is a syndrome influenced by both pathogen and host factors (e.g., sex, race, genetic determinants, age, comorbidities, environment) that evolve over time. What distinguishes sepsis from infection is an aberrant or dysregulated host response and the presence of organ dysfunction.

The implementation of a structured sepsis screening tool and checklist in the emergency department (ED) at a tertiary care hospital provides valuable insights into patient demographics, prevalent sources of sepsis, clinical red-flag signs, NEWS-2 score dynamics, and effectiveness of timely interventions. Analysis of patient demographics reveals that the incidence of sepsis is markedly higher among older adults, with over 84% of cases occurring in individuals above 50 years of age. The 61-80 years age bracket alone constitutes nearly 58% of the studied population. This age-related predisposition aligns with global and Indian epidemiological data, reflecting increased vulnerability due to immunosenescence, chronic comorbidities, and frequent hospitalizations in elderly groups.

Similar to the study by Levy MM, et al, in our study, chronic kidney disease (22.5%) and ischemic heart disease (15.7%) were notable conditions reflecting the multi-morbid nature of the subjects.[7] The observed nearly balanced sex distribution, with 47.1% females and 52.9% males, suggests that susceptibility to sepsis is comparable across genders-a finding consistent with previous studies indicating no strong sex predilection for sepsis incidence. According to Gupta S, et al, when they looked at nationwide trends and outcomes, pneumonia is the most common cause of sepsis. Respiratory, gastrointestinal, genitourinary, and soft tissue infections are also among the most common sources of sepsis, accounting for over 80% of cases.[8]

In our study, the respiratory tract (40.2%) and urinary tract (32.4%) were the major sources of infection, highlighting the need for targeted preventive measures in these areas. Respiratory tract infections (LRTIs) and urosepsis emerge as the predominant sources, accounting for 40.2% and 32.4% of cases, respectively. Frequent device-related infections highlight the need for robust infection control protocols within hospital settings. These trends mirror both global and Indian findings where respiratory and urinary sources consistently lead to sepsis cases in acute care settings. Updating and applying the National Early Warning Score 2 (NEWS-2) within this protocol addressed a practical question: whether a dedicated sepsis score was required or whether a generic physiological track-and-trigger system could reliably flag deterioration. Evidence from multiple acute-care cohorts indicates that NEWS-2 performs well for early detection of clinical deterioration and infection-related adverse outcomes, with thresholds around 5 balancing sensitivity and workload by identifying patients needing urgent review without generating excessive false alarms. In the current study, a mean NEWS-2 score close to 10 on arrival suggested substantial physiological derangement; the statistically significant fall to around 7 after 24 hours reflected clinical stabilization after treatment and supported the score's usefulness for monitoring early response.

Outcome Measures in our study include score comparison where our study had the statistically significant reduction in the mean total score from 9.59 at 0 hours to 7.29 at 24 hours ($p<0.001$) indicates that the interventions were effective in improving the condition of the subjects within the first 24 hours. The Red Flag sepsis is based on clinical features and aims at triggering Sepsis six bundle while confirmatory blood results are awaited. The performance of Red Flag sepsis criteria was not being tested formally and analysis of their performance compared to SIRS, SOFA, and a well-established tract and triggered tool, National Early Warning Score (NEWS) was thus needed.[9]

Lactate elevation (≥2 mmol/L) was identified in 79.4% of patients, making it the most sensitive red-flag marker in this cohort. Tachypnoea (63.7%) and oxygen requirement (58.8%) were also prevalent, followed by hypotension (33.3%) and tachycardia (17.6%). These findings reinforce the utility of elevated lactate as an early indicator of tissue hypoperfusion and cellular dysfunction-a key diagnostic criterion endorsed by the Surviving Sepsis Campaign and reflective of disease severity. NEWS-2 scoring, which incorporates variables such as respiratory rate, oxygen saturation, and mental status, demonstrated its value in risk stratification and early recognition. The low occurrence of altered mental status (7.8%) and oliguria (3.9%) suggests these may be less frequent but still clinically relevant in advanced stages.

Time metrics for critical interventions reveal a commendable degree of clinical efficiency, with senior clinician assessment averaging 4.27 minutes, oxygen administration within 7.11 minutes, IV access and blood draws at 12.27 minutes, and fluid resuscitation at 16.09 minutes. Delays in sepsis recognition and a lack of high-quality evidence hinder its implementation. Husab G, et al, found that 25.5% and 55.5% of patients received antibiotics within one and two hours respectively. This is in line with or slightly faster than the timing reported in previous studies with comparable patient cohorts in emergency department settings, which found that 28% of patients received antibiotics within 1 hour and that median times to commencing antibiotics were 2.1 hours and 128 minutes.[10]

Administration of IV antibiotics had a mean delay of 44.62 minutes, which, although within one hour, leaves room for further improvement given that international sepsis guidelines advocate for antibiotic delivery within 1 hour of recognition. Early achievement of these benchmarks is associated with improved outcomes-even modest delays can increase the risk of morbidity and mortality dramatically. Statistical analysis indicates a significant reduction in mean NEWS-2 score from 9.59 (±\ pm ±2.95) at admission to 7.29 (±\ pm ± 3.28) after 24 hours ($p<0.001p < 0.001p<0.001$), underscoring the effectiveness of the implemented sepsis protocol. The majority of patients (94.1%) showed improvement within 24 hours, signifying prompt stabilization and reduced physiological stress thanks to a streamlined clinical approach. However, a small subset (4.9%) experienced worsening scores, suggesting refractory disease, delayed response, or underlying multidrug-resistance, highlighting the need for ongoing audit and protocol refinement.

The findings echo international experiences with structured sepsis screening and management tools, which consistently show improved guideline adherence, earlier administration of critical therapies, and enhanced patient outcomes. The robust performance of the NEWS-2 scoring system in the present study concurs with published literature supporting its sensitivity and utility for early risk stratification in acute care environments. In the Indian context, where resource limitations and overcrowding challenge quality care delivery, adoption of checklists and digital alert systems represent feasible and impactful solutions to optimize sepsis care. This study reinforces the pivotal role of systematic screening and standardized intervention in improving early sepsis outcomes. The reduction in NEWS-2 score within 24 hours validates the efficacy of the protocol and supports ongoing institutional efforts to refine and expand such measures for broader patient populations. Prompt identification and rapid therapy remain cornerstones in sepsis management; consistent protocol adherence in EDs should be considered a primary performance metric for patient safety and quality improvement initiatives.

CONCLUSION

This study demonstrates that early recognition and timely implementation of the Sepsis 6 protocol significantly improve clinical outcomes in patients with sepsis. Most patients showed improvement in NEWS-2 scores within 24 hours, highlighting the effectiveness of standardized, multidisciplinary sepsis care. Respiratory and urinary tract infections were the predominant sources of sepsis, with older age and comorbidities such as diabetes and hypertension emerging as important risk factors. Although limited by its single-centre design and small sample size, the study supports the routine use of Sepsis 6 in the emergency department and underscores the need for larger multicentre studies to further evaluate age-related differences and optimize patient-centred sepsis management.

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